TPA03 Well Intervention Environment Plan

Revision 0

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1 INTRODUCTION

1.1 Overview

Woodside Energy Ltd (Woodside), as Titleholder under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) (referred to as the Environment Regulations), on behalf of the Joint Venture detailed in Section 1.7, is Operator of the TPA03 well located in WA-5-L. The TPA03 well is connected via the TPA manifold and pipelines, to the GWA facility which processes wells fluids under the accepted Goodwyn Alpha Facility Operations Environment Plan (Woodside Ref. A1800RH158693).

Woodside plans to perform a wireline well intervention on the TPA03 well from a Well Intervention Vessel (WIV), hereafter referred to as the Petroleum Activities Program which forms the scope of this Environment Plan (EP). A more detailed description of the activities is provided in **Section 3**.

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

1.2 Defining the Petroleum Activity

The Petroleum Activities Program to be undertaken in Permit Area WA-5-L comprises of a single wireline well intervention on an existing production well, which is a petroleum activity as defined in Regulation 4 of the Environment Regulations. As such an EP is required. Following the intervention, the TPA03 well will recommence production under the Goodwyn Alpha Facility Operations Environment Plan.

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.
- The Petroleum Activities Program is carried out in a manner consistent with the principles of ecologically sustainable development (ESD) (as defined in Section 3A of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* [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, standards, and measurement criteria. These form the basis for monitoring, auditing, and managing the Petroleum Activities Program to be undertaken by Woodside and its contractors. The implementation strategy (derived from the decision support framework tools) specified in 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**.

1.5 Environment Plan Summary

An EP summary will be prepared based on the material provided in this EP. **Table 1-1** summarises the content that will be provided within the EP summary, as required by Regulation 11(4).

Table 1-1: EP Summary

EP Summary material requirement	Relevant section of this EP containing EP Summary material
The location of the activity	**Section 3.3**
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 7.5**
Response arrangements in the oil pollution emergency plan	**Section 7.9**
Consultation already undertaken and plans for ongoing consultation	**Section 5**
Details of the titleholder's nominated liaison person for the activity	**Section 1.8**

1.6 Structure of the Environment Plan

The 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 Environment Regulations and relevant section of EP

Criteria for acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
Regulation 10A(a): is appropriate for the nature and scale of the activity	Regulation 13: Environmental Assessment Regulation 14: Implementation strategy for the environment plan Regulation 16: Other information in the environment plan	The principle of 'nature and scale' applies throughout the EP	**Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 7**
Regulation 10A(b): demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable	Regulation 13(1)–13(7): 13(1) Description of the activity 13(2)(3) Description of the environment 13(4) Requirements 13(5)(6) Evaluation of environmental impacts and risks 13(7) Environmental performance outcomes and standards Regulation 16(a)–16(c): A statement of the titleholder's corporate environmental policy A report on all consultations between the titleholder and any relevant person	Set the context (activity and existing environment) Define 'acceptable' (the requirements, the corporate policy, relevant persons) Detail the impacts and risks Evaluate the nature and scale Detail the control measures – ALARP and acceptable	**Section 1** **Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 7**
Regulation 10A(c): demonstrates that the environmental impacts and risks of the activity will be of an acceptable level			

Criteria for acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
Regulation 10A(d): provides for appropriate environmental performance outcomes, environmental performance standards and measurement criteria	Regulation 13(7): Environmental performance outcomes and standards	Environmental Performance Objectives (EPOs) Environmental Performance Standards (EPSs) Measurement Criteria (MC)	**Section 6**
Regulation 10A(e): includes an appropriate implementation strategy and monitoring, recording and reporting arrangements	Regulation 14: Implementation strategy for the environment plan	Implementation strategy, including: • systems, practices and procedures • performance monitoring • Oil Pollution Emergency Plan (OPEP – **per Table 7-4**) and scientific monitoring • ongoing consultation.	**Section 7** **APPENDIX D**
Regulation 10A(f): 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 EPBC Act	Regulation 13 (1)–13(3): 13(1) Description of the activity 13(2) Description of the environment 13(3) Without limiting [Regulation 13(2)(b)], particular relevant values and sensitivities may include any of the following: (a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act; (b) the national heritage values of a National Heritage place within the meaning of that Act; (c) the ecological character of a declared Ramsar wetland within the meaning of that Act; (d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act; (e) the presence of a listed migratory species within the meaning of that Act; (f) any values and sensitivities that exist in, or in relation to, part or all of: (i) a Commonwealth marine area within the meaning of that Act; or (ii) Commonwealth land within the meaning of that Act.	No activity, or part of the activity, undertaken in any part of a declared World Heritage property	**Section 3** **Section 4** **Section 6**
Regulation 10A(g): (i) the titleholder has carried out the consultations	Regulation 11A: Consultation with relevant authorities, persons and organisations, etc. Regulation 16(b):	Consultation in preparation of the EP	**Section 5**

Criteria for acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
required by Division 2.2A (ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate	A report on all consultations between the titleholder and any relevant person		
Regulation 10A(h): complies with the Act and the regulations	Regulation 15: Details of the Titleholder and liaison person Regulation 16(c): Details of all reportable incidents in relation to the proposed activity.	All contents of the EP must comply with the Act and the regulations	**Section 1.6** **Section 7.8**

1.7 Description of the Titleholder

Woodside is the Titleholder for this activity, on behalf of a Joint Venture including Woodside Energy Ltd, BP Developments Australia Pty Ltd, Woodside Energy (North West Shelf) Pty Ltd, Chevron Australia Pty Ltd, Japan Australia LNG (MIMI) Pty Ltd, CNOOC NWS Private Ltd and Shell Australia Pty Ltd.

Woodside's mission is to deliver superior shareholder returns through realising its vision of becoming a global leader in upstream oil and gas. Wherever Woodside works, it is committed to living its values of integrity, respect, working sustainably, discipline, excellence and working together.

Woodside's operations are characterised by strong safety and environmental performance in remote and challenging locations.

Since 1984 the company has been operating, on behalf of the Joint Venture, the landmark Australian project, the North West Shelf (NWS), which is one of the world's premier liquefied natural gas (LNG) facilities.

Woodside has an excellent track record of efficient and safe production. Woodside strives for excellence in safety and environmental performance and continues to strengthen relationships with customers, partners, co-venturers, governments and communities. Further information about Woodside can be found at http://www.woodside.com.

1.8 Details of Titleholder, Liaison Person and Public Affairs Contact

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

1.8.1 Titleholder

Woodside Energy Ltd

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

E: feedback@woodside.com.au

ACN: 63 005 482 986

1.8.2 Nominated Liaison Person

Shannen Wilkinson

Senior Corporate Affairs Adviser

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

E: feedback@woodside.com.au

1.8.3 Arrangements for Notifying Change

If the titleholder, titleholder's nominated liaison person, or the contact details for the titleholder or the liaison person change, then NOPSEMA will 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 four elements: Compass and Policies; Expectations; Processes and Procedures; and Guidelines, as 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 developing processes and procedures.
- **Processes and Procedures**: Processes identify the set of interrelated or interacting activities that transforms inputs into outputs, to systematically achieve a purpose or specific objective. Procedures specify what steps, by whom, and when 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.

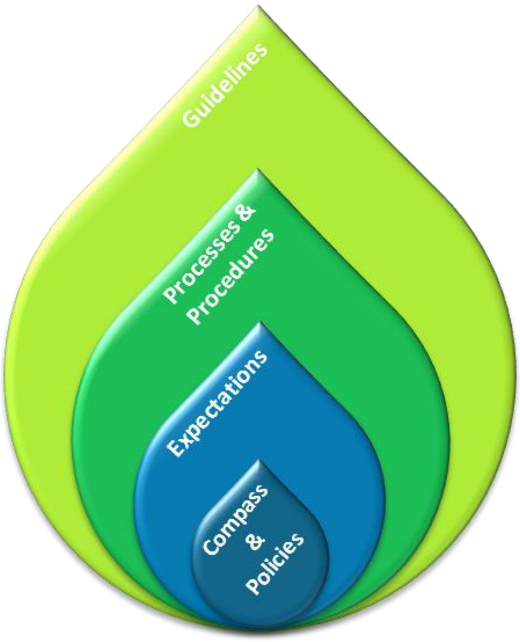

Figure 1-1: The four major elements of the WMS Seed

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 Key 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 lifecycle. The Management activities influence all areas of the business, while Support activities may influence one or more value stream activities.

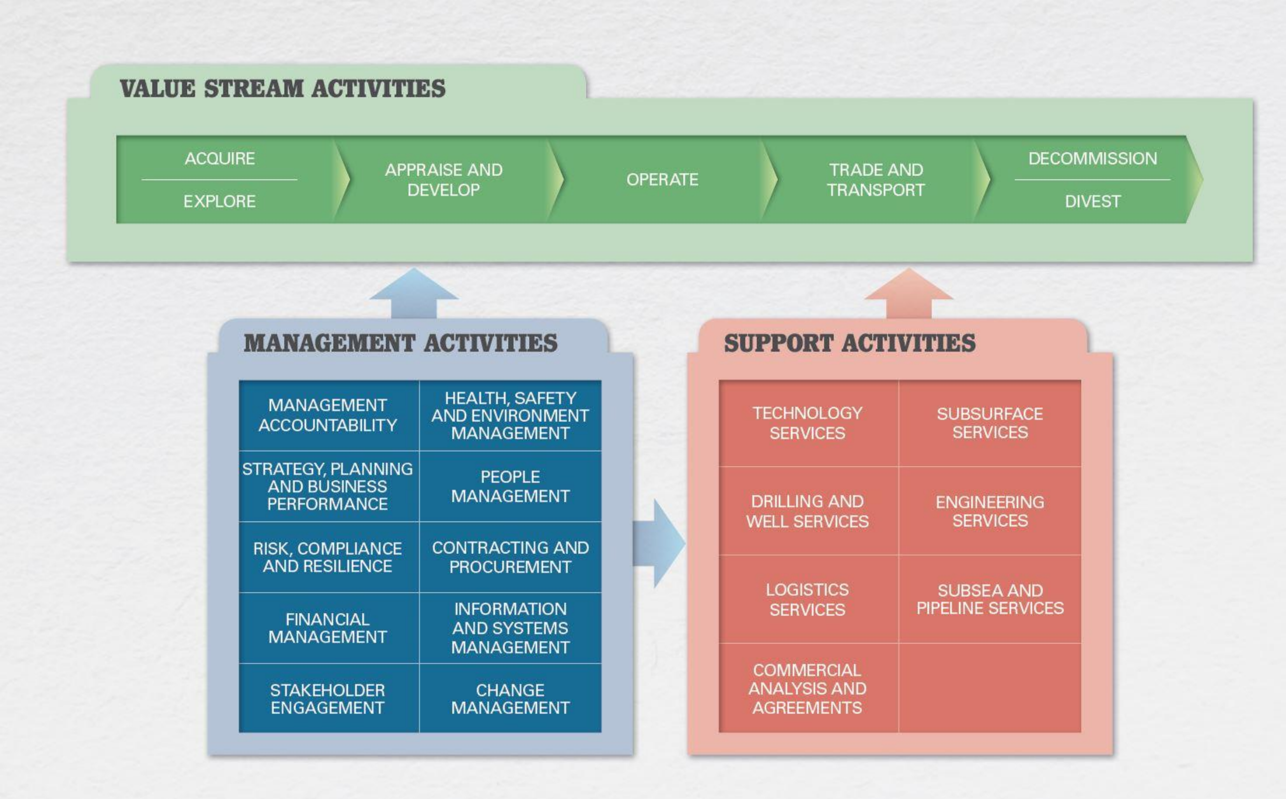

Figure 1-2: The WMS business process hierarchy

1.9.1 Health, Safety, Environment and Quality Policy

In accordance with Regulation 16(a) of the Environment Regulations, Woodside's Corporate Health, Safety, Environment and Quality 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 are relevant to the management of risks and impacts of the Petroleum Activities Program are detailed in **APPENDIX B**. This EP will not be assessed under the WA *Environment Protection Act 1986* as the activity does not occur on State land or within State Waters.

1.10.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) controls exploration and production activities beyond three nautical miles (nm) of the mainland (and islands) to the outer extent of the Australian Exclusive Economic Zone (EEZ) at 200 nm. The objective of the act is to provide a regulatory framework for petroleum exploration and recovery, greenhouse gas activities in offshore areas.

Under the OPGGS Act, 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:

- carried out in a manner consistent with the principles of ESD
- carried out in a manner by which the environmental impacts and risks of the activity will be reduced to ALARP

- carried out in a manner 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

One of the objectives 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 Ecologically Sustainable Development (ESD). 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 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 Act.

1.10.2.1 Offshore Project Approval

The GWA facility commenced operations in 1995 and subsequent tie-ins have been referred for assessment under the EPBC Act. The TPA03 well was referred under the Greater Western Flank (GWF) Phase 1 Gas Development (2011/5980) and the decision by the Environment Minister determined the action is not a controlled action if undertaken in a particular manner.

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 relation to offshore petroleum activities in Commonwealth waters, these requirements are now administered by NOPSEMA in accordance with commitments set out 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):

- NOPSEMA will not accept an Environment Plan that proposes activities that will result in unacceptable impacts to a listed threatened species or ecological community.
- NOPSEMA will not accept an Environment Plan that is inconsistent with a recovery plan or threat abatement plan for a listed threatened species or ecological community.
- NOPSEMA will have regard to any approved conservation advice in relation to a threatened species or ecological community before accepting an Environment Plan.

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 National Parks (DNP) is responsible for managing AMPs (supported by Parks Australia), and is required to publish management plans for them. Other parts of the Commonwealth Government must not perform functions or exercise powers in relation to these parks that are inconsistent with management plans (s362 of the EPBC Act). Relevant AMPs are listed in

Section 4.3 and described in the Woodside Master Existing Environment. In accordance with Regulation 31 of the Environmental Regulation, this Master Existing Environment was accepted on March 3rd 2022 as Appendix C in the Goodwyn Alpha (GWA) Facility Operations Environment Plan. The North-west Marine Parks Network Management Plan describes the requirements for management.

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 through 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 authorised 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 non-extractive 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.

1.10.2.4 World Heritage Properties

Australian World Heritage management principles are prescribed in Schedule 5 of the EPBC Regulations 2000. Management principles that are considered relevant to the scope of this EP are provided in **Table 1-3.**

Table 1-3: Relevant Management Principles under Schedule 5—Australian World Heritage management principles of the EPBC Act.

Number	Principle	Relevant Section of the EP
3	Environmental impact assessment and approval 3.01 This principle applies to the assessment of an action that is likely to have a significant impact on the World Heritage values of a property (whether the action is to occur inside the property or not). 3.02 Before the action is taken, the likely impact of the action on the World Heritage values of the property should be assessed under a statutory environmental impact assessment and approval process. 3.03 The assessment process should: (a) identify the World Heritage values of the property that are likely to be affected by the action; and (b) examine how the World Heritage values of the property might be affected; and	3.01 and 3.02: Assessment of significant impact on World Heritage values is included in **Section 6**. Principles are met by the submitted EP. 3.03 (a) and (b): World Heritage values are identified in **Section 4** and considered in the assessment of impacts and risks for the Petroleum Activity in **Section 6**.

	(c) provide for adequate opportunity for public consultation. 3.04 An action should not be approved if it would be inconsistent with the protection, conservation, presentation or transmission to future generations of the World Heritage values of the property. 3.05 Approval of the action should be subject to conditions that are necessary to ensure protection, conservation, presentation or transmission to future generations of the World Heritage values of the property. 3.06 The action should be monitored by the authority responsible for giving the approval (or another appropriate authority) and, if necessary, enforcement action should be taken to ensure compliance with the conditions of the approval.	3.03 (c): Relevant stakeholder consultation and feedback received in relation to impacts and risks to the Ningaloo World Heritage Property are outlined in **Section 5**. 3.04, 3.05 and 3.06: Principles are considered to be met by the acceptance of this EP.

Note that Section 1 – General Principles and 2 – Management Planning of Schedule 5 are not considered relevant to the scope of this EP and, therefore, have not been included.

2 ENVIRONMENT PLAN PROCESS

2.1 Overview

This section outlines the process taken by Woodside to prepare this EP, once the activity was defined as a petroleum activity. The process describes the activity, the existing environment, followed by the environmental risk management methodology used to identify, analyse and evaluate risks to meet ALARP levels and acceptability requirements, and develop environmental performance outcomes (EPOs) and environmental performance standards (EPSs). This section also describes Woodside's risk management methodologies as applied to implementation strategies for 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. The objective of the risk assessment process described in this section is to identify risks and associated impacts of an activity, so they can be assessed and appropriate control measures applied to eliminate, control or mitigate the impact/risk to ALARP, and to determine if the impact or risk level is acceptable.

Environmental impacts and risks include those directly and indirectly associated with the Petroleum Activities Program, and include potential emergency and accidental events:

- **Planned activities** have the potential for inherent environmental impacts.
- **Environmental risks** are unplanned events with the potential for environmental impact (termed risk 'consequence').

Herein, potential impacts from planned activities are termed 'impacts' and 'risks' are associated with unplanned events with the potential for environmental impact (should the risk be realised), with such impacts termed potential 'consequences'.

2.2 Environmental Risk Management Methodology

2.2.1 Woodside Risk Management Process

Woodside recognises that risk is inherent to its business and that effective management of risk is vital to delivering on company objectives, success and continued growth. Woodside is committed to managing all risk proactively and effectively. The objective of Woodside's risk management system is to provide a consistent process for recognising and managing risks across Woodside's business. Achieving this objective includes ensuring risks consider impacts across these key areas of exposure: health and safety, environment, finance, reputation and brand, legal and compliance, and social and cultural. A copy of Woodside's Risk Management Policy is provided in **APPENDIX A**.

The environmental risk management methodology used in this EP is based on Woodside's Risk Management Procedure. This procedure aligns to industry standards, such as international standard ISO 31000. Woodside's WMS risk management procedures, guidelines and tools provide guidance of specific techniques for managing risk, tailored for particular areas of risk within certain business processes. Procedures applied for environmental risk management include:

- Health, Safety and Environment Management Procedure.
- Impact Assessment Procedure.
- Process Safety Management Procedure.

The risk management methodology provides a framework to demonstrate that risks and impacts are continually identified, reduced to ALARP and assessed to be at an acceptable level, as required by the Environment Regulations. The key steps of Woodside's Risk Management Process are shown in Figure 2-1. A description of each step and how it is applied to the scopes of this activity is provided in **Sections 2.2** to **2.11**.

Figure 2-1: Woodside's risk management process

2.2.2 Health, Safety and Environment Management Procedure

The Health, Safety and Environment Management Procedure provides the structure for managing health, safety and environment (HSE) risks and impacts across Woodside, defines the decision authorities for company-wide HSE management activities and deliverables, and supports continuous improvement in HSE management.

2.2.3 Impact Assessment Procedure

To support effective environmental risk assessment, Woodside's Impact Assessment Procedure (**Figure 2-2**) provides the steps to meet the required environment, health and social standards by ensuring impact assessments are undertaken appropriate to the nature and scale of the activity, the regulatory context, the receiving environment, interests, concerns and rights of stakeholders, and the applicable framework of standards and practices.

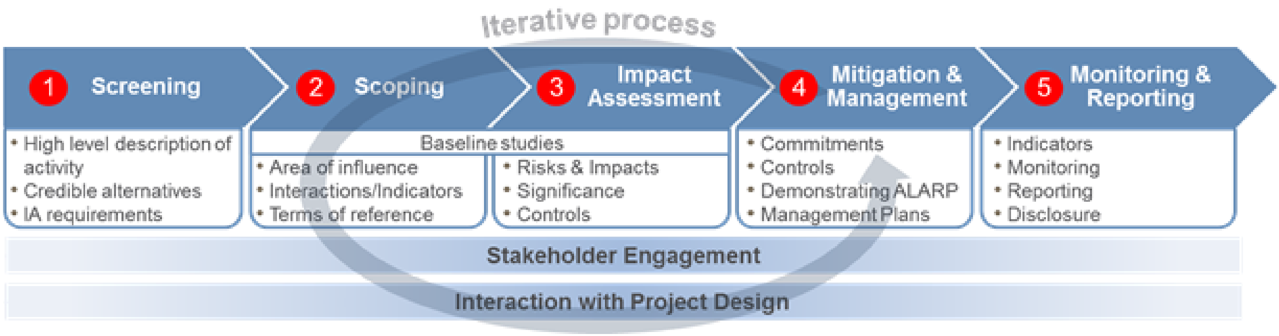

Figure 2-2: Woodside's impact assessment process

2.3 Environment Plan Process

Figure 2-3 illustrates the EP development process. Each element of this process is discussed further in **Sections 2.5** to **2.10**.

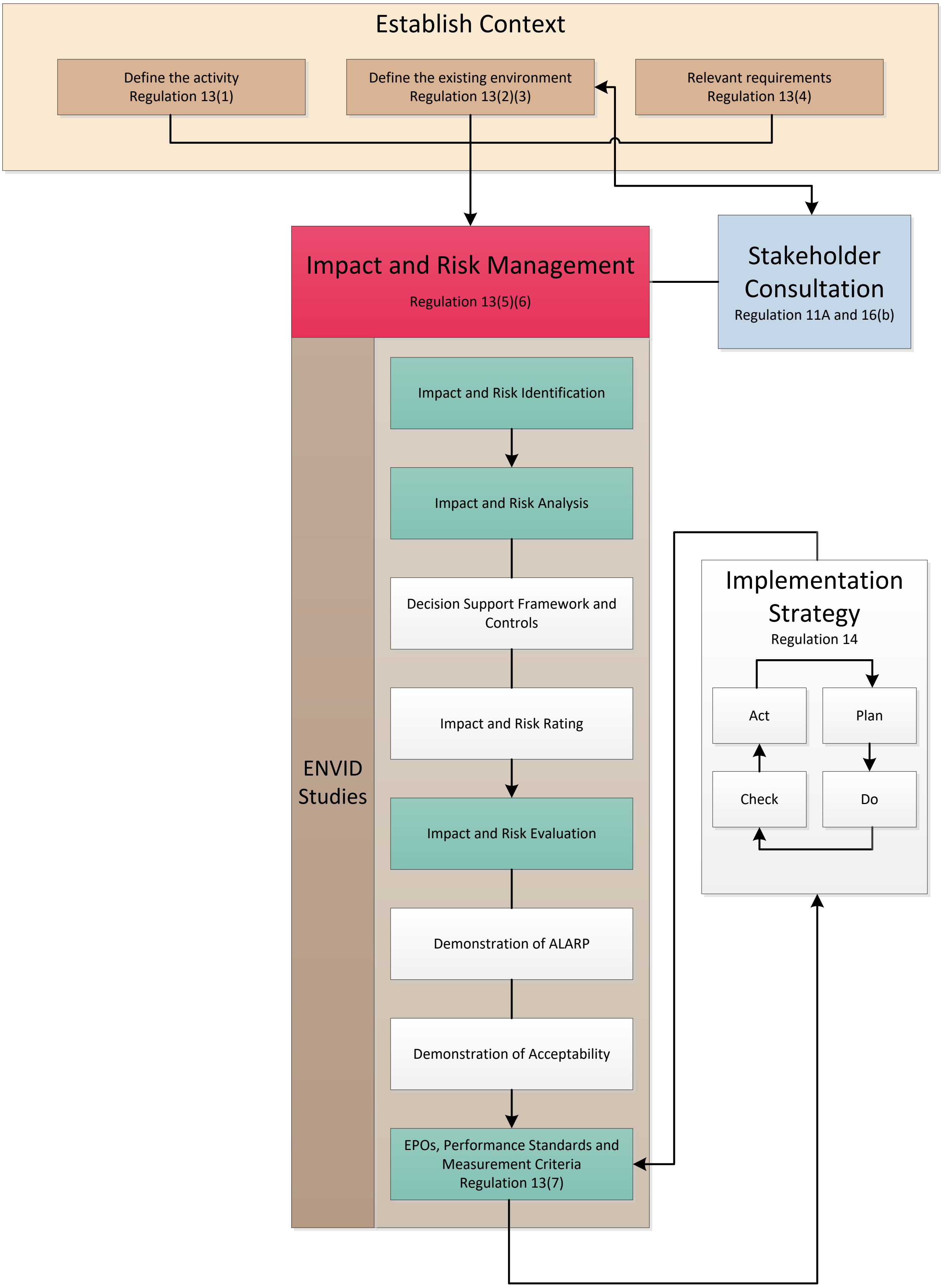

Figure 2-3: Environment Plan development process

2.4 Establish the Context

2.4.1 Define the Activity

This first stage involves evaluating whether the activity meets the definition of a 'petroleum activity' as defined in the Environment Regulations. The activity is described in relation to:

the location

what is to be undertaken

how it is planned to be undertaken, including outlining operational details of the activity and proposed timeframes.

The 'what' and 'how' are described in the context of 'environmental aspects'[1] to inform the risk and impact assessment for planned (routine and non-routine) and unplanned (accidents/incidents/emergency conditions) activities.

The activity is described in **Section 3** and is referred to as the Petroleum Activities Program.

2.4.2 Define the Existing Environment

The context of the existing environment is described and determined by considering the nature and scale of the activity (size, type, timing, duration, complexity, and intensity of the activity), as described in **Section 3**. In accordance with Regulation 31(1) of the Environment Regulations, references to the Master Existing Environment, Appendix C in the Goodwyn Alpha Facility Operations Environment Plan (hereafter referred to as the Master Existing Environment), have been made throughout this EP. This EP (NOPSEMA EP No: 5723) was accepted on the 3rd of March 2022 and is available on the NOPSEMA website: Goodwyn Alpha (GWA) Facility Operations EP. The purpose is to describe the existing environment that may be impacted by the activity, directly or indirectly, by planned or unplanned[2] events.

The Existing Environment (**Section 4**) is structured into subsections defining the physical, biological, socioeconomic and cultural attributes of the area of interest, in accordance with the definition of environment in Regulation 4(a) of the Environment Regulations. These subsections make particular reference to:

- The environmental, and social and cultural consequences as defined by Woodside (refer to **Table 2-1**), which address key physical and biological attributes, as well as social and cultural values of the existing environment. These consequence definitions are applied to the impact and risk analysis (refer **Section 2.2**) and rated for all planned and unplanned activities. Additional detail is provided for unplanned hydrocarbon spill risk evaluation.
- EPBC Act MNES including listed threatened species and ecological communities and listed migratory species. Defining the spatial extent of the existing environment is guided by the nature and scale of the Petroleum Activities Program (and associated sources of environmental risk). This considers the Operational Area and wider environment that may be affected (EMBA), as determined by the hydrocarbon spill risk assessments presented in Section 6.7.1. MNES, as defined within the EPBC Act, are addressed through Woodside's impact and risk assessment (Section 6).

[1] An environmental aspect is an element of the activity that can interact with the environment.

[2] For each source of risk, the credible worst-case scenario in conjunction with impact thresholds is used to determine the spatial extent of the EMBA. The worst-case unplanned event is considered to be an unplanned hydrocarbon release, further defined for each activity through the risk assessment process. Interpretation of stochastic oil spill modelling determines the EMBA for the release, which defines the spatial scale of the environment that may be potentially impacted by the Petroleum Activities Program, which provides context to the 'nature and scale' of the existing environment.

- Relevant values and sensitivities, which may include world or national heritage listed areas, listed threatened species or ecological communities, listed migratory species, or sensitive values.

By grouping potentially impacted environmental values by aspect (as presented in **Table 2-1**), the presentation of information about the receiving environment is standardised. This information is then consistently applied to the risk evaluation section to provide a robust approach to the overall environmental risk evaluation and its documentation in the EP.

Table 2-1: Example of the environment values potentially impacted which are assessed within the EP

Environmental Value Potentially Impacted Regulations 13(2)(3)						
Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl. Odour)	Ecosystems/ Habitats	Species	Socioeconomic

2.4.3 Relevant Requirements

The relevant requirements in the context of legislation, other environmental approval requirements, conditions and standards that apply to the Petroleum Activities Program are identified and reviewed, and are presented in **APPENDIX B**.

The Corporate Health, Safety, Environment and Quality Policy is presented in **APPENDIX A**.

2.5 Impact and Risk Identification

Relevant environmental aspects and hazards were identified that support the process to define environmental impacts and risks associated with an activity.

The environmental impact and risk assessment presented in this EP has been informed by recent and historic hazard and environment identification studies (e.g. HAZID/ENVID), PSRA processes, reviews, and desktop studies associated with the Petroleum Activities Program. 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 stakeholder engagement process (**Section 5**). The environmental outputs of applicable risk and impact workshops and associated studies are referred to as ENVID in this EP.

The ENVID was undertaken by multidisciplinary teams comprising relevant engineering and environmental personnel with sufficient breadth of knowledge, training and experience to reasonably assure that risks and impacts were identified and their potential environmental consequences assessed. 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.

The impact and risk information was classified, evaluated and tabulated for each planned activity and unplanned event. Environmental impacts and risk were recorded in an environmental impacts and risk register. The output of the ENVID is used to present the risk assessment and form the basis of performance outcomes, standards, and measurement criteria. This information is presented in **Section** , following the format presented in Table 2-2.

Table 2-2: Example of layout of identification of risks and impacts in relation to risk sources

Impacts and Risks Evaluation Summary													
Source of Risk	Environmental Value Potentially Impacted							Evaluation					
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/Habitat	Species	Socioeconomic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability
Summary of source of impact/risk													

2.6 Impact and Risk Analysis

Risk analysis further develops the understanding of a risk by defining the impacts and assessing appropriate controls, as well as considering previous risk assessments for similar activities, relevant studies, past performance, external stakeholder consultation feedback, and the existing environment.

These key steps were undertaken for each identified risk during the risk assessment:

identify the decision type in accordance with the decision support framework

identify appropriate control measures (preventive and mitigation) aligned with the decision type

assess the risk rating.

2.6.1 Decision Support Framework

To support the risk assessment process and Woodside's determination of acceptability (**Section 2.7.2**), 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 was applied during the ENVID, or equivalent 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 acceptable and ALARP (**Figure 2-4**). Application of the decision support framework confirms:

- activities do not pose an unacceptable environmental risk
- appropriate focus is placed on activities where the impact or risk is anticipated to be acceptable and demonstrated to be ALARP
- appropriate effort is applied to manage risks and impacts 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/impact (referred to as the Decision Type A, B, or C). The decision type is selected based on an informed discussion around the uncertainty of the risk/impact and is documented in ENVID worksheets.

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

2.6.1.1 Decision Type A

Decision Type A risks and impacts are well understood and established practice. They are generally recognised as good industry practice and are often embodied in legislation, codes and standards, and use professional judgment.

2.6.1.2 Decision Type B

Decision Type B risks and impacts 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 that 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.

2.6.1.3 Decision Type C

Decision Type C risks and impacts typically have significant risks related to environmental performance. Such risks typically involve greater complexity and uncertainty, therefore requiring the 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 or impacts, in addition to Decision Type A and B tools, company and societal values need to be considered by undertaking broader internal and external stakeholder consultation as part of the risk assessment process.

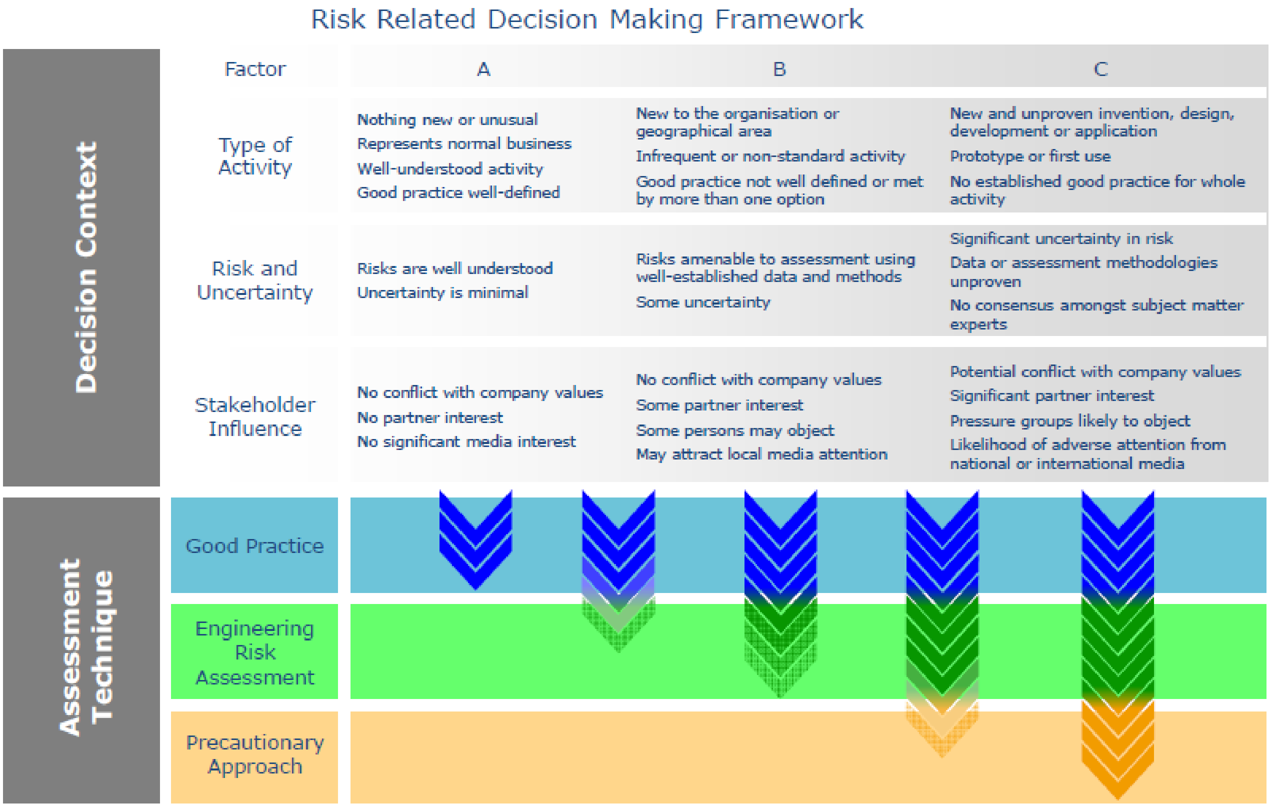

Figure 2-4: Risk-related decision-making framework

Source: Oil and Gas UK (2014)

2.6.1.4 Decision Support Framework Tools

These framework tools are applied, as appropriate, to help identify control measures based on the decision type described above:

- **Legislation, Codes and Standards (LCS)** – identifies the requirements of legislation, codes and standards that are to be complied with for the activity.
- Good Industry Practice (GP) – identifies further engineering control standards and guidelines that may be applied by Woodside above that required to meet the LCS.
- Professional Judgement (PJ) – uses relevant personnel with the knowledge and experience to identify alternative controls. Woodside applies the hierarchy of control as part of the risk assessment to identify any alternative measures to control the risk.
- Risk-based Analysis (RBA) – assesses the results of probabilistic analyses such as modelling, quantitative risk assessment and/or cost–benefit analysis to support the selection of control measures identified during the risk assessment process.
- Company Values (CV) – identifies values identified in Woodside's code of conduct, policies and the Woodside Compass. Views, concerns and perceptions are to be considered from internal Woodside stakeholders directly affected by the planned impact or potential risk.
- Societal Values (SV) – identifies the views, concerns and perceptions of relevant stakeholders and addresses relevant stakeholder views, concerns and perceptions.

2.6.1.5 Decision Calibration

To determine that the alternatives selected and the control measures applied are suitable, these tools may be used for calibration (i.e. checking) where required:

- LCS/Verification of Predictions – Verification of compliance with applicable LCS and/or good industry practice.
- **Peer Review** – Independent peer review of PJs, supported by RBA, where appropriate.
- Benchmarking – Where appropriate, benchmarking against a similar facility or activity type or situation that has been deemed to represent acceptable risk.
- Internal Stakeholder Consultation – Consultation undertaken within Woodside to inform the decision and verify company values are met.
- External Stakeholder Consultation – Consultation undertaken to inform the decision and verify societal values are considered.

Where appropriate, additional calibration tools may be selected specific to the decision type and the activity.

2.6.2 Control Measures (Hierarchy of Controls)

Risk reduction measures are prioritised and categorised in accordance with the hierarchy of controls, where risk reduction measures at the top of the hierarchy take precedence over risk reduction measures further down:

- Elimination of the risk by removing the hazard.
- Substitution of a hazard with a less hazardous one.
- Engineering Controls include design measures to prevent or reduce the frequency of the risk event, or detect or control the risk event (limiting the magnitude, intensity and duration) such as:
  - Prevention: design measures that reduce the likelihood of a hazardous event occurring
  - Detection: design measures that facilitate early detection of a hazardous event
  - Control: design measures that limit the extent/escalation potential of a hazardous event
  - Mitigation: design measures that protect the environment if a hazardous event occurs
  - Response Equipment: design measures or safeguards that enable clean-up/response after a hazardous event occurs.
- Procedures and Administration includes management systems and work instructions used to prevent or mitigate environmental exposure to hazards.
- Emergency Response and Contingency Planning includes methods to enable recovery from the impact of an event (e.g. protection barriers deployed near the sensitive receptor).

2.6.3 Impact and Risk Classification

Environmental impacts and risks are assessed to determine the potential impact significance/consequence. The impact significance/consequence considers the magnitude of the impact or risk and the sensitivity of the potentially impacted receptor (represented by **Figure 2-5**).

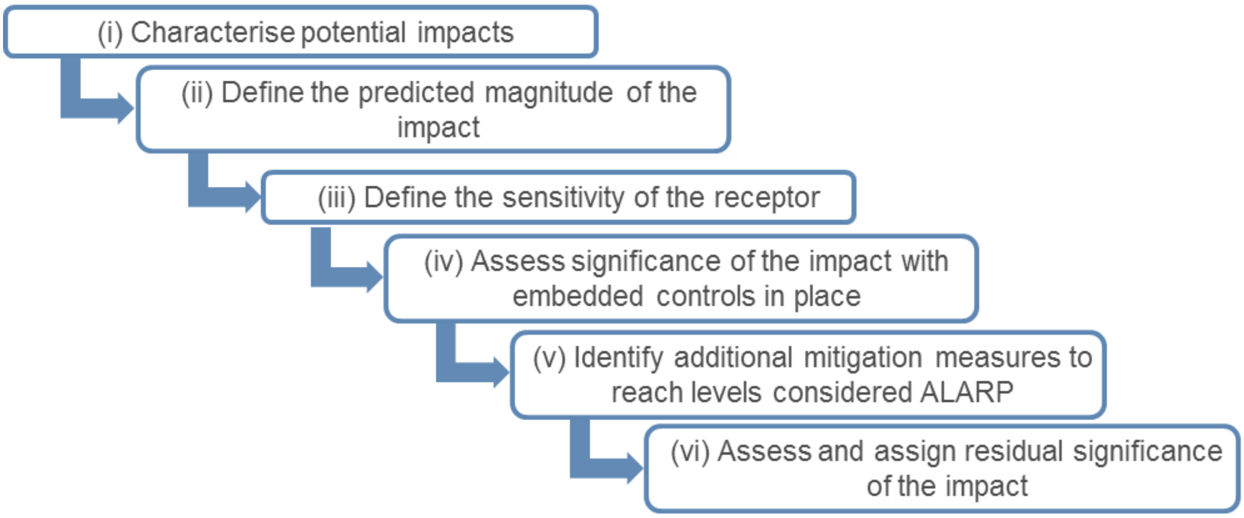

Figure 2-5: Environmental risk and impact analysis

Impacts are classified in accordance with the consequence (**Table 2-3**) outlined in Woodside's Risk Management Procedure and Risk Matrix (**Figure 2-6**). Risks are assessed qualitatively and/or quantitatively in terms of both likelihood and consequence in accordance with this matrix.

The impact and risk information, including classification and evaluation information as shown in the example (**Table 2-2**), are tabulated for each planned activity and unplanned event.

Table 2-3: Woodside risk matrix (Environment and Social and Cultural) consequence descriptions

Environment	Social and Cultural	Consequence Level
Catastrophic, long-term impact (>50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	Catastrophic, long-term impact (>20 years) to a community, social infrastructure or highly valued area/item of international cultural significance.	**A**
Major, long term impact (10–50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	Major, long-term impact (5–20 years) to a community, social infrastructure or highly valued area/item of national cultural significance.	**B**
Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	Moderate, medium term impact (2–5 years) to a community, social infrastructure or highly valued area/item of national cultural significance.	**C**
Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	**D**
Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	Slight, short-term impact (<1 year) to a community or area/item of cultural significance.	**E**
No lasting effect (<1 month). Localised impact not significant to environmental receptor.	No lasting effect (<1 month). Localised impact not significant to area/item of cultural significance.	**F**

2.6.3.1 Risk Rating Process

The risk rating process assigns a level of risk to each risk event, measured in terms of consequence and likelihood. The assigned risk rating is determined with controls in place; therefore, the risk rating is determined after identifying the decision type and appropriate control measures.

The risk rating process considers the potential environmental consequences and, where applicable, the social and cultural consequences of the risk. The risk ratings are assigned using the Woodside Risk Matrix (**Figure 2-6**).

The risk rating process is done using the steps described in the subsections below.

2.6.3.1.1 Select the Consequence Level

Determine the worst-case credible consequence (**Table 2-3**) associated with the selected event, assuming all controls (preventive and mitigative) are absent or have failed. If more than one potential consequence applies, select the highest severity consequence level.

2.6.3.1.2 Select the Likelihood Level

Determine the description that best fits the chance of the selected consequence occurring, assuming reasonable effectiveness of the prevention and mitigation controls (**Table 2-4**).

Table 2-4: Woodside risk matrix likelihood levels

Likelihood Description						
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
Experience	Remote: Unheard of in the industry	Highly Unlikely: Has occurred once or twice in the industry	Unlikely: Has occurred many times in the industry but not at Woodside	Possible: Has occurred once or twice in Woodside or may possibly occur	Likely: Has occurred frequently at Woodside or is likely to occur	Highly Likely: Has occurred frequently at the location or is expected to occur
Likelihood Level	**0**	**1**	**2**	**3**	**4**	**5**

2.6.3.1.3 Calculate the Risk Rating

The risk rating is derived from the consequence and likelihood levels above, in accordance with the Woodside Risk Matrix shown in **Figure 2-6**. A likelihood and risk rating are only applied to environmental risks, not environmental impacts from planned activities.

This risk rating is used as an input into the risk evaluation process and ultimately for prioritising further risk reduction measures. Once each risk is treated to ALARP, the risk rating articulates the ALARP baseline risk as an output of the ENVID studies.

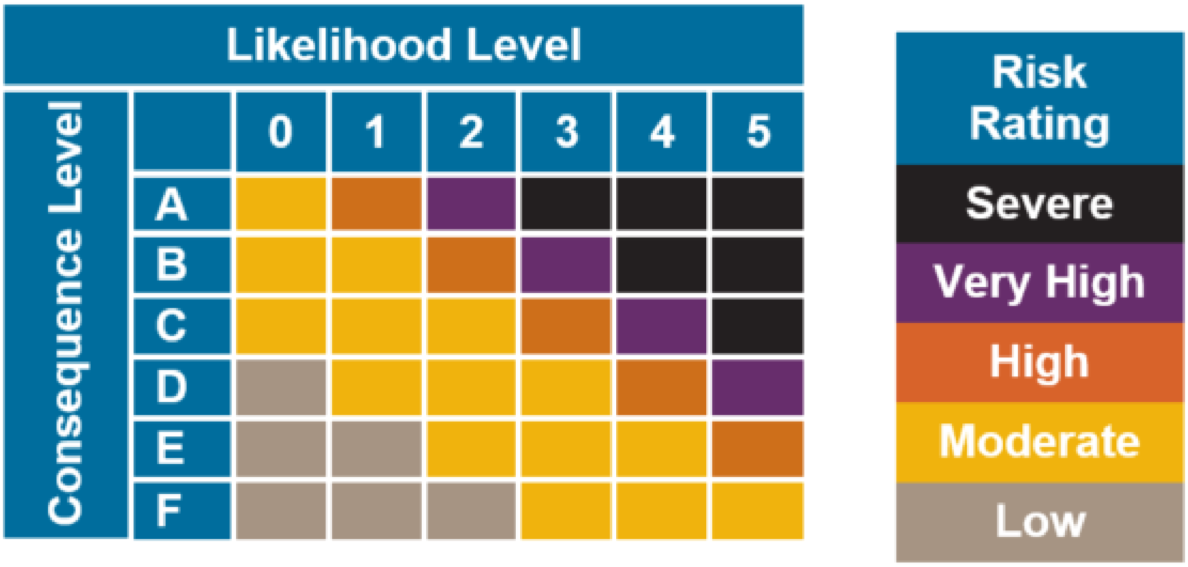

Figure 2-6: Woodside risk matrix – risk level

To support ongoing risk management (as a key component of Woodside's Process Safety Management Framework – refer to the implementation strategy in **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 controls that are currently in place and effective on a day-to-day basis. The 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 communicating and making visible the risk events and ensures the continual management of risk to ALARP by identifying risk reduction measures and assessing acceptability.

2.7 Impact and Risk Evaluation

- Environmental impacts and risks cover a wider range of issues, differing species, persistence, reversibility, resilience, cumulative effects, and variability in severity than safety risks. Determining the degree of environmental risk, and the corresponding threshold for whether a risk/impact has been reduced to ALARP and is acceptable, is evaluated to a level appropriate to the nature and scale of each impact or risk. Evaluation includes considering the:
- decision Type
- principles of ESD – as defined under the EPBC Act
- internal context – ensuring the proposed controls and risk level are consistent with Woodside policies, procedures and standards (Section 7 and APPENDIX A)
- external context – the environment consequence (Section 6) and stakeholder acceptability (Section 5)
- other requirements – ensuring the proposed controls and risk level are consistent with national and international standards, laws and policies.

In accordance with Environment Regulation 10A(a), 10A(b), 10A(c) and 13(5)(b), Woodside applies the process described in the subsections below to demonstrate ALARP and acceptability for environmental impacts and risks, appropriate to the nature and scale of each impact or risk.

2.7.1 Demonstration of ALARP

The descriptions in **Table 2-5** articulate how Woodside demonstrates that different risks, impacts and Decision Types identified within the EP are ALARP.

Table 2-5: Summary of Woodside's criteria for ALARP demonstration

Risk	Impact	Decision Type
Low and Moderate (below C level consequence)	**Negligible, Slight, or Minor (D, E or F)**	**A**
Woodside demonstrates these risks, impacts and decision types are reduced to ALARP if: • identified controls meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines, or • further effort towards impact/risk reduction (beyond using opportunistic measures) is not reasonably practicable without sacrifices that are grossly disproportionate to the benefit gained.		
High, Very High or Severe (C+ consequence risks)	**Moderate and above (A, B, 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: • legislative requirements, applicable company requirements and industry codes and standards are met • societal concerns are accounted for • the alternative control measures are grossly disproportionate to the benefit gained.		

2.7.2 Demonstration of Acceptability

The descriptions in **Table 2-6** articulate how Woodside demonstrates how different risks, impacts and Decision Types identified within the EP are Acceptable.

Table 2-6: Summary of Woodside's criteria for acceptability

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: • legislative requirements • industry codes and standards • applicable company requirements and industry guidelines • further effort towards risk reduction (beyond using opportunistic measures) is not reasonably practicable without sacrifices that are grossly disproportionate to the benefit gained.		
High, Very High or Severe	**Moderate and above (A, B, C)**	**B and C**
Woodside demonstrates these higher-order risks, impacts and decision types are of an 'Acceptable' level if it can be demonstrated that the predicted levels of impact and/or residual risk, are: • managed to ALARP (as described in Section 2.7.1) • meet the following criteria, appropriate to the nature and scale of each impact and risk: • the Principles of Ecological Sustainable Development as defined under the EPBC Act • the internal context – the proposed controls and consequence/risk level are consistent with Woodside policies, procedures and standards • the external context – consideration of the environment consequence (Section 6) and stakeholder acceptability (Section 5) are considered • other requirements – the proposed controls and consequence/risk level are consistent with national and international industry standards, laws and policies ad consideration of applicable plans for management and conservation advices, conventions and significant impact guidelines (e.g. MNES). 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	Impact	Decision Type
risk/exposure, novel activities, lack of consensus on standards, and significant stakeholder concerns. E.g. Decision Type C), acceptability may be required to be conducted separately for key receptors. This is not applicable for risks, given the consequence of an unplanned risk event occurring may not be acceptable and, therefore, acceptability is demonstrated in the context of the residual likelihood of an event occurring. Additionally, Very High and Severe risks require 'Escalated Investigation' and mitigation. If after further investigation the risk remains in the Very High or Severe category, the risk requires appropriate business engagement with increasing involvement of senior management in accordance with Woodside's Risk Management Procedure to accept the risk. This includes due consideration of regulatory requirements.		

2.8 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 4.5).
- identify relevant recovery plans and threat abatement plans (Section 4.5.2).
- 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 6.8).
- 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 6.8).

2.9 Environmental Performance Outcomes, Environmental Performance Standards, and Measurement Criteria

EPOs, EPSs and measurement criteria (MC) are defined to address the potential environmental impacts and risks. These are explored in **Section 6**.

2.10 Implement, Monitor, Review and Reporting

An implementation strategy for the Petroleum Activities Program describes the specific measures and arrangements to be implemented for the duration of the program. The strategy is based on the principles of AS/NZS ISO 14001 Environmental Management Systems, and demonstrates:

- control measures are effective in reducing the environmental impacts and risks of the Petroleum Activities Program to ALARP and Acceptable levels
- EPOs and EPSs set out in the EP are met through monitoring, recording, auditing, managing non-conformance, and reviewing
- all environmental impacts and risks of the Petroleum Activities Program are periodically reviewed in accordance with Woodside's risk management procedures
- roles and responsibilities are clearly defined, and personnel are competent and appropriately trained to implement the requirements set out in this EP, including in emergencies or potential emergencies
- arrangements are in place for oil pollution emergencies, to respond to and monitor impacts
- environmental reporting requirements are met, including 'reportable incidents'
- appropriate stakeholder consultation is undertaken throughout the activity.

The implementation strategy is presented in **Section 7**.

2.11 Stakeholder Consultation

Woodside undertakes consultation in the course of preparing EPs. The consultation, along with the process for ongoing engagement and consultation throughout the activity, is presented in **Section 5**. A copy of the full text correspondence is provided in **Appendix F**.

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 conduct well intervention activities at the TPA-03 well in Permit Area WA-5-L. TPA-03 is a dual zone well connected to the Tidepole manifold. The well is produced by the Goodwyn Platform via subsea tieback before being exported to the interfield line (IFL) and to the Karratha Gas Plant for processing.

The Petroleum Activities Program will involve well intervention activities to remediate a down-hole smart valve and restore production from the lower reservoir zone, as per the well design. A wireline intervention is planned using either slickline or electrical line (e-line) tooling from a Well Intervention Vessel (WIV). Once the intervention has been completed, the well will be started up and operated under the Goodwyn Alpha (GWA) Operations Environment Plan as part of ongoing operations. Any future decommissioning, well plug and abandonment or drilling will be the subject of a separate EP.

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-5-L
Location	North West Shelf
Water depth	Approx. 113 m
Number of wells	Well intervention activities at one well (TPA-03) in the Tidepole reservoir.
Subsea infrastructure	Subsea Vertical Xmas Tree tied back to GWA platform via a subsea manifold
Vessels	Well Intervention Vessel (WIV) Support vessels including general supply/support vessels.
Key activities	Connection to Xmas tree with subsea intervention system including workover riser system (WORS) Wireline intervention activities Handover control to GWA Platform Temporary suspension (planned or if necessary, for unforeseen circumstances).

3.3 Location

The Petroleum Activities Program is located in Permit Area WA-5-L in Commonwealth waters, about 138 km north-west of Dampier. The closest landfall to the Petroleum Activities Program is the North West Island, about 76 km south-west at its nearest point (**Figure 3-1**). Approximate location details for the Petroleum Activities Program are provided in **Table 3-2**.

Table 3-2: Location details for the TPA-03 well intervention activities

Activity	Water depth (approx. m LAT)	Latitude (WGS84)	Longitude (WGS84)	Petroleum title(s)
TPA-03 Well Intervention	113	19° 45’ 43.618” S	115° 53’ 23.986” E	WA-5-L

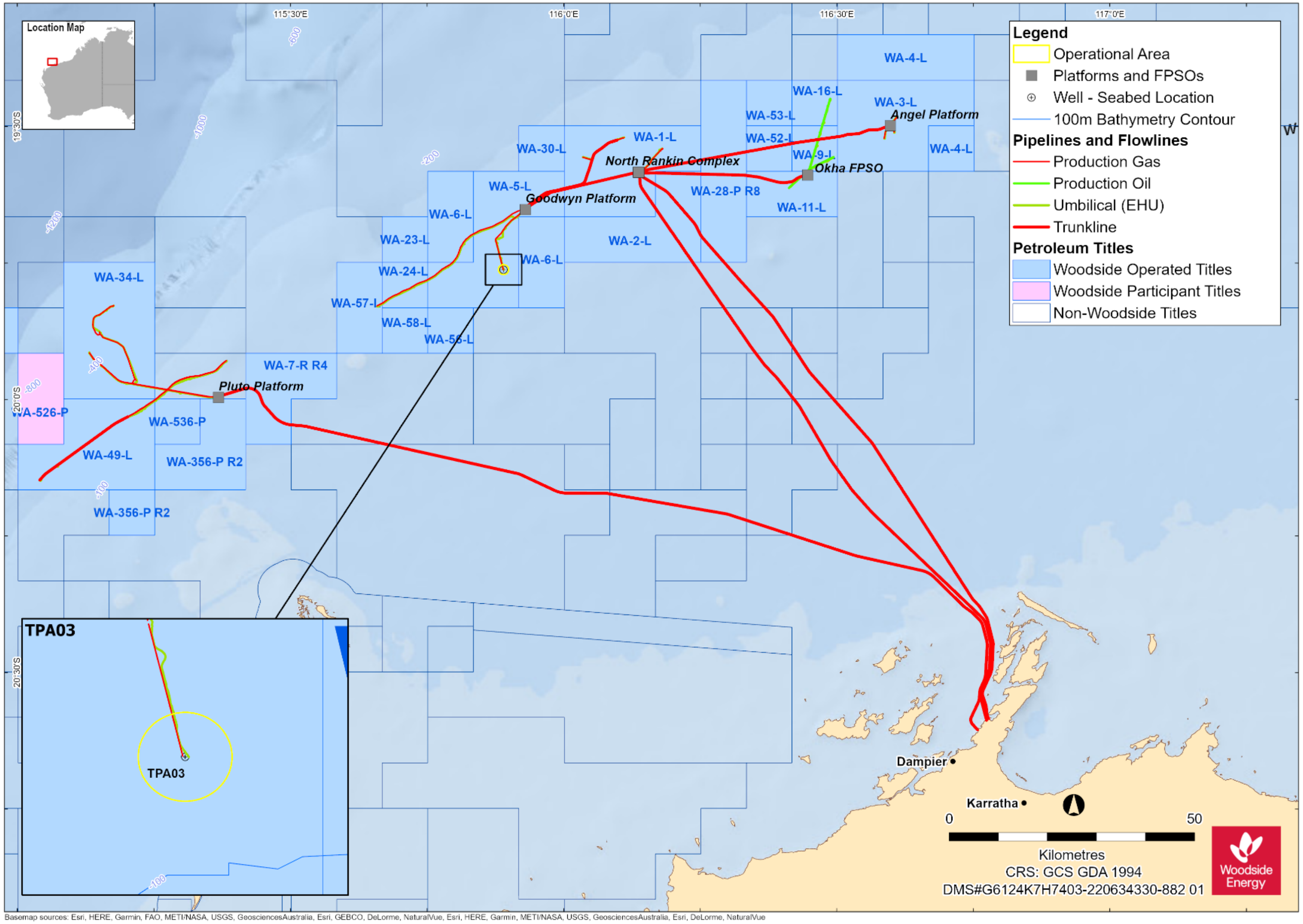

Figure 3-1: Location of the Petroleum Activities Program

3.4 Operational Area

The spatial boundary of the Petroleum Activities Program has been described and assessed using the Operational Area. For the purposes of this EP, the following Operational Area applies:

For a dynamically positioned (DP) Well Intervention Vessel (WIV), the Operational Area encompasses a radius of 1 km from the TPA-03 drill centre, in which well intervention related petroleum activities will take place and will be managed under this EP.

The Operational Area for the activity includes a 500 m safety exclusion zone around the WIV to manage vessel movements. The 500 m safety exclusion zone is under the control of the Person in Charge.

Vessel-related activities within the Operational Area 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.

3.5 Timing

The Petroleum Activities Program is planned to commence in Q4 2022 – Q1 2023. The activity is expected to take between 5 to 14 days and will take place 24 hours, 7 days a week.

When underway, activities will be 24 hours per day, seven days per week. No Simultaneous Operations (SIMOPS) activities will occur and the manifold may be shut in during activities. Timing and duration of all activities is subject to change due to project schedule requirements, WIV/vessel availability, unforeseen circumstances and weather.

The EP has risk-assessed intervention activities, support operations and contingency activities throughout the year (all seasons) to provide operational flexibility for requirements and schedule changes and WIV/vessel availability.

3.6 Subsea Intervention Activities

This Environment Plan assesses a planned well intervention on TPA03, which will be carried out to restore production from the lower reservoir zone in the well. Well intervention work will be carried out with appropriate barriers, i.e. a Work-over Control System/Work-over Riser System (WOCS/WORS) or equivalent and Wireline Pressure Containing Equipment. The objective of the intervention is to remove the blanking plug from the lower smart valve in the well.

The primary scope of well intervention is likely to involve:

- Connecting subsea intervention equipment, connecting wireline pressure containing equipment, and pressure testing;
- Running a toolstring to equalise pressure either side of the blanking plug;
- Running a toolstring to pull the equalised blanking plug from the well;
- Closing valves, pressure testing, disconnecting subsea intervention equipment and wireline pressure containing equipment and re-installing the Xmas tree cap.

Potential contingency activities during this well intervention may include:

- Drift runs, to confirm no downhole obstructions are present;
- Running tooling to perform real-time downhole diagnostics;
- Pumping an inhibited brine / MEG package to assist with equalising pressures either side of the blanking plug;
- Running a stroker and tractor assembly on e-line, a contingency to provide high pulling force;

- Running a wire-cutter, to sever the slickline / e-line in the event of stuck equipment downhole;
- Fishing runs, to collect any equipment lost downhole.

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

During intervention activities, local control of the Xmas tree from the WIV will be required. Valve actuation of the trees will result in small releases of subsea control fluids to the marine environment.

3.6.1 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 3-3** lists typical relevant subsea infrastructure inspections/surveys.

Table 3-3: 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
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. Vessel and ROV operations associated with inspections are described in **Section 3.8**.

3.6.2 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. Vessel and ROV operations associated with monitoring are described in **Section 3.8**.

3.6.3 Connection of Integrated WOCS/WORS

Intervention of TPA03 will commence with the deployment of an integrated WOCS/WORS to provide a physical connection between the well (Xmas tree) and WIV. In conjunction with topside wireline pressure containing equipment, this enables a contained conduit to be maintained, where fluids can be circulated from the well bore back to the WIV through the workover riser (WORS). The only fluids planned to be used in this activity are drill water and a brine/MEG mix. The exception to this is for control fluids used in the workover control system (WOCS) as the WOCS operates in an open loop with the Xmas tree. The Xmas tree valves will be controlled by the WIV via an umbilical and ROV, if required.

The WOCS/WORS, comprising of a Lower Riser Package (LRP) and Emergency Disconnect Package (EDP), include a series of independent barriers to seal the well in addition to the Xmas tree, to prevent loss of containment. WOCS/WORS well control valves will be pressure tested similarly to a BOP. Various system tests of both the WOCS/WORS and the Xmas tree will be completed following connection of the WOCS/WORS, and when establishing communications with the Xmas tree.

At the surface, wireline pressure containing equipment (including a wireline BOP and lubricator package) will be rigged up to provide well barriers and control pressure during wireline operations.

Barrier pressure testing will be conducted upon connection of the WOCS/WORS to the Xmas tree. Following this, there will be a function test about every 7 days and a barrier pressure test about every 21 days thereafter. Each of the tests will result in 1000 – 3000 L of hydraulic / control fluids (e.g. HW443) being discharged, depending on the level of testing required. These tests may be standalone tests, or may be incorporated into operational procedures.

3.6.4 Fluid Circulation Pits

There are typically a number of tanks on the WIV that provide a capacity to mix, maintain and store fluids required for activities. The only fluids likely required for this activity include a MEG/brine mix and drill water. The pits and associated equipment/infrastructure are typically cleaned out at the completion of operations. Tank wash residue is operationally discharged with less than 1% oil contamination by volume, with no contamination expected. Tank wash residue over 1% oil by volume is sent to shore for disposal.

Following the intervention or during an EDS, fluids contained within the riser may be routed back to stock tanks during depressuring and flushing the WOCS/WORS. These fluids will be returned onshore for disposal.

3.6.5 Air Emissions

During well intervention activities, surface returns of small volumes of hydrocarbon gas from annular spaces will be cold vented in a controlled and safe manner via a choke manifold or through degassing of the stock tank returns. Due to the small volume of the gas, it is not feasible that this gas could be flared.

3.6.6 Subsea Equipment Preservation Chemicals

Following well intervention activities, subsea equipment may contain preservation fluids including monoethyleneglycol (MEG) to prevent corrosion and any other deterioration of the equipment prior to production re-commencing.

3.6.7 Shut-In prior to Return to Production

Following intervention activities, the well will be shut-in pending return to production operations Xmas tree valves will be shut, the WOCS/WORS will be disconnected and retrieved to surface, and an Xmas tree cap will be installed. Well control will be handed back over to the Goodwyn-A Facility where it will remain shut-in until the well resumes production.

3.6.8 Underwater Acoustic Positioning

An array of long base line (LBL) transponders may be installed on the seabed as required to support intervention activities. The LBL array provides accurate positioning by measuring ranges to three or more transponders deployed at known locations on the seabed and structures. Alternatively ultra-short baseline transponders (USBL) may be installed on the seabed or mounted to the wellhead as required. Transmissions from USBL transponders are similar to LBL transponders.

An array of transponders is proposed within a radius of 500 m from the proposed location of the wells. 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). Transmissions from USBL transponders are similar to LBL transponders.

Transponders may be deployed 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 the transponders, clump weights and seabed frames will be removed by ROV.

3.6.9 Repair

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 repair activities. **Table 3-4** lists typical discharge volumes during repair activities.

Table 3-4: Typical discharge volume during 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 activities. An ROV is used for this activity; **Table 3-5** lists the different techniques used.

Table 3-5: 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

3.7 Project Fluids

3.7.1 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 intervention chemicals are included on the Woodside Drilling and Completions Chemical Assessment Register which is reviewed as per the Chemical Selection and Assessment Environment Guideline.

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 3-2**).

- 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.

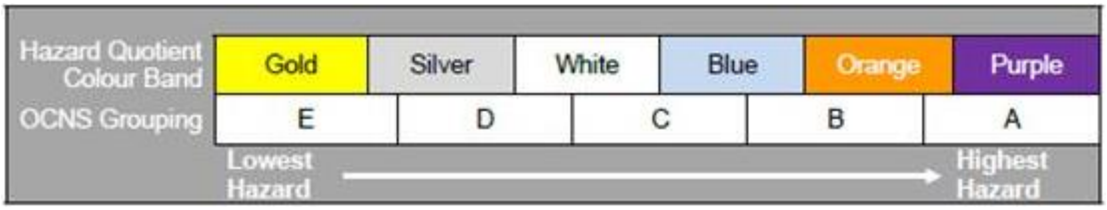

Figure 3-2: **OCNS ranking scheme**

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.

3.7.1.1 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.*

3.7.2 Ecotoxicity

Chemical ecotoxicity is assessed using the criteria used by CEFAS to group chemicals based on ecotoxicity results (**Table 3-6**). 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 3-6: 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.

3.8 Project Vessels and Support Activities

3.8.1 WIV Operations

The Petroleum Activities Program will be undertaken by a DP WIV. Example specifications for a DP WIV are provided in **Table 3-7.**

Table 3-7: Example DP WIV specifications

Component	Specification Range
Rig type / Design / Class	Ultra deepwater semi-submersible WIV
Accommodation	140 persons
Station keeping	Dynamically positioned (Class 3)
Fuel oil storage capacity	1,799 m^3
Brine storage capacity	321 m^3

3.8.2 Vessel Operations

Vessels used during the Petroleum Activities Program may include subsea support vessels, with multiple vessels likely to be used to support WIV. Vessels may mobilise from the nearest Australian port or directly from international waters to the Operational Area, in accordance with biosecurity and marine assurance requirements.

All project vessels are subject to the Marine Offshore Vessel Assurance procedure which is detailed in **Section 7.5.2.2.**

3.8.2.1 Support and Other Vessels

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

The loading and back-loading of equipment, materials and wastes is one of the most common supporting activities. Loading and back-loading is undertaken using cranes on the WIV to lift materials in appropriate offshore rated containers (e.g. ISO tanks, skip bins, containers) between the WIV 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 WIV 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. It is subsequently discharged from the WIV at the sea surface at potentially a higher temperature.

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 WIV 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 Operational Area during the activities due to water depth; therefore, vessels will utilise DP.

The support vessels are also available to assist in implementation of the Oil Pollution First Strike Plan (FSP), should an environmental incident occur (e.g. spills).

3.8.2.2 Holding Station: Dynamic Positioning

DP uses satellite navigation and radio transponders in conjunction with thrusters to maintain the position of the WIV or vessel at the required location. Information relating to the position of the WIV or vessel is provided via seabed transponders, which emit signals that are detected by receivers on the WIV 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 intervention activities.

3.8.3 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 Operational Area are limited to helicopter take-off and landing on the helideck. Helicopters may be refuelled on the helideck.

3.8.4 ROV Operations

The WIV 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 well intervention for activities such as:

- pre and post intervention survey
- transponder deployment
- subsea intervention equipment land-out and recovery
- visual observations at seabed during intervention activities
- pressure testing 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.

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 B**.

3.9 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.

3.9.1 Emergency Disconnect Sequence

An Emergency Disconnect Sequence (EDS) may be implemented if the WIV is required to rapidly disengage from the well. The EDS closes WOCS/WORS valves (i.e. shutting in the well) and disconnects the riser to break the conduit between the Xmat tree and WIV. Common examples of when this system may be initiated include the movement of the WIV outside of its operating circle (e.g. due to a failure of the dynamic positioning system) or the movement of the WIV to avoid a vessel collision (e.g. third-party vessel on collision course with the WIV). EDS aims to leave the wellhead and Lower Riser Package (LRS) of the WOCS/WORS in a secure condition but will result in the loss of the fluids/gases 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. In accordance with Regulation 31 of the Environment Regulations, references to the Master Existing Environment (Appendix C in the Goodwyn Alpha (GWA) Facility Operations EP) are made throughout this section. 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 **Table 4-1** and **Section 6.7.1**. The worst-case credible spill scenario for this EP is a loss of well containment from the TPA03 well during well intervention activities.

Woodside recognises that hydrocarbons may be visible beyond the EMBA at lower concentrations than the ecological impact thresholds defined in **Table 4-1** and **Section 6.7.1**. 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. 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

<table>
<tr><th>Hydrocarbon Type</th><th>EMBA[1]</th><th>Socio-cultural EMBA[1]</th><th>Planning Area for Scientific Monitoring</th></tr>
<tr><td>Surface</td><td>10 g/m^2
This represents the minimum oil thickness (0.01 mm) at which ecological impacts (e.g. to birds and marine mammals) are expected to occur.</td><td colspan="2">1 g/m^2
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.
This low exposure value also establishes the planning area for scientific monitoring (NOPSEMA guidance note: A652993, April 2019).</td></tr>
<tr><td>Dissolved</td><td colspan="2">50 ppb
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.</td><td rowspan="2">10 ppb
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.
In the event of a spill, DNP will be notified of AMPs which may be contacted by hydrocarbons at this threshold (Table ____)</td></tr>
<tr><td>Entrained</td><td colspan="2">100 ppb
This represents potential toxic effects, particularly sublethal effects to highly sensitive species (NOPSEMA</td></tr>
</table>

Hydrocarbon Type	EMBA[1]	Socio-cultural EMBA[1]	Planning Area for Scientific Monitoring
	guidance note: 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 This represents the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat.	10 g/m^2 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 6.7.1***

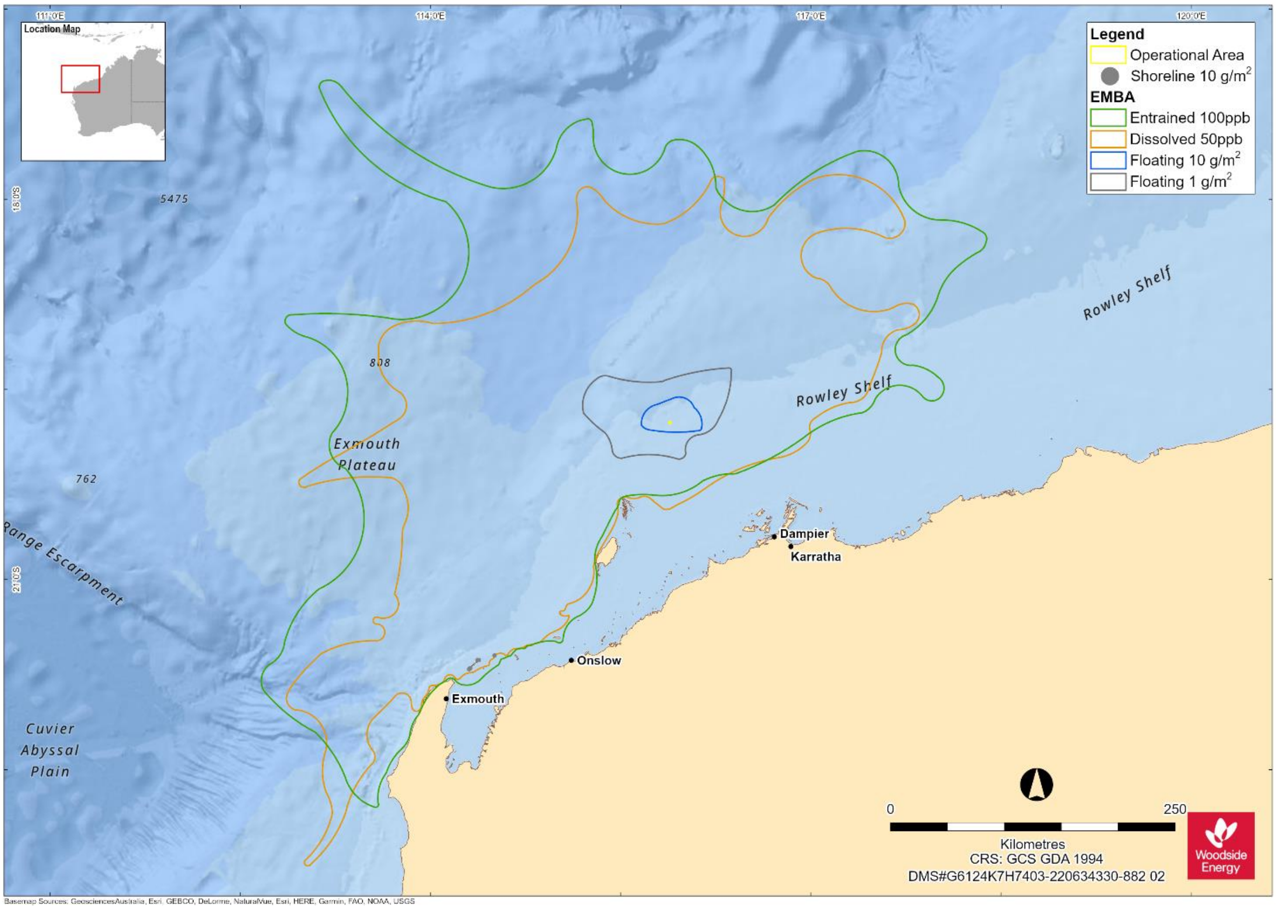

Figure 4-1: Environment that may be affected by the Petroleum Activities Program

4.2 Regional Context

The Operational Area is located in Commonwealth waters within the North-west Marine Region (NWMR), as defined under the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) (Commonwealth of Australia, 2006), in water depths of about 113 m. Within the NWMR, the Operational Area lies within the NWS Province (**Figure 4-2**). The EMBA also overlaps the Southwest Marine Region. Woodside's Master Existing Environment summarises the characteristics for the relevant marine bio-regions.

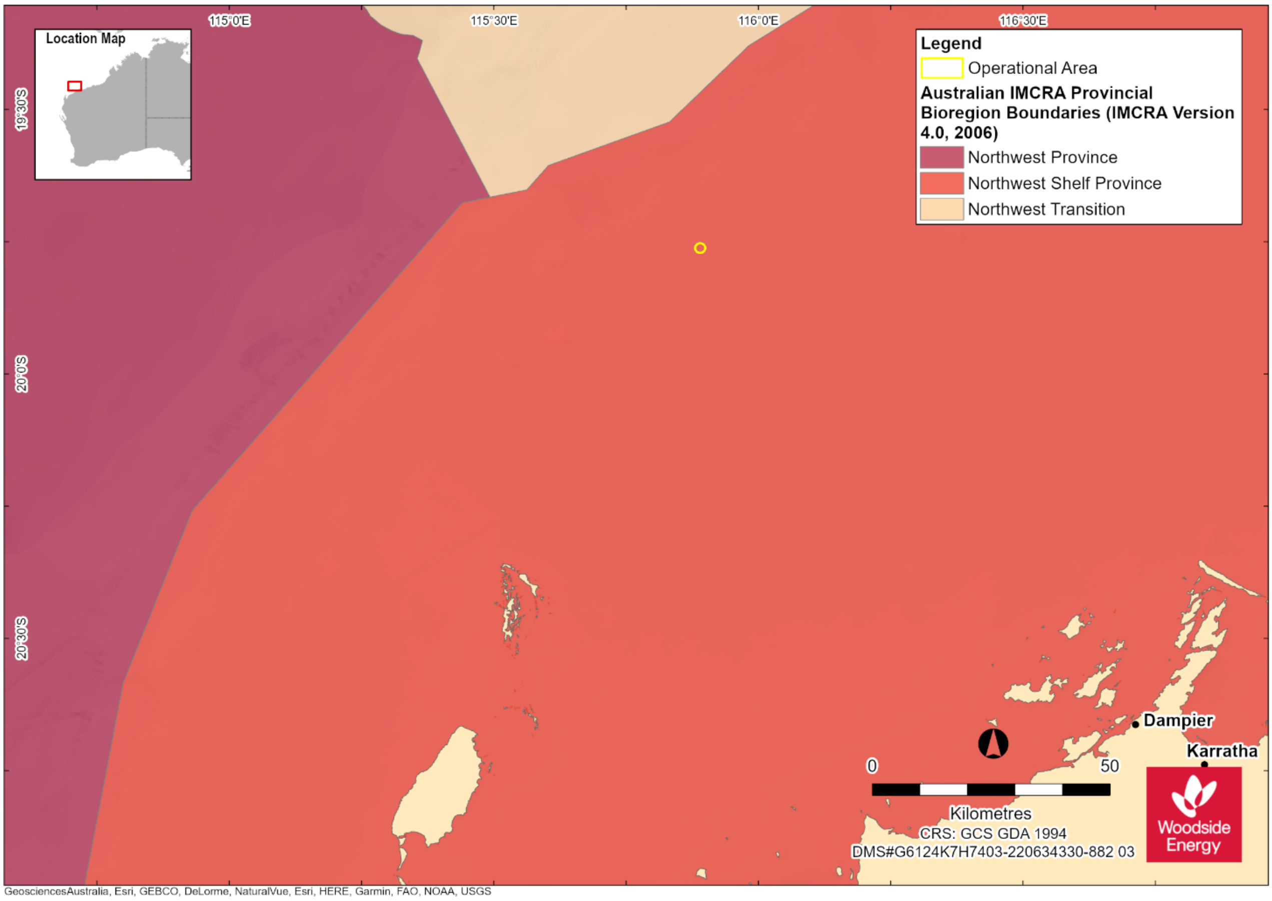

Figure 4-2: Location of the Operational Area and relevant marine bioregions

4.3 Matters of National Environmental Significance (EPBC Act)

Table 4-2 and **Table 4-3** summarise the MNES overlapping the Operational Area 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.

Table 4-2: Summary of MNES identified by the EPBC Act PMST as potentially occurring within the Operational Area

MNES	Number	Relevant Section
World Heritage Properties	None	**Section 4.6.1.4**
National Heritage Places	None	**Section 4.6.1.4**

MNES	Number	Relevant Section
Wetlands of International Importance (Ramsar)	None	**Section 4.5.4**
Commonwealth Marine Area	1	**Section 4.5.4**
Listed Threatened Ecological Communities	None	**Section 4.5.4**
Listed Threatened Species	19	**Section 4.5.2**
Listed Migratory Species	33	**Section 4.5.2**

Table 4-3: Summary of MNES identified by the EPBC Act Protected Matters Search Tool (PMST) as potentially occurring within the EMBA

MNES	Number	Relevant Section
World Heritage Properties	1	**Section 4.6.1.4**
National Heritage Places	1	**Section 4.6.1.4**
Wetlands of International Importance (Ramsar)	None	**Section 4.5.4**
Commonwealth Marine Area	2	**Section 4.5.4**
Listed Threatened Ecological Communities	None	**Section 4.5.4**
Listed Threatened Species	46	**Section 4.5.2**
Listed Migratory Species	61	**Section 4.5.2**

4.4 Physical Environment

The Operational Area lies on the outer continental shelf in waters approximately 113 m deep **(Figure 4-3).** The bathymetry within the Operational Area is generally flat, which is consistent with the broader NWS Province shelf region (Baker et al. 2008). The seabed has a gentle (0.05°) seaward gradient extending to a steep distal slope occurring between 200 to 300 km offshore in water depths of around 200 m (Dix et al. 2005). The continental slope then descends more rapidly from the shelf edge to depths greater than 1,000 m to the north-west (James et al. 2004).

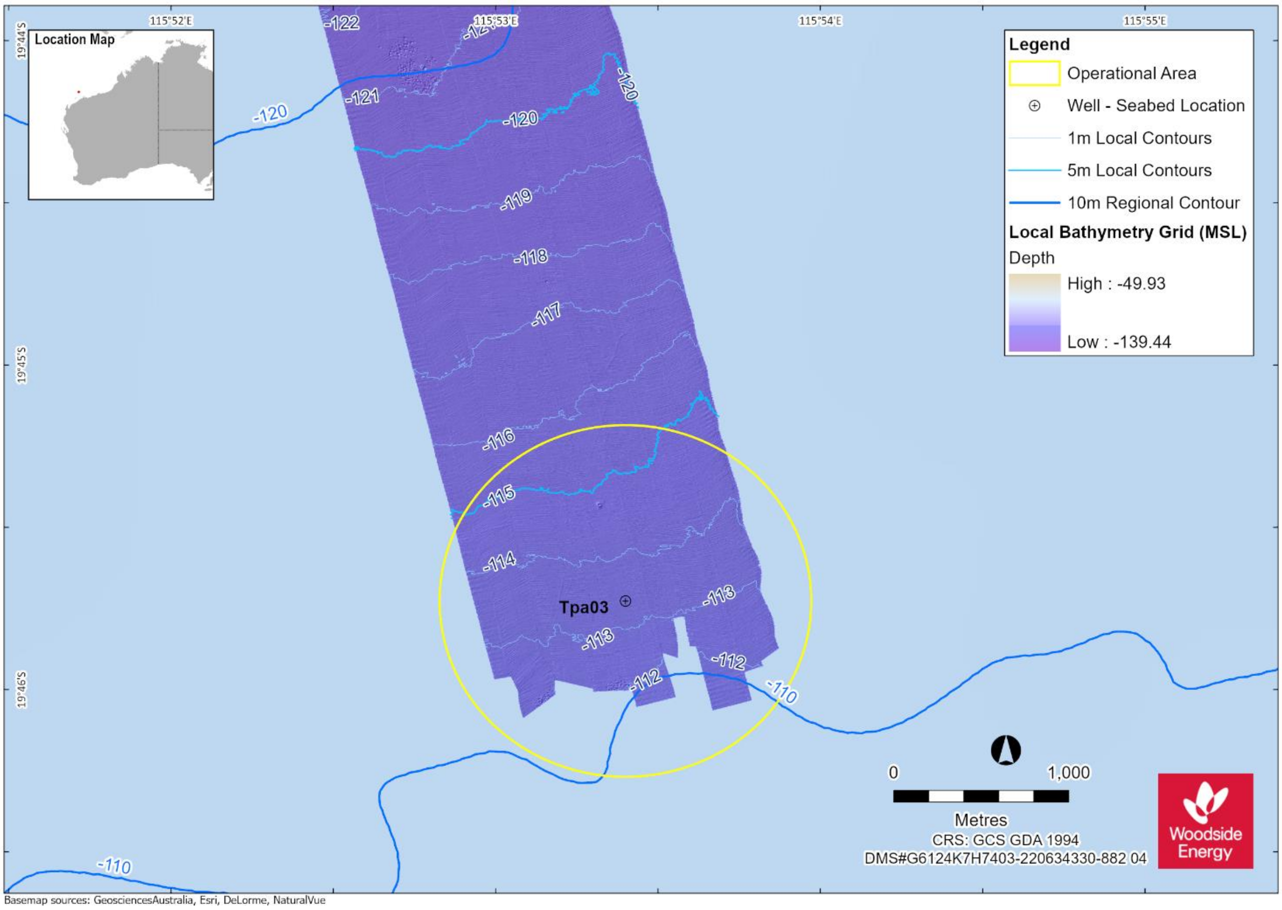

Figure 4-3: Bathymetry of the Operational Area and surrounding waters

4.5 Biological Environment

4.5.1 Habitats and Biological Communities

Sediments in the Operational Area are broadly consistent with those in the NWS Province, with typically low levels of potential contaminants of geogenic origin (often below laboratory limits of detection), with the exception of localized areas of elevated barium (AIMS 2014b, RPS 2012). Elevated barium has been attributed to contamination from historical drilling activities (AIMS 2014b), as barite (barium sulphate) is commonly used in drilling fluids. Sediments in the outer NWS Province are relatively homogenous and are typically dominated by sands and a small portion of gravel (Baker et al. 2008). Fine sediment size classes (e.g. muds) increase with proximity to the shoreline and the shelf break, but are less prominent in the intervening continental shelf (Baker et al. 2008). Carbonate sediments typically account for the bulk of sediment composition, with both biogenic and precipitated sediments present on the outer shelf (Dix et al. 2005). Beyond the shelf break, the proportion of fine sediments increases along the continental slope towards the Exmouth Plateau and the abyssal plain (Baker et al. 2008).

Sediments in the Operational Area are expected to be comprised primarily of fine sands, very fine sands and silt, with monitoring near the Operational Area indicating these size fractions constitute the majority of sediments (BMT Oceanica 2015).

While hard substrates are not known to occur within the Operational Area, they occur in the region more broadly and can host more diverse benthic communities. Hard substrate may be associated with the Ancient Coastline at 125 m Depth Contour Key Ecological Feature (KEF) (Section 4.7), which overlaps the Operational Area.

Rankin Bank is on the continental shelf, approximately 32 km from the Operational Area at the closest point. While not a KEF, Rankin Bank, along with Glomar Shoal, is the only large, complex bathymetrical feature on the outer western shelf of the West Pilbara and represents habitats that are likely to play an important role in the productivity of the Pilbara region (AIMS 2014a). Rankin Bank consists of three submerged shoals delineated by the 50 m depth contour with water depths of approximately 18–30.5 m (AIMS 2014a).

Rankin Bank represents a diverse marine environment, predominantly composed of consolidated reef and algae habitat (~55% cover), followed by hard corals (~25% cover), unconsolidated sand/silt habitat (~16% cover), and benthic communities composed of macroalgae, soft corals, sponges and other invertebrates (~3% cover) (AIMS 2014a). Hard corals are a significant component of the benthic community of some parts of the bank, with abundance in the upper end of the range observed elsewhere on the submerged shoals and banks of NW Australia (Heyward et al. 2012).

Rankin Bank has been shown to support a diverse fish assemblage (AIMS 2014a). This is consistent with studies showing a strong correlation between habitat diversity and fish assemblage species richness (Gratwicke and Speight 2005; Last et al. 2005).

The habitat surrounding Rankin Bank (<50 m) was mapped by AIMS on behalf of Woodside (2014b) and hosts filter feeding communities in areas of consolidated substrate interspersed by sand.

Glomar Shoal is a shallow sedimentary bank comprised of coarser biogenic material than the surrounding seabed. The shoal is 26 to 70 m below the sea surface (Falkner et al. 2009) and lies approximately 96 km east of the Operational Area. Glomar Shoal has also been identified as a KEF (Falkner et al. 2009). This KEF encompasses a wider area than the shoal feature itself and is located 76 km north-east of the Operational Area.

Key habitats and ecological communities within the EMBA are identified in **Table 4-1** and described below.

Table 4-4: Habitats and Communities within the EMBA

Habitat/community	Key locations within the EMBA
Seabed characteristics	
Glomar Shoal	Glomar Shoal is a shallow sedimentary bank comprised of coarser biogenic material than the surrounding seabed. The shoal is 26 to 70 m below the sea surface (Falkner et al. 2009) and lies approximately 60 km east of the Operational Area and 90 km east of the GWA facility. Glomar Shoal has also been identified as a KEF (Falkner et al. 2009). This KEF encompasses a wider area than the shoal feature itself and is located 42 km east of the Operational Area.
Ancient Coastline at 125 m Depth Contour	The Ancient Coastline at 125 m Depth Contour KEF, overlaps part of the Operational Area (DAWE 2019a; Section 4.7). Areas of this KEF comprise hard substrate and may occur within the Operational Area. Hard substrate seabed habitats present within the Operational Area are likely to support filter feeding biota such as sponges and gorgonians (sea whip and fans), as reported for hard substrate seabed habitat in similar water depths along this outer shelf area of the NWS.
Marine primary producers	
Coral	• Rankin Bank (31 km west) • Glomar Shoal (96 km north-east) • Montebello Islands (77 km south-west) • Barrow Island (112 km south-west) • Ningaloo Coast (287 km south-west) • Muiron Islands (265 km south-west)
Seagrass beds and macroalgae	• Montebello Islands (77 km south-west)

Habitat/community	Key locations within the EMBA
	• Barrow Island (112 m south-west) • Ningaloo Coast (287 km south-west) • Muiron Islands (265 km south-west) • Exmouth Gulf (266 km south-west)
Mangroves	Ningaloo Coast (287 km south-west) Montebello Islands (77 km south-west) Exmouth Gulf (266 km south-west)
Other communities and habitats	
Plankton	Plankton within the Operational Area and EMBA are expected to be representative of the wider NWMR, as detailed in **Section 4.3** of the Master Existing Environment. Peak primary productivity within the EMBA occurs in late summer/early autumn, along the shelf edge of the Ningaloo Reef. It also links to a larger biologically productive period in the area that includes mass coral spawning events, peaks in zooplankton and fish larvae abundance (CALM 2005a), with periodic upwelling throughout the year. Further detail regarding productivity at other notable locations within the EMBA (e.g. North-west Cape) is provided in **the Master Existing Environment, Section 4.3.3**.
Pelagic and demersal fish populations	Pelagic and demersal fish populations within the Operational Area and EMBA are expected to be representative of the NWMR (described in the Master Existing Environment, Section 5.3). Particular features within the EMBA that are known to support pelagic and demersal fish populations include the Ancient Coastline at 125 m Depth Contour KEF (which is mapped as overlapping the Operational Area), the Continental Slope Demersal Fish Communities KEF, the Western demersal slope and associated fish communities of the Central Western Province KEF, Rankin Bank and Glomar Shoal (including the Glomar Shoal KEF). Detail regarding these features is provided in **the Master Existing Environment**, **Section 9**. Notably, the presence of subsea infrastructure associated with the GWA facility has resulted in the development of demersal fish communities that would otherwise not occur in the Operational Area due to the generally featureless, soft substrate that is present (McLean et al. 2017).
Epifauna and infauna	Filter feeders such as sponges, ascidians, soft corals, and gorgonians are animals that feed by actively filtering suspended matter and food particles from water by passing the water over specialised filtration structures (DEWHA 2008). Filter feeders within the EMBA are expected to be representative of the NWMR, with notable areas of high sponge diversity occurring in the Commonwealth waters of Ningaloo Marine Park and at shoals (such as Glomar Shoal) within the EMBA (see **Master Existing Environment**, **Section 5.4**). Discrete areas of hard substrate hosting sessile filter feeding communities may also be associated within the Ancient Coastline at 125 m Depth Contour KEF, which overlaps the Operational Area. Filter feeder communities within the Operational Area are present on the subsea infrastructure and GWA platform, which provides hard substrate for attachment in an otherwise generally featureless, soft and sandy substrate.

4.5.2 Protected Species

A total of 66 EPBC Act listed species considered to be MNES were identified as potentially occurring within the EMBA, of which a subset of 33 species were identified as potentially occurring within the Operational Area. The full list of marine species identified from the PMST reports is provided in Appendix E. including several MNES that are not considered to be credibly impacted (e.g. terrestrial species within the EMBA). Criteria for determining species to be considered for impact assessment is outlined in Section 3.2 of the Master Existing Environment.

Species identified as potentially occurring within the Operational Area and EMBA, and Biologically Important Areas (BIAs) or Habitat Critical to their Survival (Habitat Critical) that overlap the Operational Area and EMBA, are listed in **Table 4-5** to Table 4-13. A description of species is included in Section 6 to Section 8 of the Master Existing Environment.

Figure 4-4 to **Figure 4-8** show the spatial overlap with relevant BIAs and Habitat Critical areas and the Operational Area.

4.5.2.1 Fish, Sharks and Rays

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

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Thunnus maccoyii	Southern bluefin tuna	Conservation Dependent	N/A	Breeding known to occur within area	Breeding known to occur within area
Carcharias taurus (west coast population)	Grey nurse shark	Vulnerable	N/A	Species or species habitat may occur within area	Species or species habitat known to occur within area
Carcharodon carcharias	White shark	Vulnerable	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Pristis pristis	Freshwater sawfish	Vulnerable	Migratory	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Pristis zijsron	Green sawfish	Vulnerable	Migratory	Species or species habitat known to occur within area	Species or species habitat known to occur within area
Rhincodon typus	Whale shark	Vulnerable	Migratory	Foraging, feeding or related behaviour known to occur within area	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini	Scalloped hammerhead	Conservation Dependent	N/A	Species or species habitat likely to occur within area	Species or species habitat known to occur within area
Anoxypristis cuspidata	Narrow sawfish	N/A	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Carcharhinus longimanus	Oceanic whitetip shark	N/A	Migratory	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Isurus oxyrinchus	Shortfin mako	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	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	Species or species habitat likely to occur within area	Species or species habitat known to occur within area
Manta birostris	Giant manta ray	N/A	Migratory	Species or species habitat likely to occur within area	Species or species habitat known to occur within area
Pristis clavata	Dwarf sawfish	Vulnerable	Migratory	N/A	Species or species habitat known to occur within area

Table 4-6: Fish, shark and ray BIAs within the Operational Area and EMBA

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
Whale shark	Foraging (northward from Ningaloo along 200 m isobath)	Overlaps
	Foraging (high density prey) (Ningaloo Marine Park)	298 km south-west

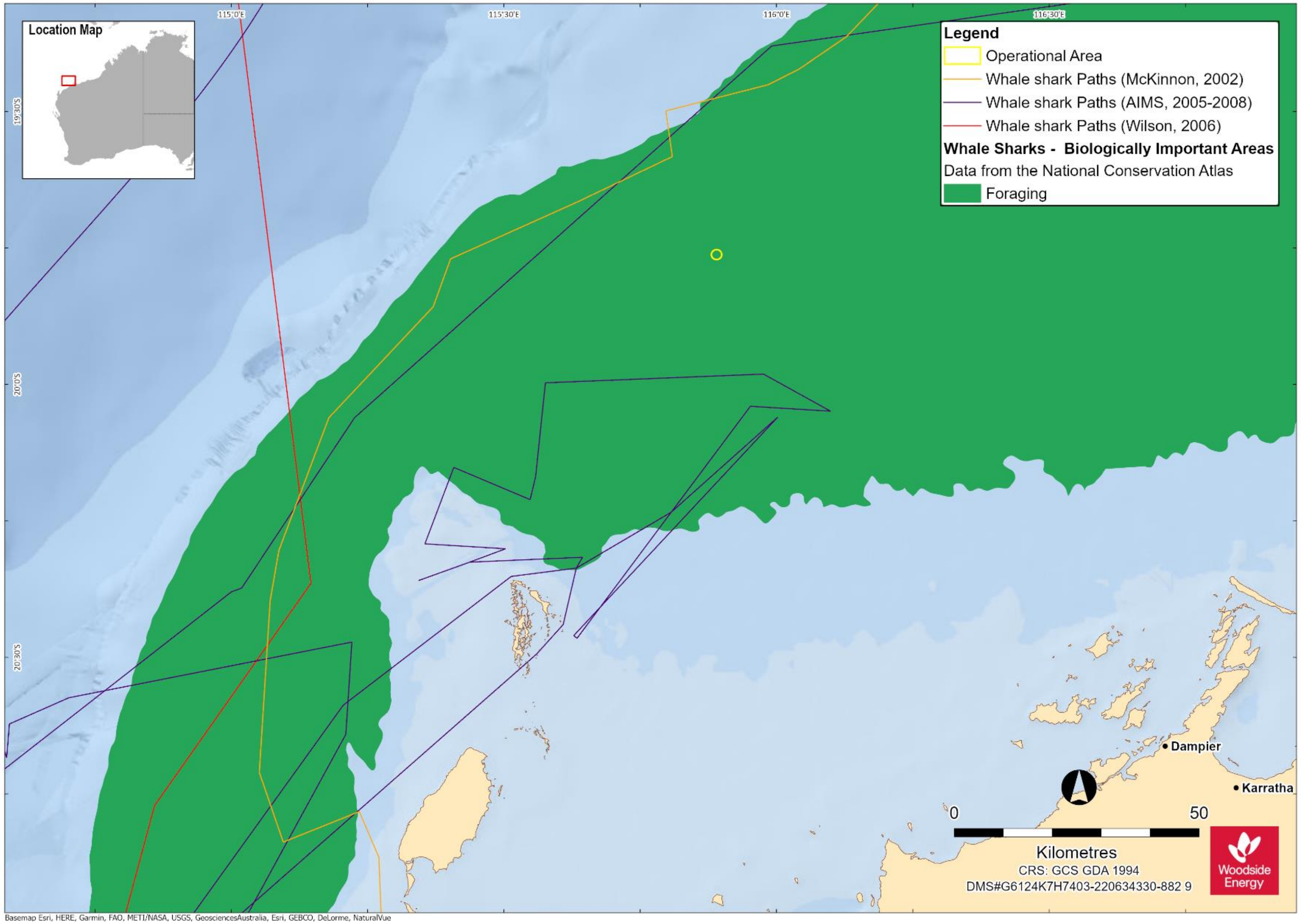

Figure 4-4: Whale shark BIAs and satellite tracks of whale sharks tagged between 2005 and 2008 (Meekan and Radford, 2010)

4.5.2.2 Marine Reptiles

Table 4-7: Threatened and Migratory marine reptile species predicted to occur within the Operational Area and EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Caretta caretta	Loggerhead turtle	Endangered	Migratory	Species or species habitat likely to occur within area	Breeding known to occur within area
Chelonia mydas	Green turtle	Vulnerable	Migratory	Species or species habitat likely to occur within area	Breeding known to occur within area
Dermochelys coriacea	Leatherback turtle	Endangered	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	Breeding known to occur within area
Natator depressus	Flatback turtle	Vulnerable	Migratory	Congregation or aggregation known to occur within area	Breeding known to occur within area
Aipysurus apraefrontalis	Short-nosed seasnake	Critically Endangered	N/A	N/A	Species or species habitat known to occur within area
Aipysurus foliosquama	Leaf-scaled seasnake	Critically Endangered	N/A	N/A	Species or species habitat known to occur within area

Table 4-8: Marine turtle BIAs within the Operational Area and EMBA

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
Flatback turtle	Internesting Buffer (Montebello Islands – Hermite Is, NW Is, Trimouille Is)	Overlaps
	Internesting (Coral reef habitat west of Montebello)	86 km south-west

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
	Internesting Buffer (Dampier Archipelago)	31 km south-east
	Internesting Buffer (Legendre Is, Hauy Is)	52 km south-east
	Internesting Buffer (Intercourse Is)	46 km south-east
	Internesting Buffer (Delambre Is)	67 km south-east
	Internesting Buffer (Dixon Is)	76 km south-east
	Internesting Buffer (West of Cape Lambert)	88 km south-east
	Internesting Buffer (Thevernard Island – South Coast)	104 km south-west
	Nesting (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Nesting (Barrow Island)	108 km south-west
	Nesting (Thevernard Island – South Coast)	202 km south-west
	Mating (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Mating (Coral reef habitat west of Montebello)	86 km south-west
	Mating (Barrow Island)	108 km south-west
	Foraging (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Foraging (Coral reef habitat west of Montebello)	86 km south-west
	Foraging (Barrow Island)	108 km south-west
	Aggregation (Coral reef habitat west of Montebello)	86 km south-west
Green turtle	Internesting (Montebello Islands)	67 km south-west
	Internesting (Coral reef habitat west of Montebello group)	85 km south-west
	Internesting (Barrow Island)	111 km south-west
	Internesting Buffer (Montebello Islands)	47 km south-west
	Internesting Buffer (Montebello Is – NW Is, Trimouille Is)	52 km south-west
	Internesting Buffer (Middle Is, West Coast Barrow Island West Coast and North Coast)	89 km south-west
	Internesting Buffer (North and South Muiron Is)	237 km south-west

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
	Internesting Buffer (North West Cape)	265 km south-west
	Nesting (Montebello Islands)	67 km south-west
	Nesting (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Nesting (Middle Is, West Coast Barrow Island West Coast and North Coast)	111 km south-west
	Nesting (North and South Muiron Is)	258 km south-west
	Nesting (North West Cape)	285 km south-west
	Mating (Montebello Islands)	67 km south-west
	Mating (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Mating (Coral reef habitat west of Montebello group)	85 km south-west
	Mating (Middle Is, West Coast Barrow Island West Coast and North Coast)	111 km south-west
	Foraging (Montebello Islands)	67 km south-west
	Foraging (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Foraging (Coral reef habitat west of Montebello group)	85 km south-west
	Foraging (Inshore tidal and shallow subtidal around Barrow Island)	111 km south-west
	Aggregation (Coral reef habitat west of Montebello group)	85 km south-west
	Basking (Middle Is, West Coast Barrow Island West Coast and North Coast)	111 km south-west
Hawksbill turtle	Foraging (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Foraging (Inshore tidal and shallow subtidal areas around Barrow Island)	112 km south-west
	Nesting (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Nesting (Barrow Island)	113 km south-west
	Nesting (Thevenard Island)	205 km south-west
	Nesting (Ningaloo Coast and Jurabi Coast)	285 km south-west
	Mating (Montebello Is – Hermite Is, NW Is, Trimouille Is)	72 km south-west
	Mating (Barrow Island)	113 km south-west

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
	Internesting Buffer (Montebello Is – Hermite Is, NW Is, Trimouille Is)	53 km south-west
	Internesting Buffer (Ah chong and South East Is)	57 km south-west
	Internesting Buffer (Montebello Is, Trimouille and NW islands)	70 km south-west
	Internesting Buffer (Lowendal Islands Group)	83 km south-west
	Internesting Buffer (Barrow Island)	89 km south-west
	Internesting Buffer (Varanus Island)	90 km south-west
	Internesting Buffer (Thevenard Island)	183 km south-west
	Internesting Buffer (Ningaloo Coast and Jurabi Coast)	265 km south-west
Loggerhead turtle	Internesting Buffer (Montebello Islands)	61 km south-west
	Internesting Buffer (Lowenthal Island)	87 km south-west
	Internesting Buffer (Muiron Island)	236 km south-west
	Internesting Buffer (Ningaloo Coast and Jurabi Coast)	266 km south-west
	Nesting (Muiron Island)	256 km south-west
	Nesting (Ningaloo Coast and Jurabi Coast)	285 km south-west

Table 4-9: Internesting Habitat Critical to the Survival of Marine Turtle Species predicted to occur within the Operational Area and EMBA

Species	Genetic Stock	Nesting Locations	Approximate Distance of Area from Operational Area	Inter-nesting buffer	Nesting period	Hatching period
Flatback turtle	Pilbara	Barrow Island, Montebello Islands, coastal islands from Cape Preston to Locker Island	36 km south-west	40 km	Oct–Mar (peak: Nov-Jan)	Feb-Mar
		Dampier Archipelago, including Delambre Island and Hauy Island	45 km south-east	60 km		

Species	Genetic Stock	Nesting Locations	Approximate Distance of Area from Operational Area	Inter-nesting buffer	Nesting period	Hatching period
Green turtle	North-West Shelf	Barrow Island, Montebello Islands, Serrier Island and Thevenard Island	56 km south-west	20 km	Nov–Mar (peak: Dec-Feb)	Jan–May (peak: Feb–Mar)
		Exmouth Gulf and Ningaloo coast	267 km south-west	20 km		
Hawksbill turtle	Western Australia	Cape Preston to mouth of Exmouth Gulf including Montebello Islands and Lowendal Islands	56 km south-west	20 km	All year (peak: Oct–Jan)	All year (peak: Dec–Feb)
Loggerhead turtle	Western Australia	Exmouth Gulf and Ningaloo coast	267 km south-west	20 km	Nov–Mar (peak: Jan)	Jan–May
Leatherback turtle	No overlap – nesting located in Northern Territory and North Queensland					
Olive ridley turtle	No overlap – nesting located in Northern Australia and North Queensland					

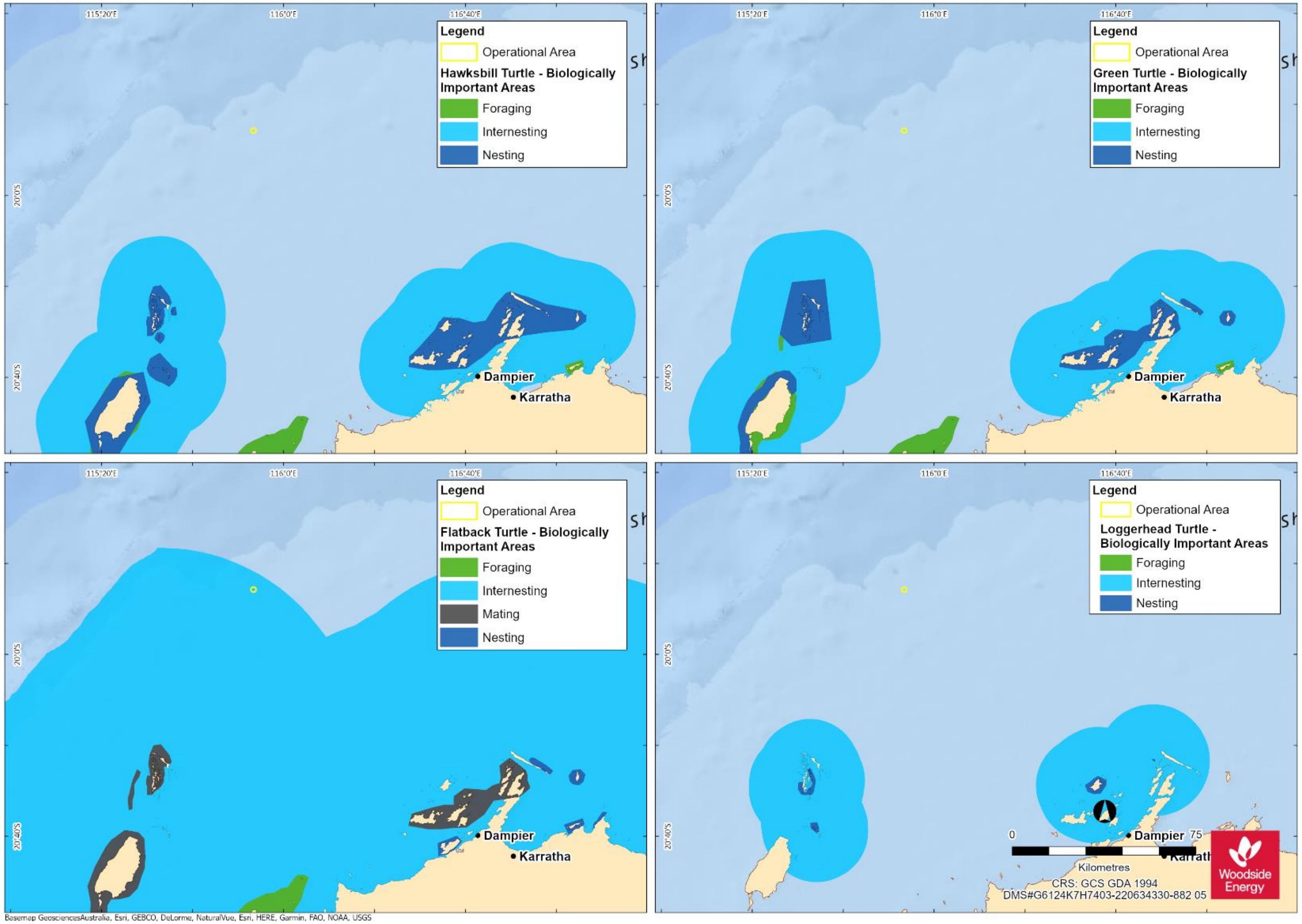

Figure 4-5: Marine turtle BIAs

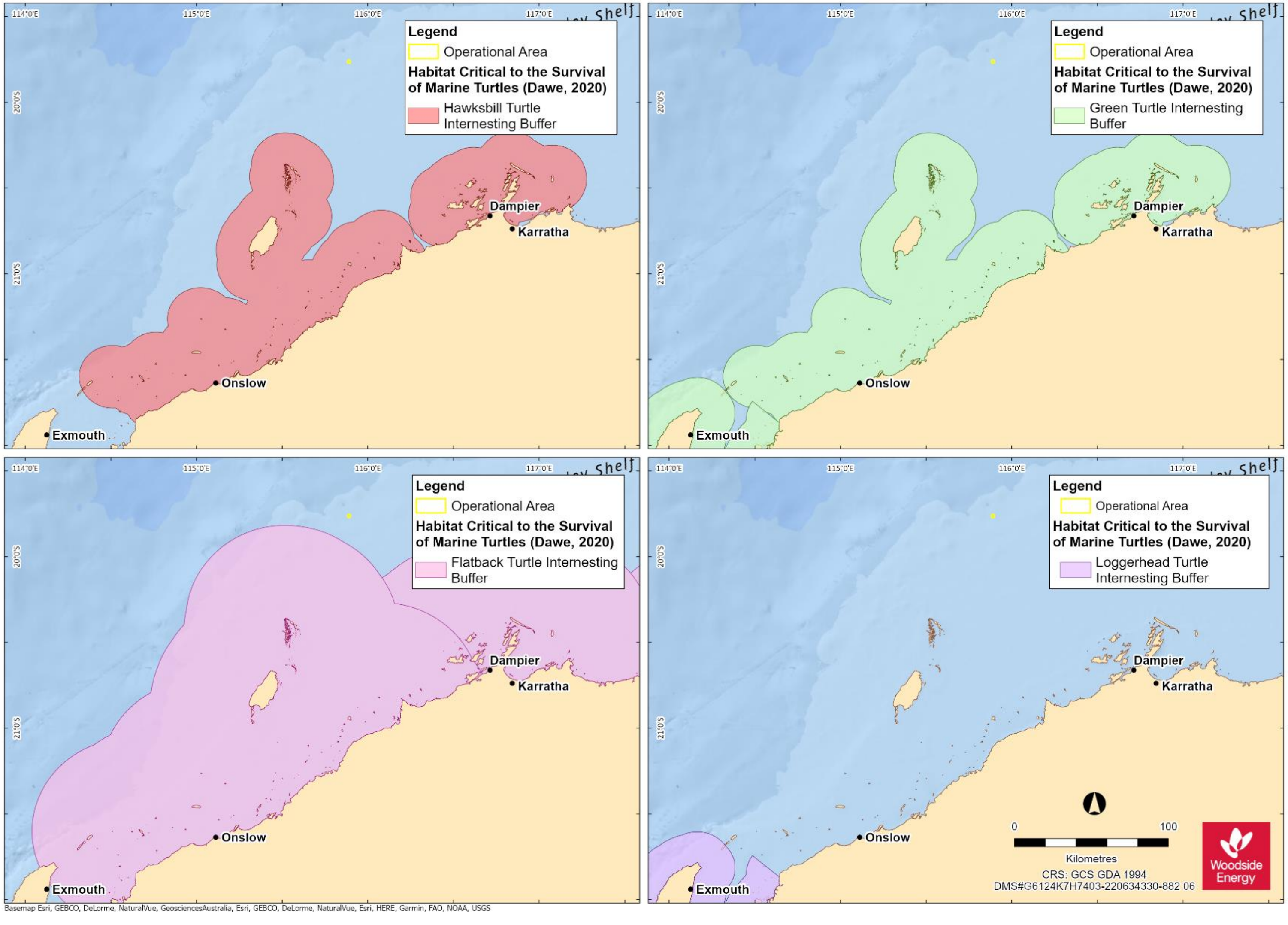

Figure 4-6: Habitat Critical to the Survival of Marine Turtles

4.5.2.3 Marine Mammals

Table 4-10: Threatened and Migratory marine mammal species predicted to occur within the Operational Area and EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Balaenoptera musculus	Blue whale	Endangered	Migratory	Species or species habitat likely to occur within area	Migration route known to occur within area
Balaenoptera borealis	Sei whale	Vulnerable	Migratory	Species or species habitat likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera physalus	Fin whale	Vulnerable	Migratory	Species or species habitat likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Megaptera novaeangliae	Humpback whale	N/A	Migratory	N/A	Breeding 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
Orcinus orca	Killer whale	N/A	Migratory	Species or species habitat may occur within area	Species or species habitat may occur within area
Physeter macrocephalus	Sperm whale	N/A	Migratory	Species or species habitat may occur within area	Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted bottlenose dolphin	N/A	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Eubalaena australis	Southern right whale	Endangered	Migratory	N/A	Species or species habitat likely to occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Balaenoptera bonaerensis	Antarctic minke whale	N/A	Migratory	N/A	Species or species habitat likely to occur within area
Dugong dugon	Dugong	N/A	Migratory	N/A	Breeding known to occur within area
Sousa chinensis	Indo-Pacific humpback dolphin	N/A	Migratory	N/A	Species or species habitat known to occur within area

Table 4-11: Marine mammal BIAs within the Operational Area and EMBA

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
Humpback whale	Migration (north and south - extends from the coast to out to approximately 100 km offshore in the Kimberley region extending south to North-west Cape. From North-west Cape to south of Shark Bay the migration corridor is reduced to approximately 50 km)	25 km south
	Resting (Exmouth Gulf)	277 km south-west
Pygmy blue whale	Foraging (Ningaloo)	306 km south-west
	Migration (Augusta to Derby. Tend to pass along the shelf edge at depths of 500 m to 1000 m; appear close to coast in the Exmouth-Montebello Islands area on southern migration)	43 km north-west
Dugong	Calving (Exmouth Gulf)	269 km south-west
	Nursing (Exmouth Gulf)	269 km south-west
	Breeding (Exmouth Gulf)	269 km south-west
	Foraging (Exmouth Gulf)	269 km south-west

Pygmy Blue Whales

The Operational Area overlaps the pygmy blue whale distribution range, a spatially defined area representing presence certainty and not biologically important behaviour (e.g. breeding, foraging, migration). The distribution range acknowledges the migratory movement of pygmy blue whales to the west of the Migratory BIA, though the majority of the important migration areas for north-west Australia are within the migratory BIA (Thums et al. 2022) and telemetry data also indicates north of the North West Cape pygmy blue whales transit through deeper and further offshore waters (Thums et al., 2022 and Double et al., 2014).

Considering the proximity of the pygmy blue whale migration BIA to the Operational Area (about 39 km) it is likely that individuals may transit in and around the Operational Area 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) (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 (northbound) display predominately relatively fast, directed travel interspersed with relatively short periods of low move persistence indicative of foraging (Thums et al. 2022) and acoustic detection (McCauley, 2011) indicated a short, sharp pulse of southbound migrating pygmy blue whales.

Thums et al. (2022) acknowledge that the majority of important migration areas for north-west Australia were encompassed by the Migration BIA. Furthermore, the analysis identified areas from the shelf edge from Ningaloo Reef to the Rowley Shoals 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) include areas within and to the west of the Migration BIA indicating there is some but most likely low likelihood of foraging whales being present in the Operational Area.

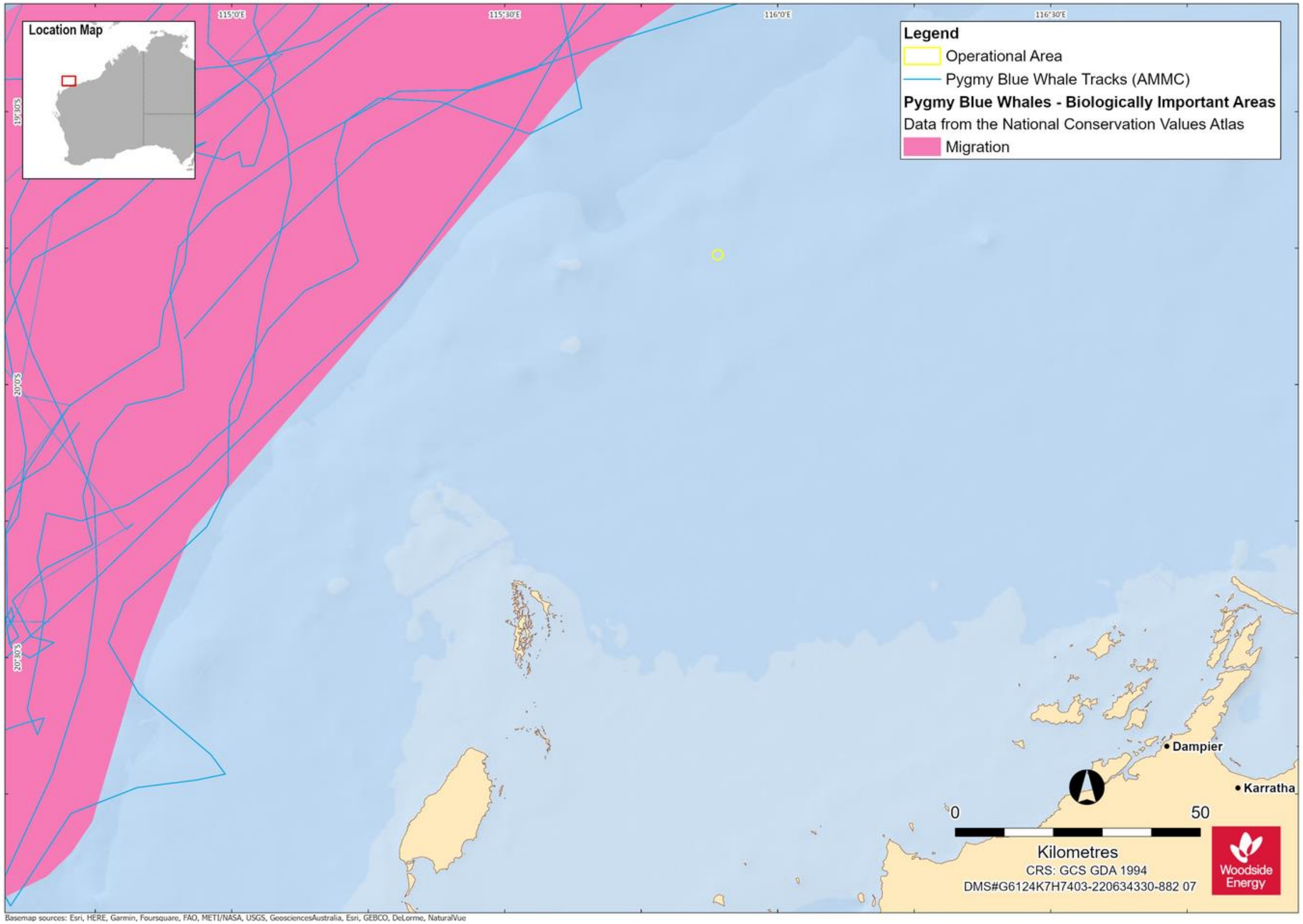

Figure 4-7: Pygmy blue whale BIAs and satellite tracks of tagged whales (Thums et al., 2022)

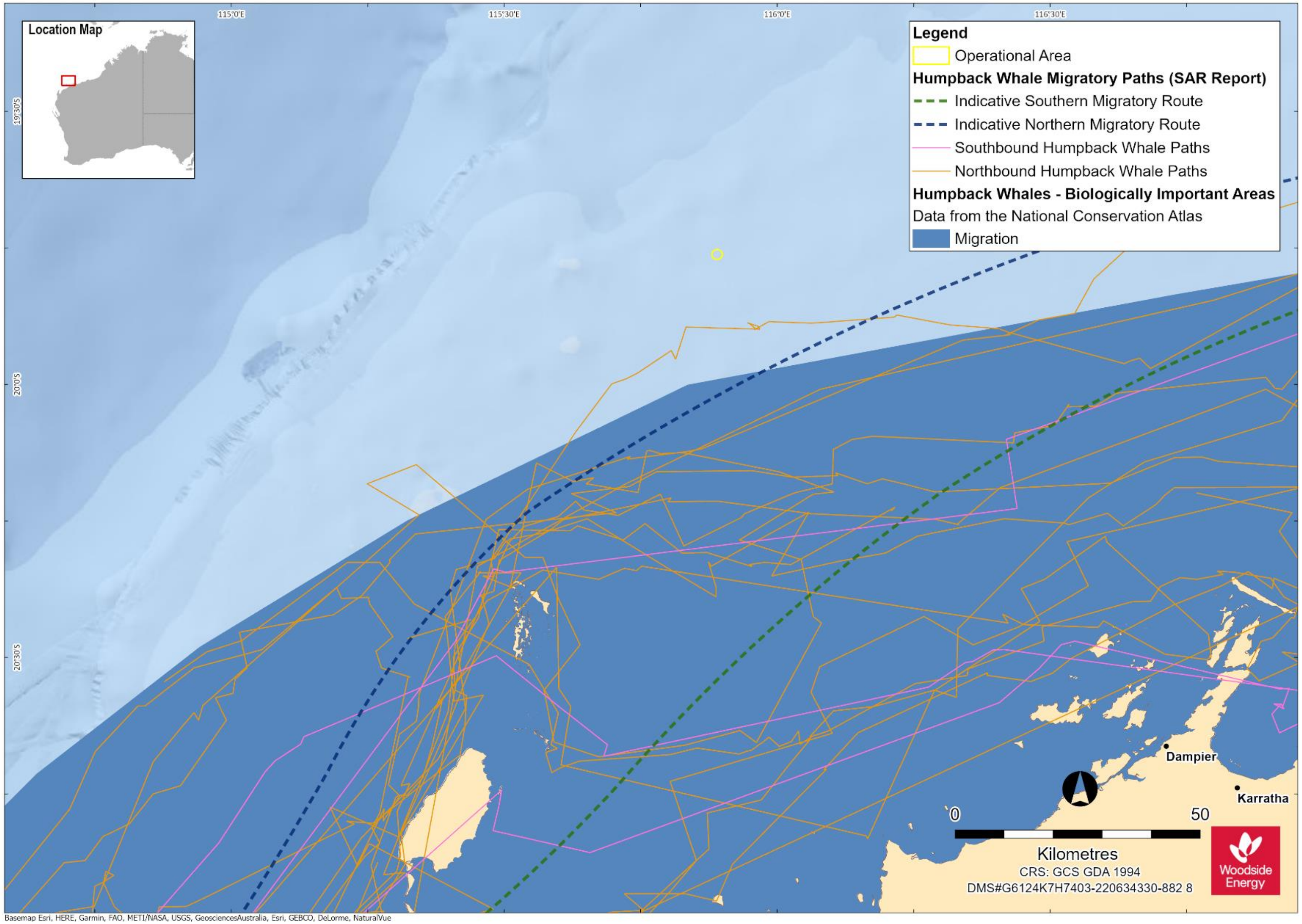

Figure 4-8: Humpback whale BIAs and satellite tracks of whales tagged between 2010 and 2012 (Double et al., 2012, 2010)

4.5.2.4 Seabirds and Migratory Shorebirds

Table 4-12: Threatened and Migratory seabird and migratory shorebird species predicted to occur within the Operational Area and EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Calidris canutus	Red knot	Endangered	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Numenius madagascariensis	Eastern curlew	Critically Endangered	Migratory	Species or species habitat may occur within area	Species or species habitat known to occur within area
Phaethon lepturus fulvus	Christmas Island white-tailed tropicbird	Endangered	Migratory	Species or species habitat may occur within area	Species or species habitat may occur within area
Sternula nereis	Australian fairy tern	Vulnerable	N/A	Species or species habitat may occur within area	Breeding known to occur within area
Fregata minor	Great frigatebird	N/A	Migratory	Species or species habitat may occur within area	Species or species habitat may occur within area
Anous stolidus	Common noddy	N/A	Migratory	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Calonectris leucomelas	Streaked shearwater	N/A	Migratory	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Fregata ariel	Lesser frigatebird	N/A	Migratory	Species or species habitat likely occur within area	Species or species habitat known to occur within area
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Critically Endangered	N/A	N/A	Species or species habitat known to occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	N/A	N/A	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus	Southern giant petrel	Endangered	Migratory	N/A	Species or species habitat may occur within area
Ardenna carneipes	Flesh-footed shearwater	N/A	Migratory	N/A	Species or species habitat likely to occur within area
Ardenna pacifica	Wedge-tailed shearwater	N/A	Migratory	N/A	Breeding known to occur within area
Hydroprogne caspia	Caspian tern	N/A	Migratory	N/A	Breeding known to occur within area
Sterna dougallii	Roseate tern	N/A	Migratory	N/A	Breeding known to occur within area
Onychoprion anaethetus	Bridled tern	N/A	Migratory	N/A	Breeding known to occur within area
Sternula albifrons	Little tern	N/A	Migratory	N/A	Breeding known to occur within area
Thalasseus bergii	Greater crested tern	N/A	Migratory	N/A	Breeding known to occur within area
Apus pacificus	Fork-tailed swift	N/A	Migratory	N/A	Species or species habitat likely to occur within area
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Migratory	N/A	Species or species habitat known to occur within area
Actitis hypoleucos	Common sandpiper	N/A	Migratory	N/A	Species or species habitat known to occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Charadrius leschenaultii	Greater sand plover	Vulnerable	Migratory	N/A	Species or species habitat likely to occur within area
Calidris acuminata	Sharp-tailed sandpiper	N/A	Migratory	N/A	Species or species habitat known to occur within area
Calidris melanotos	Pectoral sandpiper	N/A	Migratory	N/A	Species or species habitat may occur within area
Charadrius leschenaultii	Greater sand plover	Vulnerable	Migratory	N/A	Species or species habitat likely to occur within area
Papasula abbotti	Abbott's booby	Endangered	N/A	N/A	Species or species habitat may occur within area
Thalassarche carteri	Indian yellow-nosed albatross	Vulnerable	Migratory	N/A	Species or species habitat may occur within area
Thalassarche impavida	Campbell albatross	Vulnerable	Migratory	N/A	Species or species habitat may occur within area
Rostratula australis	Australian painted snipe	Endangered	N/A	N/A	Species or species habitat likely to occur within area
Charadrius veredus	Oriental plover	N/A	Migratory	N/A	Species or species habitat may occur within area
Glareola maldivarum	Oriental pratincole	N/A	Migratory	N/A	Species or species habitat may occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Limnodromus semipalmatus	Asian dowitcher	N/A	Migratory	N/A	Species or species habitat known to occur within area
Pandion haliaetus	Osprey	N/A	Migratory	N/A	Breeding known to occur within area
Tringa nebularia	Common greenshank	N/A	Migratory	N/A	Species or species habitat likely to occur within area

Table 4-13: Seabird and shorebird BIAs within the Operational Area and EMBA

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
Fairy tern	Breeding (Pilbara and Gascoyne coasts and islands)	68 km south-west
	Foraging (Pilbara and Gascoyne coasts and islands)	68 km south-west
Lesser crested tern	Breeding (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	72 km south-west
	Foraging (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	72 km south-west
Roseate tern	Breeding (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	65 km south-west
	Foraging (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	65 km south-west
Wedge-tailed shearwater	Breeding (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	Overlaps
	Foraging (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	Overlaps
White-tailed tropicbird	Breeding (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	292 km north-east
	Foraging (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	292 km north-east

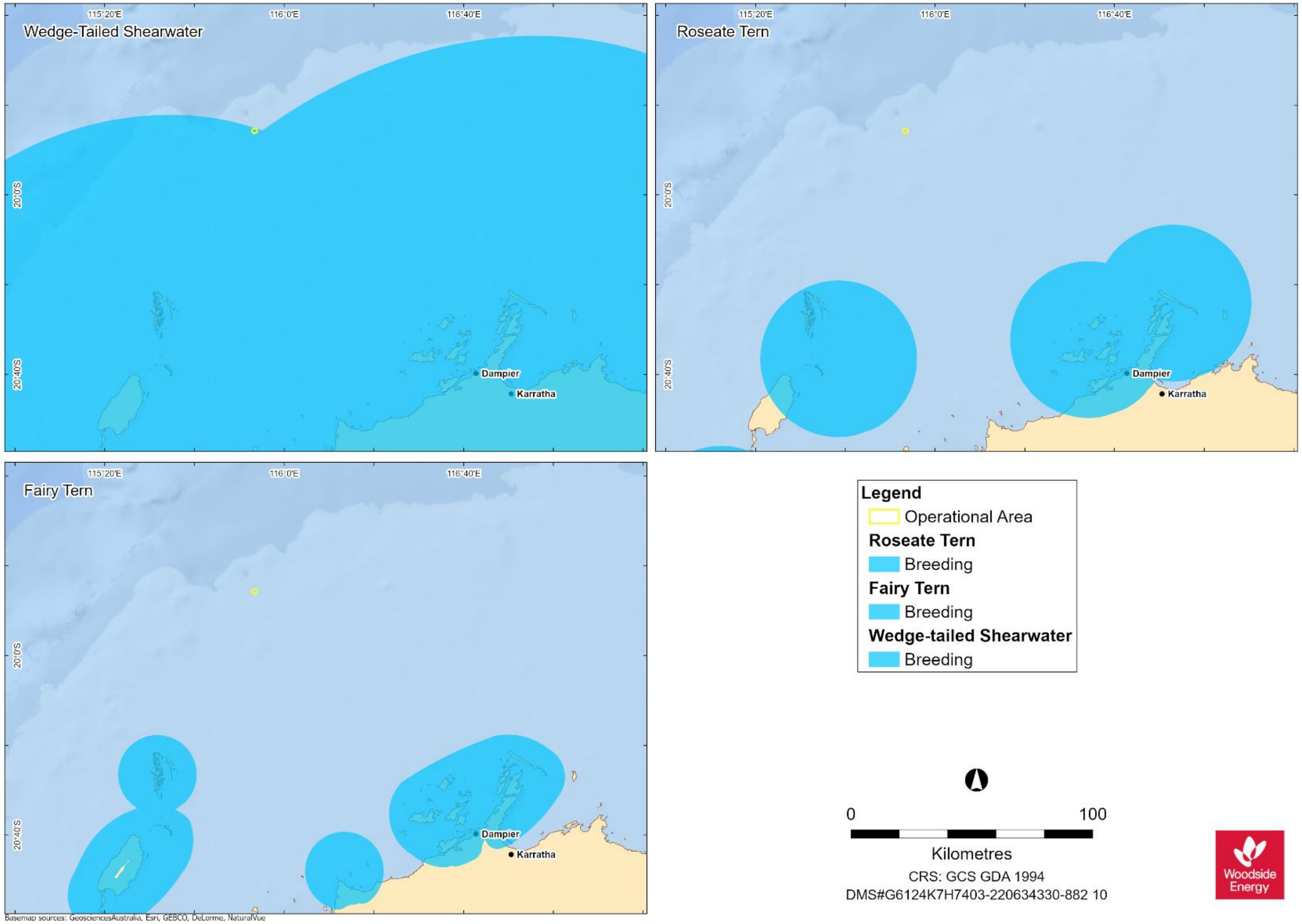

Figure 4-9: Seabird BIAs

4.5.2.5 Seasonal Sensitivities for Protected Species

Seasonal sensitivities for protected migratory species identified as potentially occurring within the Operational Area are identified in **Table 4-14**.

Table 4-14: Key seasonal sensitivities for protected migratory species identified as occurring within the Operational Area.

Species	January	February	March	April	May	June	July	August	September	October	November	December
Fish, Sharks and Rays												
Whale shark – northern and southern migration (NWMR) (TSSC, 2015d)												
Whale shark – foraging/ aggregation (Ningaloo Coast) (TSSC, 2015d)												
Great white shark – northern migration (to North West Cape) (DSEWPaC, 2013a)												
Mammals												
Fin whale												
Humpback whale – northern migration (Double et al. 2010; TSSC, 2015a)												
Humpback whale – southern migration (Double et al. 2010; TSSC, 2015a)												
Sei whale – migration (DEH, 2005)												
East Indian Ocean (EIO) pygmy blue whale – northern migration (Double et al., 2012; 2014)												
East Indian Ocean (EIO) pygmy blue whale – southern												

Species	January	February	March	April	May	June	July	August	September	October	November	December
migration (Double et al., 2012; 2014)												
Marine Reptiles												
Flatback turtle Pilbara Coast genetic stock – nesting (Commonwealth of Australia, 2017)												
Flatback turtle Pilbara Coast genetic stock – hatching (Commonwealth of Australia, 2017)												
Green turtle NWS genetic stock – nesting (Commonwealth of Australia, 2017)												
Green turtle NWS genetic stock – hatching (Commonwealth of Australia, 2017)												
Hawksbill turtle Western Australia genetic stock – nesting (Commonwealth of Australia, 2017)												
Hawksbill turtle Western Australia genetic stock – hatching (Commonwealth of Australia, 2017)												
Loggerhead turtle Western Australia genetic stock – nesting (Commonwealth of Australia, 2017)												
Loggerhead turtle Western Australia genetic stock – hatching												

Species	January	February	March	April	May	June	July	August	September	October	November	December
(Commonwealth of Australia, 2017)												
Seabirds and shorebirds												
Red knot – non-breeding season (NWMR) (TSSC, 2016a)												
Eastern Curlew – non-breeding (NWMR) (DoE, 2015d)												
Wedge-tailed shearwater – various breeding sites (DSEWPaC 2012c, Environment Australia 2002)												
	Species may be present in the Operational Area											
	Peak period. Presence of animals is reliable and predictable each year											

References for species seasonal sensitivities:

Environment Australia, 2002

CALM, 2005; Environment Australia, 2002

Commonwealth of Australia, 2017; Chevron, 2015; CALM, 2005; DSEWPaC, 2012a

Commonwealth of Australia, 2017; Chevron, 2015

DSEWPaC, 2012a; McCauley and Jenner, 2010; McCauley, 2011

DSEWPaC, 2012a; McCauley and Jenner, 2010

CALM, 2005; Environment Australia, 2002; Jenner et al., 2001a; McCauley and Jenner, 2001

McCauley and Jenner, 2001

DSEWPaC, 2012b; Environment Australia, 2002

*(*Periods of sensitivity include whale shark foraging off Ningaloo Coast and foraging northward from the Ningaloo Marine Park along the 200 m isobath)*

4.5.3 Key Ecological Features (KEFs)

KEFs within the Operational Area and EMBA are identified in **Table 4-15**. **Figure 4-10** shows the spatial overlap with KEFs and the Operational Area.

Table 4-15: KEFs within the Operational Area and EMBA.

Key Ecological Feature	Distance from Operational Area to KEF (km)
Ancient Coastline at 125 m Depth Contour	Overlaps
Continental Slope Demersal Fish Communities	44 km west
Exmouth Plateau	157 km west
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	227 km south-west
Commonwealth Waters adjacent to Ningaloo Reef	273 km south-west

Key Ecological Feature	Distance from Operational Area to KEF (km)
Glomar Shoal	76 km north-east

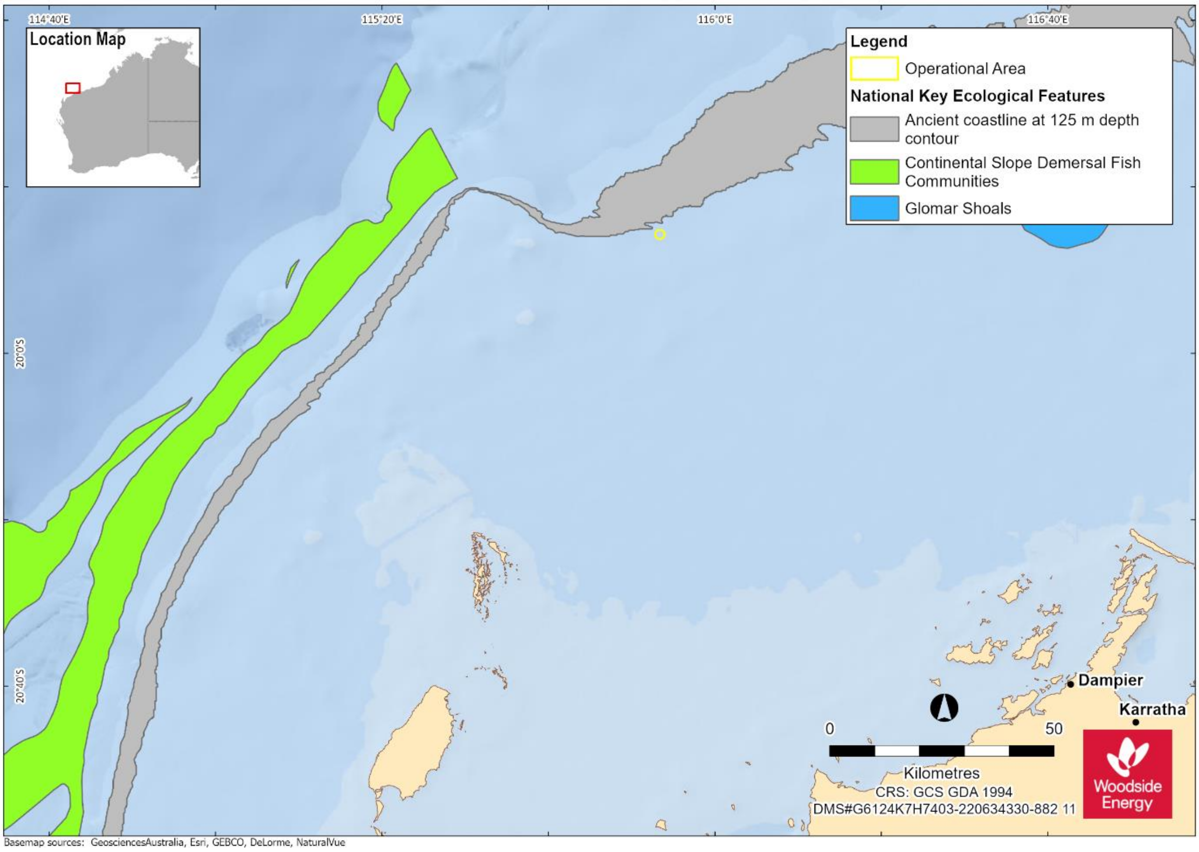

Figure 4-10: KEFs in relation to the Operational Area

4.5.4 Protected Places

No protected places overlap the Operational Area. Protected places within the EMBA are identified in **Table 4-16** and presented in **Figure 4-11**.

Table 4-16: Established protected places and other sensitive areas overlapping the EMBA

	Distance from Operational Area to protected place or sensitive area (km)	IUCN category* or relevant park zone overlapping the Operational Area and/or EMBA
Australian Marine Parks (AMPs)		
NWMR		
Argo-Rowley Terrace AMP	257 km north-east	Multiple Use Zone (IUCN VI)
Montebello AMP	33 km south-west	Multiple Use Zone (IUCN VI)
Gascoyne AMP	246 km south-west	Multiple Use Zone (IUCN VI)

	Distance from Operational Area to protected place or sensitive area (km)	IUCN category* or relevant park zone overlapping the Operational Area and/or EMBA
Gascoyne AMP	392 km south-west	Habitat Protection Zone (IUCN IV)
Ningaloo AMP	273 km south-west	Recreational Use Zone (IUCN IV)
	402 km south-west	National Park Zone (IUCN II)
State Marine Parks and Nature Reserves		
Marine Parks		
Barrow Island Marine Park	121 km south-west	Sanctuary Zone - Ia
Montebello Islands Marine Park	70 km south-west	Sanctuary Zone – Ia Recreational Use Zone – IV, Special Purpose Zone – VI
Ningaloo Marine Park	273 km south-west	Sanctuary Zone - IA, Recreational Use Zone - IV, Special Purpose Zone - VI
5(1)(h)		
Jurabi Coastal Park 5(1)(h) Reserve	292 km south-west	National Park Zone - II
Marine Management Areas		
Barrow Island Marine Management Area	89 km south-west	Special Purpose Zone - VI
Muiron Islands Marine Management Area	255 km south-west	Special Purpose Zone - VI, Sanctuary Zone – IA
Fish Habitat Protection Areas		
None identified	N/A	N/A
Nature Reserves		
Muiron Islands Nature Reserve	258 km south-west	National Park Zone - II
Thevenard Island Nature Reserve	206 km south-west	National Park Zone - II
Bessieres Island Nature Reserve	227 km south-west	National Park Zone - II
National Parks		
Cape Range National Park	313 km south-west	National Park Zone - II

**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.

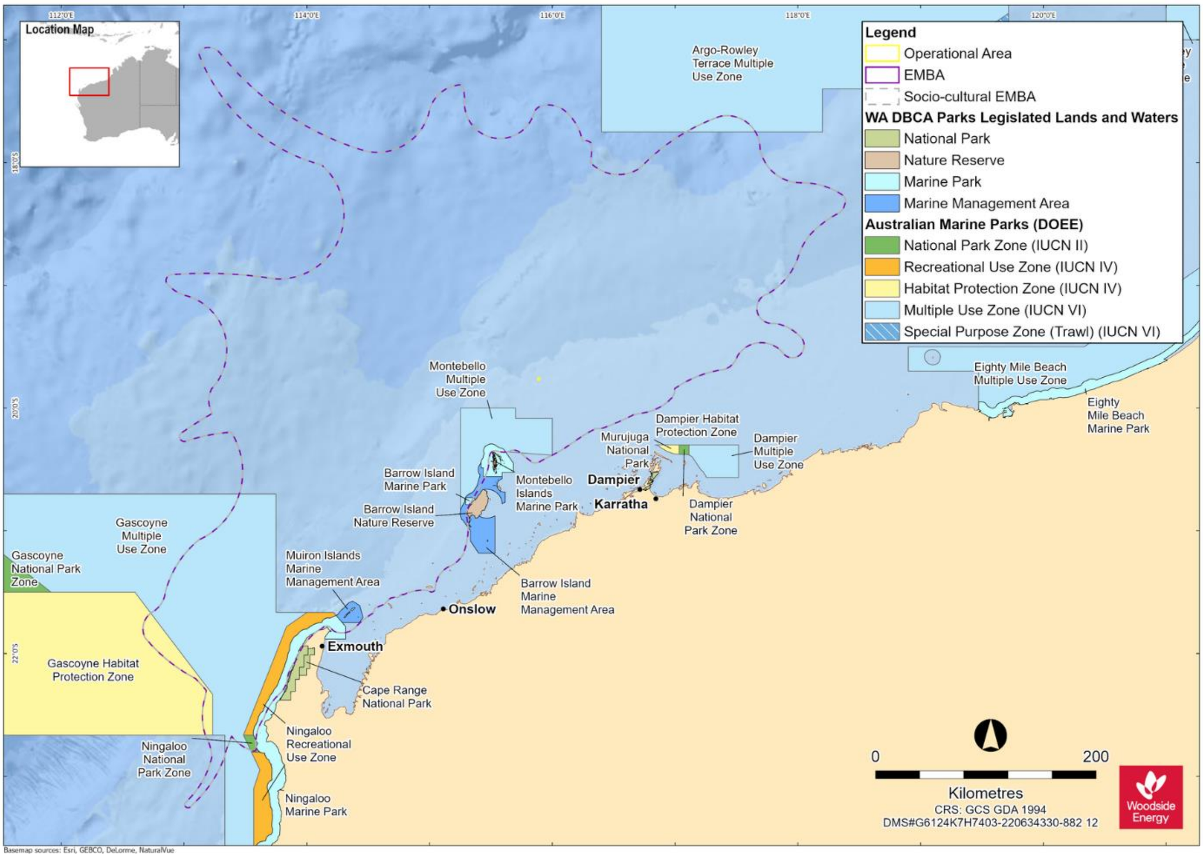

Figure 4-11: Protected Areas overlapping the EMBA

4.6 Socio-Economic Environment

4.6.1 Cultural Heritage

4.6.1.1 Indigenous Sites of Significance

Indigenous Australian people have occupied the Australian continent for at least 65,000 years and in many places maintain a strong continuing connection with Country. Woodside acknowledges this unique connection between Aboriginal peoples and the land and sea in which the company operates. Woodside also understands that while marine resources used by Indigenous peoples are generally limited to coastal waters for activities such as fishing, hunting and maintenance of culture and heritage, many Aboriginal groups have a direct cultural interest in decisions affecting the management of deeper offshore waters, particularly through intangible heritage values or culturally significant migratory fauna.

Within the EMBA, the Pilbara and adjacent coastlines have a long history of occupancy by Aboriginal communities. The longstanding relationship between Aboriginal people and the land and sea is prevalent in Indigenous culture today and Indigenous heritage places including archaeological sites which are protected under the *Aboriginal Heritage Act 1972* (WA) or EPBC Act.

The Department of Aboriginal Affairs (DAA) Heritage Inquiry System was searched for the EMBA, which indicated a number of registered Indigenous heritage places (see site details in **APPENDIX G**). The exact location, access and traditional practices for a number of these sites are not disclosed and if required, such as in the event of a major oil spill, would involve prioritising further consultation with key contacts within DAA and relevant local Aboriginal communities.

4.6.1.2 European Sites of Significance

There are no known sites of European cultural heritage significance within the Operational Area. The Master Existing Environment describes cultural heritage sites within the EMBA.

4.6.1.3 Underwater Heritage

A search of the Australian National Shipwreck Database, which records all known Maritime Cultural Heritage (shipwrecks, aircraft, relics and other underwater cultural heritage) in Australian waters indicated that there are no sites within the Operational Area. However, a number of sites were identified within the EMBA; the closest are the *McDermot Derrick Barge No 20* and *McCormack* located approximately 43 km south-south-west of the Operational Area at its closest point.

4.6.1.4 World, National and Commonwealth Heritage Listed Places

No listed heritage places overlap the Operational Area. World, National and Commonwealth heritage places within the EMBA are identified in **Table 4-17**.

Table 4-17: World, National and Commonwealth Heritage Listed Places within the EMBA

Listed Place	Distance from Operational Area to Listed Place (km)
World Heritage Properties (WHP)	
Ningaloo Coast World Heritage Property	Located 254 km south-west of the Operational Area.
National Heritage Places (NHP)	
Ningaloo Coast National Heritage Place	Located 254 km south-west of the Operational Area.
Commonwealth Heritage Places (CHP)	
Ningaloo Marine Area – Commonwealth Waters	Located 275 km south-west of the Operational Area.

4.6.2 Commercial Fisheries

A number of Commonwealth and State fishery management areas are located within the Operational Area and EMBA. FishCube data was requested to analyse the potential for interaction of fisheries with the Operational Area, which was used to determine consultation with State Fisheries who may be impacted by proposed petroleum activities (Department of Primary Industries and Regional Development [DPIRD], 2021).

Table **4-18** provides an assessment of the potential interaction and consultation described in **Section 5**. **Figure 4-12** shows fisheries identified as having a potential interaction with the Petroleum Activities Program.

Table 4-18: Commonwealth and State commercial fisheries overlapping the Operational Area and EMBA

Fishery	Overlap with Operational Area	Overlap with EMBA	Potential for interaction within Operational Area	
Commonwealth Managed Fisheries				
Southern Bluefin Tuna Fishery	✓	✓	×	While there is an overlap with the fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery within the Operational Area given the current distribution of fishing effort is focused in the Great Australian Bight (Patterson et al. 2021).
Western Skipjack Tuna Fishery	✓	✓	×	While there is an overlap with the fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery within the Operational Area given there have been no active vessels in this fishery since 2009 (Patterson et al. 2021).
Western Tuna and Billfish Fishery	✓	✓	×	While there is an overlap with the fishery management area and the Operational Area, Woodside considers there to be no potential for interaction with this fishery within the Operational Area given the current distribution of fishing effort is concentrated south of Carnarvon (Patterson et al., 2021).
Western Deepwater Trawl Fishery	×	✓	×	The Western Deepwater Trawl Fishery management area does not overlap the Operational Area. Current distribution of fishing effort occurs south of the Operational Area on the western side of the 200 m isobath between Shark Bay and Ningaloo (Patterson et al. 2021). Therefore there is no potential for interaction with this fishery.
State Managed Fisheries				
Pilbara Line Fishery *Part of the Pilbara Demersal Scalefish Fishery (includes trawl, trap and line fisheries)*	✓	✓	✓	The Operational Area is located within the 60 nm CAES block (ref. 19150). Fishing effort of up to five vessels has been reported in the 60 nm CAES block overlapping the Operational Area in the last 10 years (2011 to 2020, inclusive). Therefore there is potential for interaction with this fishery within the Operational Area (DPIRD, 2021).
Mackerel Managed Fishery (Area 2)	✓	✓	✓	The fishery management area overlaps the Operational Area. Fishing effort of up to five vessels has been reported in the 60 nm CAES block (ref. 19150) overlapping the Operational Area, however no effort has been reported in the 10 nm CAES block

Fishery	Overlap with Operational Area	Overlap with EMBA	Potential for interaction within Operational Area	
				(ref. 194155) overlapping the Operational Area in the last 10 years (2011 – 202, inclusive) (DPIRD, 2021). Given effort has been reported within the 60 nm CAES block Woodside considers there to be a potential for interaction with this fishery within the Operational Area.
Pilbara Trap Managed Fishery *Part of the Pilbara Demersal Scalefish Fishery (includes trawl, trap and line fisheries)*	✓	✓	✓	The Operational area overlaps the fishery management area. Fishing effort of up to three vessels has been reported in the 60 nm CAES block (ref. 19150) overlapping the Operational Area in the last ten years (2011 to 2020, inclusive (DPIRD, 2021). Therefore, it is considered there is potential for interaction with this fishery.
Specimen Shell Fishery	✓	✓	×	The Operational Area is overlapped by this fisher management area. The fishery typically uses hand collection methods to collect specimen shells in water depths of less than 30 m. ROV collection methods could enable fishing in water depths up to 300 m, however this method is no longer active. No fishing effort was recorded in the CAES blocks overlapping the Operational Area in the last ten years (DPIRD, 2021), therefore no interaction with the fishery is anticipated.
WA North Coast Shark Managed Fishery	✓	✓	×	The Operational Area overlaps with the WA North Coast Shark Managed fishery management area, however fishing activity has not been reported in the fishery since 2008-2009 (Newman et al., 2021). Therefore, no interaction with this fishery is anticipated.
West Coast Deep Sea Crustacean Managed Fishery	✓	✓	×	The Operational Area overlaps an area of closed waters of the West Coast Deep Sea Crustacean Managed Fishery management. Woodside considers there to be no potential for interaction with this fishery within the Operational Area given that current effort is concentrated between Carnarvon and Fremantle (Kangas et al. 2021, DPIRD, 2021). Additionally, no effort has been reported within the Catch and Effort System (CAES) blocks overlapping the Operational Are in the last ten years (DPIRD, 2021).
Marine Aquarium Managed Fishery	✓	✓	×	This fishery generally collects fish for display in water depths less than 30 m. No fishing effort has been reported in the last 10 years in the CAES blocks overlapping the Operational Area (DPIRD, 2021) Therefore, no effort occurs within the

Fishery	Overlap with Operational Area	Overlap with EMBA	Potential for interaction within Operational Area	
				Operational Area and Woodside considers there to be no potential for interaction with this. fishery.
South West Coast Salmon Managed Fishery	✓	✓	✗	No fishing occurs north of the Perth Metropolitan Area. Therefore, no effort occurs within the Operational Area and Woodside considers there to be no potential for interaction with this fishery.
Pilbara Crab Managed Fishery	✓	✓	✗	All waters of the fishery north of 23° 34’ S and west of 115° 06.50’ E (inclusive of the Operational Area) have been closed to fishing since the formation of the fishery. Fishing activity within the Operational Area is currently not permitted and accordingly, Woodside considers there to be no potential for interaction with this fishery.
Western Australian Abalone Fishery (Area 4)	✓	✓	✗	Whilst the Operational Area is overlapped by this fishery management area, the abalone fishery is typically only active to depths of up to 40 m. No fishing effort for the West Australian Abalone Fishery has occurred north of Moore River since 2011-2012 (Strain et al., 2019). As the depths of the Operational Area are greater than 40 m and as there was no fishing effort reported within the CAES blocks overlapping the Operational Area in the last ten years, no interaction with this fishery is anticipated (DPIRD, 2021).
Onslow Prawn Managed Fishery (Area 3)	✓	✓	✗	The fishery management area overlaps the Operational Area however no fishing effort has been recorded within the CAES blocks overlapping the Operational Area in the last ten years and fishing primarily occurs in water depths of 15 m or less for this fishery (DPIRD, 2021). No interaction with this fishery is therefore anticipated.
Pilbara Fish Trawl (Interim Managed Fishery *Part of the Pilbara Demersal Scalefish Fishery (includes trawl, trap and line fisheries)*	✓	✓	✗	The Operational Area Overlaps Area 6, which is closed to trawling (i.e. closed to this fishery). No fishing effort for this fishery has been recorded within the CAES blocks overlapping the Operational Area in the last 10 years (DPIRD, 2021). Therefore, it is considered that there is no potential for interaction with this fishery.
Pearl Oyster Managed Fishery (Zone 1)	✓	✓	✗	This fishery management area overlaps the Operational Area however fishing effort is limited to 35 m depth.

Fishery	Overlap with Operational Area	Overlap with EMBA	Potential for interaction within Operational Area	
				No fishing effort has been recorded within the CAES blocks overlapping the Operational Area in the last ten years (DPIRD, 2021). No interaction with this fishery is therefore anticipated.
West Australian Sea Cucumber Fishery	×	✓	×	There is no overlap with the Beche-de-mer Fishery management area and the Operational Area. The target species typically inhabit nearshore waters, therefore there is no potential for interaction with this fishery.
Exmouth Prawn Managed Fishery	×	✓	×	The fishery management area does not overlap the Operational Area therefore there is no potential for interaction with this fishery within the Operational Area.
Nickol Bay Prawn Managed Fishery	×	✓	×	The fishery management area does not overlap the Operational Area therefore there is no potential for interaction with this fishery within the Operational Area.
West Coast Rock Lobster Managed Fishery	×	✓	×	The fishery management area does not overlap the Operational Area therefore there is no potential for interaction with this fishery within the Operational Area.
Exmouth Gulf Prawn Managed Fishery	×	✓	×	The fishery management area does not overlap the Operational Area therefore there is no potential for interaction with this fishery within the Operational Area.
Gascoyne Demersal Scalefish Managed Fishery	×	✓	×	The fishery management area does not overlap the Operational Area therefore there is no potential for interaction with this fishery within the Operational Area.
Hermit Crab Fishery of Western Australia	×	✓	×	The fishery management area does not overlap the Operational Area therefore there is no potential for interaction with this fishery within the Operational Area.

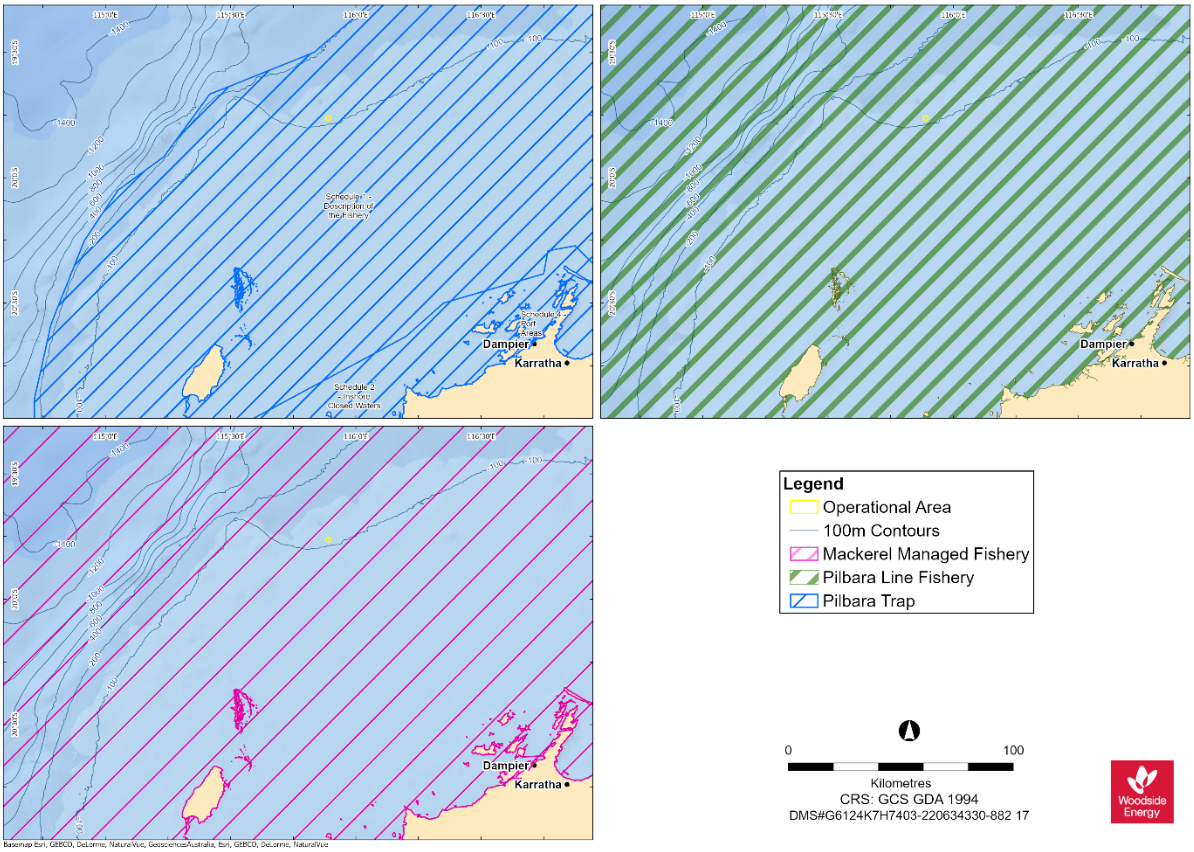

Figure 4-12: Commercial fisheries overlapping the Operational Area with a potential for interaction with the Petroleum Activities Program

4.6.3 Traditional Fisheries

There are no traditional, or customary, fisheries within the Operational Area, as these are typically restricted to shallow coastal waters and/or areas with structures such as reef. However, it is recognised that Barrow Island, Montebello Islands, Exmouth, Ningaloo Reef and the adjacent foreshores, all within the wider EMBA, have a known history of fishing when areas were occupied (as from historical records) (CALM 2005, DEC 2007). Areas that are covered by registered native title claims are likely to practice Aboriginal fishing techniques at various sections of the Western Australia coastline.

4.6.4 Tourism and Recreation

Current FishCube data (2011 – 2020) indicates that no tour operators use the waters within or surrounding the Operational Area (DPIRD, 2021). The Operational Area is considered too far offshore for recreational fishing or tourism activities to occur. It is acknowledged that there are growing tourism and recreational sectors in Western Australia. These sectors have expanded in area over the last couple of decades. Potential for growth and further expansion in tourism and recreational activities in the Pilbara and Gascoyne regions is recognised, particularly with the development of regional centres and a workforce associated with the resources sector (Gascoyne Development Commission, 2012).

Within the EMBA, tourism is one of the major industries of the Gascoyne region and contributes significantly to the local economy in terms of both income and employment. The main marine nature-based tourist activities are concentrated around and within the Ningaloo Marine Park and North West Cape area. Activities include recreational fishing, snorkelling and scuba diving, whale shark encounters (April to August) and manta rays (September to November), whale watching (July to October) and turtle watching (all year round) (Shire of Exmouth). Recreational use of the Ningaloo Marine Park varies in intensity throughout the year, depending on school holidays and seasonal peaks of marine fauna being observed. Coral Bay is documented as one of the most heavily used areas (MPRA, 2005).

The Montebello Islands (76 km from the Operational Area) are the next closest location for tourism, with some charter boat operators taking visitors to these remote islands.

Recreational fishing in the North West Shelf Province is mainly concentrated around the coastal waters and islands (including Dampier Archipelago, Ningaloo Marine Park, North West Cape area, the Montebello Islands, and other islands and reefs in the region) (DoF, 2011). It has grown exponentially with the expanding regional centres and increasing residential and fly in/fly out work force, particularly in the Pilbara region. Occasional recreational fishing occurs at Rankin Bank (located about 31 km west of the Operational Area, respectively).

4.6.5 Commercial Shipping

The Australian Maritime Safety Authority (AMSA) has introduced a network of shipping 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 Operational Area; however, the nearest fairway is directly adjacent to the Operational Area approximately 0.18 km west of Operational Area (**Figure 4-13**). Vessel tracking data suggest shipping is concentrated to the south-east of the Operational Area, which is associated with vessels transiting between ports.

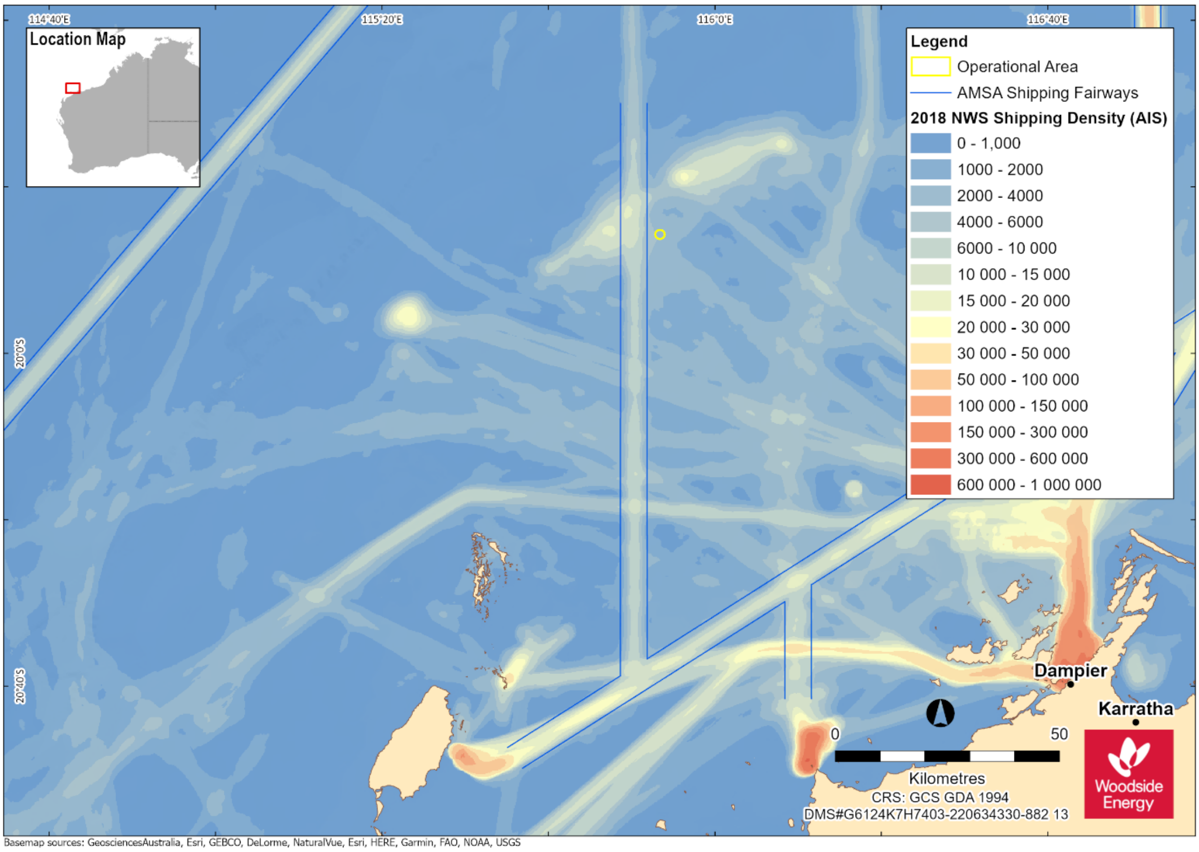

Figure 4-13: Vessel density in relation to the Operational Area, derived from AMSA satellite tracking system data (vessels include cargo, LNG tanker, passenger vessels, support vessels, and others/unnamed vessels)

4.6.6 Oil and Gas

The Operational Area is situated within an area of established oil and gas operations, with additional infrastructure in the broader North West Shelf region. The Operational Area for the activity overlaps with the GWF-1 pipeline, TPA01, TPA02, Tidepole East-1 and TPA03a wells. **Table 4-19** details other oil and gas facilities located within 50 km of the Operational Area (**Figure 4-14).**

Table 4-19: Other Oil and Gas Facilities located within 50 km of the Operational Area

Facility Name and Operator	Distance from Operational Area to Listed Place (km)
North Rankin Complex (Woodside)	31 km north-east
Goodwyn Platform	12 km north-east

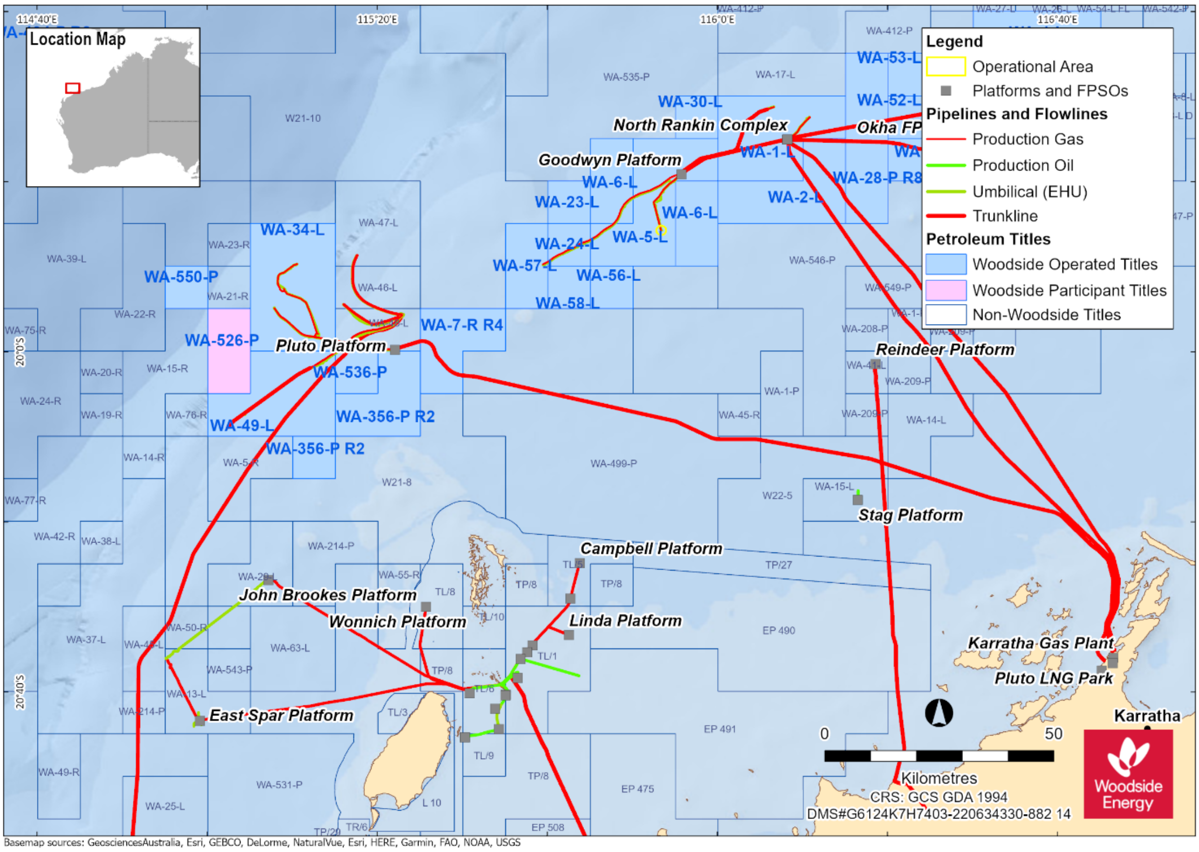

Figure 4-14: Oil and gas Infrastructure within the Operational Area and region

4.6.7 Defence

There are no designated defence practice areas overlapping the Operational Area. Designated defence practice areas occur within the offshore marine waters off Ningaloo and the North West Cape in the broader EMBA (**Figure 4-15**). The closest site where unexploded ordinance is known to occur is 8 km east of Trimouille Island in depths of about 40 m, located approximately 70 km south-east of the Operational Area. Defence areas in relation to the Operational Area are presented in **Figure 4-15**.

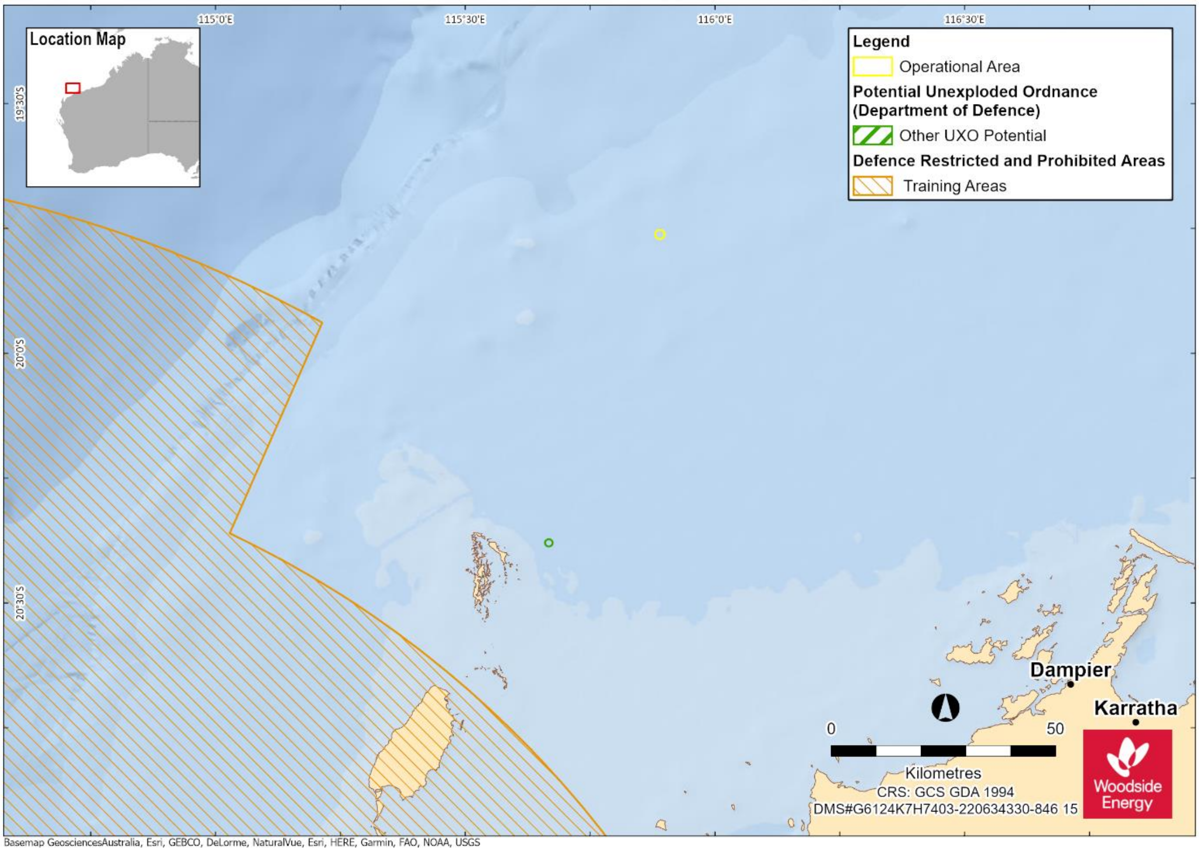

Figure 4-15: Defence areas relative to the Operational Area

5 STAKEHOLDER CONSULTATION

5.1 Summary

Woodside consults relevant persons in the course of preparing EPs to obtain appropriate feedback from relevant persons to inform planning for proposed petroleum activities and build upon Woodside's ongoing stakeholder consultation for its offshore petroleum activities in the region.

5.2 Stakeholder Consultation Objectives

In support of this EP, Woodside has sought to:

- Ensure all relevant persons are identified and engaged in a timely and effective manner.
- Develop and make available communications material for a reasonable period to relevant persons that is sufficient 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.
- Incorporate relevant person feedback into the management of the proposed activity where relevant and practicable.
- Provide feedback to relevant persons on Woodside's assessment of their feedback and keep a record of all engagements.
- Provide opportunities to provide feedback during the life of this EP.

5.3 Stakeholder Expectations for Consultation

Relevant person consultation for this activity has also been guided by relevant person expectations for consultation on planned activities. This guidance includes:

NOPSEMA:

- *GL1721 - Environment plan decision making - June 2021*
- *GN1847 - Responding to public comment on environment plans - September 2020*
- *GN1344 - Environment plan content requirements - September 2020*
- *GN1488 - Oil pollution risk management - February 2021*
- *GN1785 – Petroleum activities and Australian Marine Parks – June 2020*
- *GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – July 2020*
- *NOPSEMA Bulletin #2 – Clarifying statutory requirements and good practice consultation – November 2019*

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*

5.4 Identification of Relevant Persons

Woodside has followed the requirements of subregulation 11A (1) of the Environment Regulations to identify relevant persons in the course of preparing this EP, these being:

- Each Department or agency of the Commonwealth Government to which the activities to be carried out under the Environment Plan, or the revision of the Plan, may be relevant.
- Each Department or agency of a State or the Northern Territory Government to which the activities to be carried out under the Environment Plan, or the revision of the 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 Plan.
- Any other person or organisation that the Titleholder considers relevant.

The identification of a person or organisation whose functions, interests or activities may be affected by the activity is informed by a number of factors, including but not limited to:

- Consideration of the nature and scale of the activity
- Understanding the potential for interaction based on the timing and location of the activity
- A review of the most recent fishery data such as DPIRD FishCube
- Consideration of previous Woodside consultation in the activity area
- Advice from representative industry associations
- Input from other stakeholders as to other potentially relevant persons
- Consideration of stakeholders who can materially contribute to improving the environment plan

Woodside considers factors including the above criteria as part of a case-by-case approach for each EP to identify relevant persons.

Self-identification:

- Woodside acknowledges that, in the course of preparing the EP, additional stakeholders may contact Woodside self-identifying themselves as a relevant person.
- Woodside will assess the self-identified person based on factors including the criteria above to determine if Woodside considers the person to be a relevant person for the purposes of consultation on this EP. Those determined to be relevant persons for the

purposes of consultation will be contacted, provided with information relevant to their interests, and invited to provide feedback about the proposed activity.

- The result of Woodside's assessment of stakeholder relevance and stakeholders that self-identify as relevant during the development of the EP are outlined in **Table 5-1**.

5.5 Consultation Material and Timing

Woodside produces a Stakeholder Consultation Information Sheet for each EP. This is provided to relevant persons and is also available on the Woodside website for interested parties to review and provide feedback. The information provided generally includes a summary of the activity description, timing and duration, location map, relevant exclusion zones, mitigation and/or management control measures and contact details to provide feedback to Woodside. Additional targeted consultation material may be developed such as specific information sheets or presentation material, depending on the nature and scale of the activity. This may include, for example, providing commercial fishing licence holders and representative bodies with additional information relevant to their fishery.

Woodside consultation arrangements typically provide relevant persons up to 30 days (unless otherwise agreed) to review and respond to proposed activities where relevant persons are potentially affected. Woodside considers this consultation period a reasonable timeframe. Woodside will continue to accept feedback from stakeholders during the assessment of this EP and throughout the duration of the accepted EP.

5.6 Providing Feedback

Feedback can be provided through the Woodside feedback email or via the Woodside feedback toll free phone line as outlined in the Stakeholder Consultation Information Sheet and the Woodside website. Depending on the nature and scale of the activity and the specific feedback provided, where appropriate, consultation with relevant persons may also be supported by phone calls or meetings.

5.7 Assessment of Merit of Objections or Claims

Feedback is reviewed and objections and claims about an adverse impact of an activity to which the EP relates will be assessed for merit for instance, through review of data and literature and for relevancy to the nature and scale of the activity outlined in the EP. Where the objection or claim is substantiated, it will be assessed in the EP and additional controls may be applied where reasonable or practical to manage impacts and risks to ALARP and acceptable levels.

Table 5-2 includes Woodside's response to relevant persons' feedback, consideration of the merits of objections or claims, and, where appropriate, changes incorporated in the EP as a result of the feedback.

Table 5-1: Assessment of relevant stakeholders for the proposed activity

Stakeholder	Relevant to activity	Reasoning
Commonwealth Government department or agency		
Australian Border Force (ABF)	Yes	Responsible for coordinating maritime security.
Australian Fisheries Management Authority (AFMA)	No	Responsible for managing Commonwealth fisheries. No Commonwealth fisheries are active in the Operational Area. Woodside has provided information to AFMA, consistent with information provided to other stakeholders with an interest in Commonwealth fisheries.
Australian Hydrographic Office (AHO)	Yes	Responsible for maritime safety and Notices to Mariners.
Australian Maritime Safety Authority (AMSA) – Maritime Safety	Yes	Statutory agency for vessel safety and navigation in Commonwealth waters.
Australian Maritime Safety Authority (AMSA) – Marine Pollution	Yes	Legislated responsibility for oil pollution response in Commonwealth waters.
Department of Climate Change, Energy, the Environment and Water (DCCEEW) – Fisheries *(Formerly the Department of Agriculture, Water and the Environment (DAWE))*	No	Responsible for implementing Commonwealth policies and programs to support climate change, sustainable energy use, water resources, the environment and our heritage. No Commonwealth fisheries are active in the Operational Area. Woodside has provided information to DCCEEW, consistent with information provided to other stakeholders with an interest in Commonwealth fisheries.
DCCEEW – Biosecurity (marine pests, vessels, aircraft and personnel)	Yes	DCCEEW administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity has the potential to transfer marine pests. DCCEEW 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. The Department 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. The proposed activity has the potential impact to DCCEEW's interests in the prevention of introduced marine species.
Department of Defence (DoD)	No	Responsible for defending Australia and its national interests. The proposed activity is not within a defence area.
Department of Industry, Science and Resources (DISR) *(Formerly Department of Industry, Science, Energy and Resources (DISER))*	Yes	Department of relevant Commonwealth Minister and is required to be consulted under the Regulations.

Stakeholder	Relevant to activity	Reasoning
Director of National Parks (DNP)	Yes	Responsible for managing AMPs and therefore 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).
WA Government department or agency		
Department of Biodiversity, Conservation and Attractions (DBCA)	No	Responsible for managing WA parks, forests and reserves. Planned activities do not impact DBCA's functions, interests, or activities. Woodside has chosen to provide DBCA with information.
Department of Mines, Industry Regulation and Safety (DMIRS)	Yes	Department of relevant State Minister and is required to be consulted under the Regulations.
Department of Primary Industries and Regional Development (DPIRD)	Yes	Responsible for managing State fisheries. DPIRD date indicates active fishing in the area by the Mackerel Managd Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery.
Department of Transport (DoT)	Yes	Legislated responsibility for oil pollution response in State waters.
Commonwealth fisheries*		
Southern Bluefin Tuna Fishery	No	Although the fishery overlaps the Operational Area, it has not been active within the last five years. Woodside does not consider that the activity presents a risk to licence holders 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). In addition, future interactions are not expected given the species' pelagic distribution. Woodside has provided information to the fishery's representative organisation – the Australian Southern Bluefin Tuna Industry Association and Commonwealth Fisheries Association – 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.
Western Tuna and Billfish Fishery	No	Although the fishery overlaps the Operational Area, it has not been active within the last five years. Woodside does not consider that the activity presents a risk to licence holders, given fishing methods for species fished by licence holders and the species' pelagic distribution. Woodside has provided information to the fishery's representative organisation – Tuna Australia – on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the

Stakeholder	Relevant to activity	Reasoning
		proposed area to be consulted, which can be through the relevant fishing industry associations.
Western Skipjack Fishery	No	Although the fishery overlaps the Operational Area, it has not been active within the last five years. Woodside does not consider that the activity presents a risk to licence holders, given fishing methods for species fished by licence holders and the species' pelagic distribution. Woodside has provided information to the fishery's representative organisation – Commonwealth Fisheries Association and Australian Southern Bluefin Tuna Industry Association – 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.
State fisheries*		
Mackerel Managed Fishery - Pilbara (Area 2)	Yes	The fishery overlaps the Operational Area and DPIRD data indicates active fishing.
South West Coast Salmon Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. 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 (fishers are active south of Perth and from the beach (previous WAFIC advice).
West Coast Deep Sea Crustacean Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. In recent years fishing has only been undertaken along the continental shelf edge and in waters south of Exmouth (West Coast Deep Sea Crustacean Managed Fishery; DPIRD, 2005).
West Australian Sea Cucumber Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. Woodside does not consider the activity will present a risk to licence holders given fishing methods, location, and water depth for species fished by licence holders. It is a dive and wade fishery with activities generally restricted to waters less than 30 m deep (previous WAFIC advice).
Pearl Oyster Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. 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 et al. 2002).
Pilbara Crab Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. Further, fishing activity within the Operational Area is currently not permitted. 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 (target species (blue swimmer crab) are only found in waters up to 50 m deep).

Stakeholder	Relevant to activity	Reasoning
Marine Aquarium Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. Woodside does not consider that hat the activity will present a risk to licence holders given fishing methods (dive and wade fishery, with activities generally restricted to waters less than 30 m deep (previous WAFIC advice).
Specimen Shell Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. Woodside does not consider the activity will present a risk to licence holders given fishing methods, location, and water depth for species fished by licence holders. It is a dive and wade fishery with activities generally restricted to waters less than 30 m deep (previous WAFIC advice).
Abalone Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. This is a dive and wade fishery with activities generally restricted to waters less than 40 m deep (DOF, 2011).
Onslow Prawn Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. Woodside does not consider the activity will present a risk to licence holders given depth and prawn trawling takes place in water depths of approximately 30 metres and less (previous licence holder feedback).
WA North Coast Shark Managed Fishery	No	Although the fishery overlaps the Operational Area it has not been active since 2008/09 (DPIRD). Interaction with the fishery is not expected given fishing methods and the species' pelagic distribution.
Pilbara Demersal Scalefish Fishery • Pilbara Trawl Fishery	No	Although the fishery overlaps the Operational Area it has not been active within the last five years. Further, the Operational Area overlaps Area 6, which is closed to trawling.
• Pilbara Trap Fishery	Yes	The fishery overlaps the Operational Area and DPIRD data indicate active fishing.
• Pilbara Line Fishery	Yes	The fishery overlaps the Operational Area and DPIRD data indicate active fishing.
Industry		
BP Developments Australia	Yes	Adjacent Titleholder
Industry representative organisations		
Australian Petroleum Production and Exploration Association (APPEA)	Yes	Represents the interests of oil and gas explorers and producers in Australia.
Commonwealth Fisheries Association (CFA)	No	Represents the interests of commercial fishers with licences in Commonwealth waters. No Commonwealth Fisheries are active in the Operational Area.

Stakeholder	Relevant to activity	Reasoning
		Woodside has provided information to the CFA 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.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	No	Represents the interests of the Southern Bluefin Tuna Fishery and Western Skipjack Fishery. The Fishery isn't active in the Operational Area. Woodside has provided information to ASBTIA 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.
Tuna Australia	No	Represents the interests of the Western Tuna and Billfish Fishery. The Fishery isn't active in the Operational Area. Woodside has provided information to Tuna Australia 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.
Pearl Producers Association (PPA)	No	PPA has requested to be informed of Woodside's planned activities.
Recfishwest	No	Represents the interests of recreational fishers in WA. Activities do not have the potential to impact recreational fishers.
Marine Tourism WA	No	Represents the interests of recreational fishers in WA. Activities do not have the potential to impact recreational fishers.
WA Game Fishing Association	No	Represents the interests of charter owners and operators in WA. Activities do not have the potential to impact gamefishers.
Western Australian Fishing Industry Council (WAFIC)	Yes	Represents the interests of commercial fishers with licences in State Waters. DPIRD data indicates active fishing in the area by the Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery.

** Fisheries have been identified as being relevant on the basis of fishing licence overlap with the proposed Operational Area, as well as consideration of fishing effort data, fishing methods, water depth, and likelihood of fishing in the future.* ***Table 4-18*** *provides a detailed assessment of Commonwealth and State fisheries within or adjacent to the Operational Area.*

5.8 Stakeholder Consultation Summary

A Stakeholder Consultation Information Sheet was provided to relevant persons which included details such as an activity overview, maps, a summary of key risks and/or impacts and management measures (Appendix F, reference 1.14).

Since the commencement of the consultation period, the Stakeholder Consultation Information Sheet has also been available on Woodside's website - it includes a toll-free 1800 phone number and Woodside's feedback email address (feedback@woodside.com.au).

Where appropriate, additional targeted information was provided to relevant persons including maps and information relevant to the specific functions, interests and activities.

The relevant persons had a 30 day period in which to provide feedback.

Woodside considered relevant person responses and assessed the merits and relevancy of objections and claims about the potential adverse impact of the proposed activity set out in the EP.

5.9 Stakeholder Consultation

Consultation activities conducted for the proposed activity with relevant persons are outlined in **Table 5-2.**

The Consultation Information Sheet (Appendix F, reference 1.14) is published on the Woodside website and includes a toll-free 1800 phone number.

Table 5-2: Stakeholder Consultation Activities

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
Australian Government department or agency				
ABF	On 22 June 2022, Woodside emailed ABF advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has addressed maritime security-related issues in **Section 6** of this EP based on previous offshore activities. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
	On 12 July 2022, Woodside emailed ABF following up on the proposed activity (Appendix F, reference 2.6), and provided a Consultation Information Sheet.	No feedback received.	No response required.	
AFMA	On 22 June 2022, Woodside emailed AFMA advising of the proposed activity (Appendix F, reference 1.2) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	Woodside has addressed AFMA's feedback, including confirming that Woodside has provided information to relevant representative organisations on behalf of Commonwealth fishery licence holders who have entitlements to fish within the proposed area. Woodside has consulted AFMA, DCCEEW, CFA, ASBTIA, Tuna Australia and WAFIC. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.6.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 12 July 2022, Woodside emailed AFMA following up on the proposed activity (Appendix F, reference 2.7), and provided a Consultation Information Sheet and fisheries map.	On 13 July 2022, AFMA responded advising that it had no further comment and encouraged Woodside to continue consulting with all fishers who have entitlements to fish within the proposed area.	On 13 July 2022, Woodside responded thanking AFMA for its feedback and confirmed that Woodside has provided information to relevant representative organisations on behalf of Commonwealth fishery licence holders who have entitlements to fish within the proposed area.	

AHO	On 22 June 2022, Woodside emailed the AHO advising of the proposed activity (Appendix F, reference 1.3) and provided a Consultation Information Sheet and shipping lanes map.	On 22 June 2022, the AHO responded acknowledging receipt of Woodside's email.	Woodside notes the AHO has received the consultation materials. No response required.	Woodside will notify the AHO no less than four working weeks before operations commence, as referenced as **Control 1.3** in this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
AMSA (marine safety)	On 22 June 2022, Woodside emailed AMSA advising of the proposed activity (Appendix F, reference 1.2) and provided a Consultation Information Sheet and shipping lanes map.	No feedback received.	No response required.	Woodside has addressed AMSA's requests: Woodside will notify AMSA's JRCC at least 24–48 hours before operations commence for each survey, as referenced as **Control 1.5** in this EP. Woodside will notify the AHO no less than four working weeks before operations commence, as referenced as a **Control 1.3** in this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 12 July 2022, Woodside emailed AMSA following up on the proposed activity (Appendix F, reference 2.8), and provided a Consultation Information Sheet and shipping lanes map.	On 14 July 2022, AMSA emailed Woodside requesting: • The AHO be contacted no less than four working weeks before operations commence for the promulgation of related notices to mariners. • AMSA's Joint Rescue Coordination Centre (JRCC) be notified at least 24–48 hours before operations commence • Provide updates to the AHO and JRCC should there be changes to the activity. • Vessels exhibit appropriate lights and shapes to reflect the nature of operations and comply with the International Rules of Preventing Collisions at Sea. AMSA provided advice on obtaining vessel traffic plots, including digital datasets and maps.	On 14 July 2022, Woodside responded to AMSA confirming it will contact/notify: • The AHO no less than 4 weeks before operations commence • AMSA's JRCC at least 24-48 hours before operations commence • Provide updates to both the AHO and AMSA on any changes. Confirmed vessels will exhibit appropriate lights and shapes to reflect the nature of operations and the obligation to comply with the International Rules for Preventing Collisions at Sea.	

AMSA (marine pollution)	On 30 June 2022, Woodside emailed AMSA (Appendix F, reference 1.5) and provided a copy of the Oil Pollution First Strike Plan (Appendix I).	No feedback received.	No response required.	Woodside has addressed oil pollution planning and response at Appendix D. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
DCCEEW	On 22 June 2022, Woodside emailed DCCEEW advising of the proposed activity considering biosecurity matters (Appendix F, reference 1.5) and provided a Consultation Information Sheet.	No feedback received.	No response required.	No feedback provided. Woodside has consulted AFMA, DCCEEW, CFA, ASBTIA, Tuna Australia and WAFIC. Woodside has assessed the relevance of Commonwealth fisheries issues in **Section 4.6.2** of this EP. Woodside has addressed maritime biosecurity issues in **Section 6** of this EP based on previous offshore activities. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
	On 12 July 2022, Woodside emailed DCCEEW following up on the proposed activity (Appendix F, reference 2.9), and provided a Consultation Information Sheet.	No feedback received.	No response required.	
DISR	On 22 June 2022, Woodside emailed DISR advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond.

	On 12 July 2022, Woodside emailed DISR following up on the proposed activity (Appendix F, reference 2.6), and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
DNP	On 22 June 2022, Woodside emailed DNP advising of the proposed activity (Appendix F, reference 1.6), and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has addressed the DNP's feedback, including confirming that Woodside will contact the DNP if details regarding the activity change and result in an overlap with or new impact to a marine park, or for an emergency response, as per the commitment in the Oil Pollution First Strike Plan (Appendix I). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 11 July 2022, Woodside emailed DNP following up on the proposed activity (Appendix F, reference 2.1), and provided a Consultation Information Sheet.	On 22 July 2022, DNP responded thanking Woodside for the opportunity to comment on the EP and: noted the planned activities do not overlap any AMPs advised there are no authorisation requirements from the DNP and there are no claims and obections at this time. advised that the DNP doesn't require further notification of progress made in relation to this activity unless details regarding the activity change and result in an overlap with or new impact to a marine park, or for emergency responses The DNP also referenced the NOPSEMA and Parks Australia guidance note that outlines what titleholders need to consider and evaluate for an EP and the North-west Marine Parks Network Management Plan 2018. The DNP advised that it should be made aware of oil/gas pollution incidences which occur within a	On 25 July 2022, Woodside responded thanking DNP for its feedback and noted the DNP's confirmation that: planned activities do not overlap any AMPs • there are no authorisation requirements from the DNP at this time • there are no claims or objections at this time. Woodside confirmed that it would contact the DNP if details regarding the activity change and result in an overlap with or new impact to a marine park, or for emergency responses.	

		marine park or are likely to impact on a marine park as soon as possible.		
Western Australian Government department or agency or advisory body				
DBCA	On 22 June 2022, Woodside emailed DBCA advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	On 8 July 2022, DBCA responded thanking Woodside for the consultation information and advised that it had no comments.	On 11 July 2022, Woodside responded thanking DBCA for its feedback.	Planned activities do not impact DBCA's functions, interests or activities. DBCA provided feedback that it has no comment on the proposed activity. The Environment Plan demonstrates that the proposed activities are outside the boundaries of a proclaimed State Marine Park and identifies that there are no credible risks as part of planned activities that have potential to impact the values of any marine parks (**Section 6**). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
DMIRS	On 22 June 2022, Woodside emailed DMIRS advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has addressed DMRIS feedback including confirming that it will provide notifications to DMIRS prior to the commencement and at the end of the activity, as referenced in **Section 7.8.2.1 in t**his EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 12 July 2022, Woodside emailed DMIRS following up on the proposed activity (Appendix F, reference 2.6), and provided a Consultation Information Sheet.	On 22 July 2022, DMIRS responded: • acknowledging receipt consultation information. • advising that it had reviewed the information and did not require any further information at this stage. • requested that commencement and cessation notifications for	On 25 July 2022, Woodside responded: • thanking DMIRS for its feedback confirming that DMIRS had reviewed the consultation information and did not require any further information at this stage. • confirmed that Woodside would send DMIRS commencement and	

		the activity are sent to DMIRS; and • noted its Consultation Guidance Note for reporting of incidents that could potentially impact on any land or water under State jurisdiction.	cessation notifications for the activity.	
DPIRD	On 22 June 2022, Woodside emailed DPIRD advising of the proposed activity (Appendix F, reference 1.7) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	No feedback received. Woodside has consulted DPIRD, WAFIC, and individual relevant licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.6.2** of this EP. Woodside will provide notifications to DPIRD, WAFIC and relevant Fishery Licence Holders (Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery) prior to the commencement and at the end of the activity, as referenced as **PS 1.4.1** in this EP. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
	On 11 July 2022, Woodside emailed DPIRD following up on the proposed activity (Appendix F, reference 2.2) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	
DoT	On 22 June 2022, Woodside emailed DoT advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has addressed oil pollution planning and response at Appendix D.

	On 12 July 2022, Woodside emailed DoT following up on the proposed activity (Appendix F, reference 2.6), and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside will provide DoT with a copy of the accepted Oil Pollution First Strike Plan. Woodside will consult DoT if there is a spill impacting State water from the proposed activity. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 30 June 2022, Woodside emailed DoT (Appendix F, reference 1.4) and provided a copy of the Oil Pollution First Strike Plan (Appendix D).	On 15 July 2022, DoT responded thanking Woodside for the information and advised that it would review and revert back with any comments/queries.	No response required.	
State fisheries				
Mackerel Managed Fishery (Area 2)	On 22 June 2022, Woodside sent a letter to Mackerel Managed Fishery (Area 2) advising of the proposed activity (Appendix F, reference 1.8) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	No feedback received. Woodside has consulted DPIRD, WAFIC, and individual relevant licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.6.2** of this EP. Woodside will provide notifications to DPIRD, WAFIC and relevant Fishery Licence Holders (Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery) prior to the commencement and at the end of the activity, as referenced **as PS 1.4.1** in this EP. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
	On 11 July 2022, Woodside sent a letter to Mackerel Managed Fishery (Area 2) following up on the proposed activity (Appendix F, reference 2.3) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	
Pilbara Trap Fishery	On 22 June 2022, Woodside emailed Pilbara Trap Fishery advising of the proposed activity (Appendix F, reference 1.9) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	No feedback received. Woodside has consulted DPIRD, WAFIC, and individual relevant licence holders.

	On 11 July 2022, Woodside emailed Pilbara Trap Fishery following up on the proposed activity (Appendix F, reference 2.4) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	Woodside has assessed the relevancy of State fisheries issues in **Section 4.6.2** of this EP. Woodside will provide notifications to DPIRD, WAFIC and relevant Fishery Licence Holders (Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery) prior to the commencement and at the end of the activity, as referenced **as PS 1.4.1** in this EP. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
Pilbara Line Fishery	On 22 June 2022, Woodside emailed Pilbara Line Fishery advising of the proposed activity (Appendix F, reference 1.9) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	No feedback received. Woodside has consulted DPIRD, WAFIC, and individual relevant licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.6.2** of this EP. Woodside will provide notifications to DPIRD, WAFIC and relevant Fishery Licence Holders (Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery) prior to the commencement and at the end of the activity, as referenced **as PS 1.4.1** in this EP. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
	On 11 July 2022, Woodside emailed Pilbara Line Fishery following up on the proposed activity (Appendix F, reference 2.4) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	

Industry				
BP Developments Australia	On 22 June 2022, Woodside emailed [Operator] advising of the proposed activity (Appendix F, reference 1.10) and provided a Consultation Information Sheet and Titleholder map.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 12 July 2022, Woodside emailed BP Developments Australia following up on the proposed activity (Appendix F, reference 2.10), and provided a Consultation Information Sheet and Titleholder map.	No feedback received.	No response required.	
Industry representative organisations				
APPEA	On 22 June 2022, Woodside emailed APPEA advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 12 July 2022, Woodside emailed APPEA following up on the proposed activity (Appendix F, reference 2.6), and provided a Consultation Information Sheet.	No feedback received.	No response required.	
CFA	On 22 June 2022, Woodside emailed the CFA advising of the proposed activity (Appendix F, reference 1.11) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	No feedback provided. Woodside has consulted AFMA, DCCEEW , CFA, ASBTIA, Tuna Australia and WAFIC. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.6.2** of this EP. Woodside considers it has provided sufficient information and
	On 12 July 2022, Woodside emailed CFA following up on the proposed activity (Appendix F, reference 2.11) and provided a Consultation	No feedback received.	No response required.	

	Information Sheet and fisheries map.			opportunity to respond and considers this adequately addresses stakeholder interests.
ASBTIA	On 22 June 2022, Woodside emailed the ASBTIA advising of the proposed activity (Appendix F, reference 1.11) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	No feedback provided. Woodside has consulted AFMA, DCCEEW, CFA, ASBTIA, Tuna Australia and WAFIC. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.6.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 12 July 2022, Woodside emailed ASBTIA following up on the proposed activity (Appendix F, reference 2.11) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	
Tuna Australia	On 22 June 2022, Woodside emailed Tuna Australia advising of the proposed activity (Appendix F, reference 1.11) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	Woodside has addressed Tuna Australia's feedback, including advising that EP controls are in place minimise the temporary exclusion zone. Woodside noted that: • routine marine discharges would be managed according to legislative and regulatory requirements. • seabed disturbance will be minimal given the wellhead is already in place on the seabed. • there are no other acoustic sources that will be used for the activity other than project vessels and positioning equipment.

	On 12 July 2022, Woodside emailed Tuna Australia following up on the proposed activity (Appendix F, reference 2.11) and provided a Consultation Information Sheet and fisheries map.	On 22 July 2022, Tuna Australia responded advising that the proposed activity is in the same general vicinity as those proposed for other EPs Tuna Australia had recently comments on for Woodside, and points raised also apply to this EP. This includes:
		• Tuna Australia provided an overview of the fishery, including potential future activity, and requested:
		  • more information regarding downstream effects from the activity, such as discharges.
		  • further understanding of potential interactions during
			On 29 July 2022, Woodside responded thanking Tuna Australia for the information provided on the fishery and its members as well as feedback on the proposed EP.
			Woodside:
			• confirmed that it plans to undertake activities in accordance with the EP and as expeditiously as possible.
			• provided additional information on the proposed activity.
			• noted Tuna Australia's comments that while there is an overlap with the Western Tuna and Billfish	

		activities in the Operational Area and exclusion zones, particularly as the fishery uses longline fishing. • advice regarding acoustic interferences from the proposed activity. Tuna Australia also commented on marine spatial congestion and requested reassurance that the activities would be completed in an expeditious timeframe.	Fishery management area and the Operational Area, no recent fishing effort has occurred within or nearby to the Operational Area, and that no fishing effort has occurred for at least the last ten years. • noted Tuna Australia's comments that there is potential for future fishing effort in the region, potentially in 2023. Woodside advised of EP controls, including limiting the temporary safety exclusion zone to 500 m and permitting commercial fishers and other marine users to enter the Operational Area. Woodside noted: • routine marine discharges would be managed according to legislative and regulatory requirements. • any localised impacts to water quality, sediment quality and marine fish are not expected to impact any commercial fisheries in the area and there will be no toxicological effects. • seabed disturbance will be minimal given the wellhead is already in place on the seabed. • given the short nature of the activity and the small footprint of the equipment, any impacts to water and sediment quality are	Woodside has consulted AFMA, DCCEEW, CFA, ASBTIA, Tuna Australia and WAFIC. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.6.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

			likely to be intermittent, highly localised and temporary in nature. noise generated in the air and underwater would be due to the operation of project vessels and positioning equipment.	
PPA	On 22 June 2022, Woodside emailed the PPA advising of the proposed activity (Appendix F, reference 1.12) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	No feedback received. Woodside has consulted DPIRD, WAFIC, and individual relevant licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.6.2** of this EP. Woodside considers it has provided sufficient information and opportunity to respond and considers this adequately addresses stakeholder interests.
	On 12 July 2022, Woodside emailed PPA following up on the proposed activity (Appendix F, reference 2.12) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	
WAFIC	On 22 June 2022, Woodside emailed WAFIC advising of the proposed activity (Appendix F, reference 1.13) and provided a Consultation Information Sheet and fisheries map.	No feedback received.	No response required.	WAFIC provided feedback that it had no specific comments regarding the planned activity. Woodside has consulted DPIRD, WAFIC, and individual relevant licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 4.6.2** of this EP. Woodside will provide notifications to DPIRD, WAFIC and relevant Fishery Licence Holders (Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery) prior to the commencement and at the end of
	On 11 July 2022, Woodside emailed WAFIC following up on the proposed activity (Appendix F, reference 2.5) and provided a Consultation Information Sheet and fisheries map.	On 14 July 2022, WAFIC responded thanking Woodside for the consultation information and advised that WAFIC had no specific comments regarding the planned activity.	On 14 July 2022, Woodside responded thanking WAFIC for its feedback.	

				the activity, as referenced **as PS 1.4.1** in this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

5.10 Ongoing Stakeholder Consultation

Depending on the nature and scale of the activity, stakeholder consultation can occur during the life of an EP. Ongoing consultation enables updates on activities and a continued understanding of stakeholder views. Should additional relevant feedback be received during the life of the EP the feedback will be assessed as per **Section 5.7**. Should new stakeholders be identified during the life of the EP they will be assessed for relevancy as per **Section 5.3.**

Planned ongoing consultation is outlined in **Section 5.10.1.1.**

5.10.1 Routine Reporting (External)

5.10.1.1 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 or organisations listed in Table 5-3.

Any significant changes on this activity will be communicated to relevant persons. Woodside hosts community forums at which members are updated on Woodside activities. These community and heritage meetings are held on a regular basis (for example, Karratha Community Liaison Group, Exmouth Community Reference Group). 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.

Relevant persons and those who are interested in the activities, can remain up to date on this activity through subscribing to our website.

Table 5-3: Ongoing consultation engagements

Report/ Information	Recipient	Purpose	Frequency	Content
Notification (email) Updates (email)	AHO	As requested by AMSA during consultation.	No less than 4 weeks prior to commencement. As required.	**C 1.3** Date of activity start. Changes to planned activities
Notification (email) Update (email)	AMSA	As requested by AMSA during consultation	At least 24-48 hours before operations commence. Provide updates to the AHO and JRCC should there be changes to the activity.	**C 1.5** Date of activity start. Changes to planned activities
Notification (email)	DMIRS	Good practice	At least 10 days prior to commencement	Activity start date
Notification (email)	DPIRD WAFIC Relevant Fishery Licence Holders (Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery)	As requested during consultation and/or organisation expectation	At least ten days prior to commencement and following completion of activities	**C 1.4** Date of activity start and end.
Notification (email)	Other relevant persons	Notification of significant change	As required	Notification of significant change

6 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT, PERFORMANCE OUTCOMES, STANDARD AND MEASUREMENT CRITERIA

6.1 Overview

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

6.2 Impact and Risk Analysis and Evaluation

As required by Regulation 13(5) and 13(6) of the Environment Regulations, the following analysis and evaluation demonstrates that the identified risks and impacts 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 risks identified during the ENVID (including decision type, current risk level, acceptability of risk and tools used to demonstrate acceptability and ALARP) have been divided into two broad categories:

- planned (routine and non-routine) activities that have the potential for inherent environmental impacts;
- 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 seven impacts and eight risks associated with the Petroleum Activities Program. Planned activities and unplanned events are summarised in **Table 6-1**.

The TPA03 Well intervention specific ENVID workshop was conducted on Tuesday the 7th of June 2022. Attendees included: Environmental Advisers, Environmental Engineers, Environmental Consultants, Subsea Engineers, Senior Completions Engineer, and Hydrocarbon Spill Advisers.

The impact and risk analysis and evaluation for the Petroleum Activities Program indicates that all the current environmental risks and impacts associated with the activity are reduced to ALARP and are of an acceptable level, as discussed further in **Sections 6.6** and **6.7**.

Table 6-1: Environmental impact analysis summary of planned and unplanned activities

Aspect	EP Section	Risk Rating				Acceptability of Impact/Risk
		Impact/Consequence	Potential Impact/Consequence Level	Likelihood	Current Risk Rating	
Planned Activities (Routine and Non-routine)						
Physical presence: Interference with other users – proximity of WIV and support vessels causing interference with or displacement to third party vessels (commercial fishing and commercial shipping), and temporary continued presence of the wellheads.	**6.6.1**	F	Social and Cultural – Slight, short-term impact (less than one year) to a community or areas/items of cultural significance	-	-	Broadly acceptable
Physical presence: Disturbance to seabed from ROV operations and equipment lay down.	**6.6.2**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine acoustic emissions: Generation of acoustic signals from DP systems on support vessels and WIV during normal operations, generation of atmospheric noise from helicopter transfers within Operational Area.	**6.6.3**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine and non-routine discharges: WIV and support vessels.	**6.6.4**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine and non-routine discharges: subsea fluids, tank wash residue and marine riser cleanout	**6.6.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable

Aspect	EP Section	Risk Rating				Acceptability of Impact/Risk
		Impact/Consequence	Potential Impact/Consequence Level	Likelihood	Current Risk Rating	
Routine atmospheric emissions from fuel combustion and cold venting.	**6.6.6**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. air quality).	-	-	Broadly acceptable
Routine light emissions: External light emissions onboard WIV and support vessels within the Operational Area.	**6.6.7**	F	Environment – No lasting effect (less than one month); localised and temporary disturbance to marine fauna.	-	-	Broadly acceptable
Unplanned Activities (Accidents, Incidents, Emergency Situations)						
Unplanned hydrocarbon release due to loss of well containment (Subsea well blowout)	**6.7.2**	B	Environment – Major, long term impact (ten to 50 years) on highly valued ecosystems, species, habitat, physical or biological attributes. Reputation/brand – National concern and/or international interest. Medium to long-term impact (five to 20 years) to reputation and brand. Venture and/or asset operations restricted.	1	M	Broadly acceptable
Unplanned hydrocarbon release resulting from a vessel collision	**6.7.3**	D	Environment – Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems), physical or biological attributes.	1	M	Broadly acceptable
Unplanned discharges: Deck and subsea spills	**6.7.4**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	2	L	Broadly acceptable

Aspect	EP Section	Risk Rating				Acceptability of Impact/Risk
		Impact/Consequence	Potential Impact/Consequence Level	Likelihood	Current Risk Rating	
Unplanned discharges: Release of solid hazardous and non-hazardous wastes	**6.7.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	2	L	Broadly acceptable
Physical presence: Vessel collision with marine fauna	**6.7.6**	E	Environment – Slight, short term local impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	0	L	Broadly acceptable
Physical presence: Dropped object resulting in seabed disturbance	**6.7.7**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. benthic habitats).	2	L	Broadly acceptable
Physical presence: Accidental introduction and establishment of invasive marine species	**6.7.8**	E	Environment – No credible risk identified. Reputation and Brand – Minor, short-term impact (one to two years) to reputation and brand. Close scrutiny of asset level operations or future proposals.	0	L	Broadly acceptable

6.2.1 Cumulative Impacts

Woodside has assessed the cumulative impacts of the Petroleum Activities Program in relation to other relevant petroleum activities that could realistically result in overlapping temporal and spatial extents. This has resulted in review of the following developments, with impacts discussed as relevant in various sections of **Section 6.6** and **6.7**:

Goodwyn Alpha platform production – Tidepole manifold and TPA01 and TPA02 wells.

Additionally, where relevant the cumulative impacts of activities associated with undertaking multiple concurrent or parallel activities associated with this Petroleum Activities Program have been assessed for cumulative impacts as relevant in **Sections 6.6** and **6.7**.

Given that unplanned activities are not intended to occur during the petroleum activities program, no reasonable estimate of the frequency, intensity or duration of such activities can be made. If these activities are undertaken, they will be discrete events and any impacts will be localised. As such, Woodside has reasonably assessed unplanned events are not credible, with no consideration of cumulative impacts of repeated unplanned events from the Petroleum Activities Program or compounding impacts from other petroleum facilities within the region.

6.3 Environmental Performance Outcomes, Standards and Measurement Criteria

Regulation 13(7) of the Environment Regulations requires that an EP includes EPOs, EPSs and MC that address legislative and other controls to manage the environmental risks and impacts of the activity to ALARP and Acceptable levels.

The EPOs, EPSs and MC for the Petroleum Activities Program have been identified to allow Woodside’s environmental performance to be measured and through the implementation of this EP, to determine whether the EPOs and EPSs have been met.

The EPOs, EPSs and MC specified are consistent with legislative requirements and Woodside’s standards and procedures. They have been developed based on the legislation, codes and standards, good industry practices and professional judgement outlined in **Sections 2.6.1.4** and **2.7**, as part of the acceptability and ALARP justification process.

The EPOs, EPSs and MC are presented throughout this section and in **APPENDIX D**. A breach of these EPOs or EPSs constitutes a ‘Recordable Incident’ under the Environment Regulations (refer to **Section 7.8**).

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 part of this EP should not interfere with other marine users, to a greater extent than is necessary for the exercise of right conferred by the titles granted.

6.4 Presentation

The analysis and evaluation (ALARP and acceptability), EPOs, EPSs and MC are presented in tabular form throughout this section, as shown in the sample below. Italicised text in this example table denotes the purpose of each part of the table, with reference to the relevant sections of the Regulations and/or this EP.

Context *Description of the context for the impact/risk. Regulation 13(1, 13(2) and 13(3)*		
Relevant Activities Source of Aspect – **Section reference** *Description of the Activity – Regulation 13(1)*	**Existing Environment** Relevant environment – **Section reference** *Description of the Environment – Regulations 13(2)(3)*	**Stakeholder consultation** Consultation – **Section reference** *Consultation – Regulation 11A*

Impacts and Risks Evaluation Summary *Summary of ENVID outcomes*														
Source of Risk *Regulation 13(1)*	***Environmental Value Potentially Impacted*** *Regulations 13(2)(3)*							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Summary of source of risk/ impact														

Description of Source of Risk or Impact
Description of the identified risk/impact including sources or threats that may lead to the impact/risk or identified event. Regulation 13(1).
Impact or Consequence Assessment
Environmental Value/s Potentially Impacted
Discussion and assessment of the potential impacts to the identified environment value/s. Regulation 13(5) (6). Description of potential impacts to environmental values aligned to Woodside Risk Matrix consequence descriptors.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[3]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
ALARP/Hierarchy of Control Tools Us–d - Section 2.6.2				
Summary of control considered to ensure the impacts and risks are continuously reduced to ALARP. *Regulation 13(5)(c).*	*Technical/logistical feasibility of the control.* *Cost/sacrifice required to implement the control (qualitative measure).*	*Qualitative commentary of impact/risk that could be averted/ environmental benefit gained 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 No. provided.*

[3] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[3]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
ALARP Statement Made on the basis of the environmental risk/impact assessment outcomes, use of the relevant tools appropriate to the decision type (**Section 2.7**) and a proportionality assessment. Regulation 10A (b).				

Demonstration of Acceptability
Acceptability Statement Made on the basis of applying the process described in **Section 2.7** taking into account internal and external expectations, risk/impact to environmental thresholds and use of environment decision principles. Regulation I(c)

EPOs, EPSs and MC			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO No. **S**: *Specific performance that addresses the legislative and other controls that manage the activity, and against which performance by Woodside in protecting the environment will be measured.* **M**: *Performance against the outcome will be measured through implementation of the controls via the MC.* **A**: *Achievability/feasibility of the outcome demonstrated via discussion of feasibility of controls in ALARP demonstration. Controls are directly linked to the outcome.* **R**: *The outcome will be relevant to the source of risk/impact and the potentially impacted environmental value[4]* **T**: *The outcome will state the timeframe during which the outcome will apply or by which it will be achieved.*	**C No.** *Identified control adopted to ensure that the impacts and risks are continuously reduced to ALARP.* *Regulation 13(5) (c).*	**PS No.** *Statement of the performance required of a control measure. Regulation 13(7)(a).*	**MC No.** *Measurement criteria for determining whether the outcomes and standards have been met. Regulation 13(7)(c).*

6.5 Potential Environment Risks/Impacts not Included Within the Scope of this Environment Plan

The ENVID identified a source of environmental risk/impact that was assessed as not being applicable within or outside the Operational Area and, therefore, were determined to not form part of this EP (refer **Section 2.5**). These are described in **Sections 6.5.1 - 6.5.3** for information only.

6.5.1 Shallow/Nearshore Activities

The Petroleum Activities Program is located in water depths approximately 113 m and at a distance of about 76 km from the nearest landfall (North West Island). Consequently, risks associated with shallow/ near-shore activities such as vessel anchoring, and risks of grounding were assessed as not credible.

[4] Where impact/consequence descriptors are capitalised and presented within EPOs in **Section 6**; performance level corresponds with those aligned with the Woodside Risk Matrix (refer **Section 2.6.3**).

6.5.2 Bunkering Activities

No bunkering will take place as part of the TPA-03 well intervention activity. As such, marine fuel loss during hydrocarbon bunkering is not a credible risk.

6.5.3 Hydrocarbon release from WIV

The fuel storage tanks on suitable WIVs considered are located on the inboard side of the pontoons, below the water line. This tank configuration means that, in the event of a vessel collision, it is not credible that the fuel storage tanks would rupture. Therefore, a spill of MDO from suitable WIVs considered is not credible.

6.5.4 Generation of Noise from Helicopters

It is not credible that airborne noise from helicopter transfers would add to levels of underwater noise emanating from the WIV, support vessels and positioning equipment to any extent. As such noise emissions from these sources has not been considered in **Section 6.6.3**.

6.5.5 Loss of Containment from Existing Subsea Infrastructure

As described in **Section 4.6.6** existing subsea infrastructure is present in the Operational Area as part of the GWA Field Production Systems. A subsea loss of containment from a rupture of live infrastructure within the Operational Area could occur, in the event of a significant dropped object.

A worst-case credible hydrocarbon release scenario has been defined in the GWA Facility Operations EP as a rupture of the 16-inch flowline upstream of the SSIV. This could result in a release of up to 237 m^3 of GWF-1 condensate. The in force GWA Facility Operations EP provides a description and assessment of impacts and risks. Management controls and response capabilities are detailed in that EP. Additional controls for operating the WIV are provided throughout **Section 6.6** and **6.7**. In particular, controls are included for the prevention of dropped objects (**Section 6.7.7**).

6.5.6 Indirect Impacts

For the PAP, the potential 'indirect' environmental impacts and risks evaluated are those associated with mobilisation/demobilisation of the WIV and support vessels to the Operational Area, which have been considered in the environmental impact assessment in **Section 6.6** and **Section 6.7**.

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 WIV and support vessels to be inherently ALARP in its current state. Therefore, Woodside considers that standard vessel and WIV operations are appropriate to manage the potential impacts and risks from mobilisation and demobilisation of the WIV and support vessels to a level that is acceptable.

The extraction of Tidepole well fluids for processing is not included in this Petroleum Activities Program and is included in the scope of the accepted GWA Facility Operation EP. The accepted GWA Facility Operation EP includes analysis and evaluation of impacts and risks arising from the extraction of Tidepole well fluids. Therefore, any indirect impacts and risks arising from the processing of Tidepole well fluids are not considered are included in the GWA Facility Operation EP which demonstrates impacts and risks have been reduced to ALARP and are managemed to a level that is acceptable.

6.6 Planned Activities (Routine and Non-routine)

6.6.1 Physical Presence: Interaction with Other Marine Users

Context		
Project Vessels – **Section 3.8**	Socioeconomic and Cultural – **Section 4.6**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	*Environmental Value Potentially Impacted*							*Evaluation*						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Interference with other users – proximity of WIV and support vessels causing interference with or displacement to third party vessels (commercial fishing and commercial shipping)							X	A	F	-	-	GP	Broadly acceptable	EPOs 1 & 2

Description of Source of Impact

Presence of WIV and Vessels

A number of support vessels and a WIV (outlined in **Section 3.8**) will be temporarily present in the Operational Area during the Petroleum Activities Program to conduct wireline well intervention activities. Two support vessels may also be present; one to transport equipment and materials between the Operational Area and the port/staging area, and the other to remain at the WIV to perform standby duties. The WIV will have a 500 m safety exclusion zone applied for the duration of the Petroleum Activities Program to limit vessel interactions.

Well intervention activities are expected to take between 5 and 14 days as outlined in **Section 3.5** and will be undertaken by a DP WIV. When underway, activities will be 24 hours, 7 days a week.

The presence of these project vessels and WIV in the Operational Area presents an opportunity for interaction with third-party marine users.

Impact Assessment

Interactions with Commercial Fishing Activities

The Operational Area overlaps three Commonwealth and 12 State managed fisheries (**Section 4.6.2**). However, only the State-managed Pilbara Line Fishery, Pilbara Trap Managed Fishery and the Mackerel Managed Fishery (Area 2) are considered to have limited potential for interaction with project activities (**Section 4.6.2**).

The Operational Area is located within a 60 nm CAES block which has reported up to six Pilbara Line Fishery vessels and up to three Pilbara Trap Managed Fishery vessels active in the block each year between 2011 and 2020 (DPIRD, 2021). Each year consistent annual fishing effort was reported from both fisheries (**Section 4.6.2**). The Operational Area also overlaps the 60 nm CAES block where fishing effort of up to five vessels has been reported in the Mackerel Managed Fishery. No effort has been reported in the 10 nm CAES block overlapping the Operational Area, in the last 10 years (2011-2020, inclusive) (DPIRD, 2021). Given the overlap of the Operational Area with the fishing block and the annual fishing effort, interactions with the Pilbara Line Fishery, Pilbara Trap Managed Fishery, and the Mackerel Managed Fishery may occur.

During Project activities, vessels will be temporarily present in the Operational Area and may restrict the use of the area by the fisheries, and any other commercial fisheries that have been identified as having potential, though unlikely, to use the Operational Area. Use will particularly be restricted within the 500 m safety exclusion zone (temporary) that will be established around the WIV when undertaking intervention activities, which represents a relatively small area when compared to the extent of the individual fishery boundaries that overlap. The WIV will only be present for up to 14 days, and therefore impacts during intervention activities will be localised and temporary.

Given the short duration of the activity, the temporary presence of vessels in the Operational Area would potentially result in a localised interference (navigational hazard) and displacement/avoidance by commercial fishing vessels within the immediate vicinity of the WIV or support vessels.

Displacement of Recreational Fishing

Given the distance from boating facilities, lack of natural attractions (e.g. reefs or shoals) and the water depth of the Operational Area, very little recreational or charter fishing is expected to occur within the Operational Area. As such, impacts to recreational and charter fishing are expected to be localised and of no lasting effect.

If recreational fishing effort occurred within the Operational Area while activities are being performed, displacement as a result of the Petroleum Activities Program would be minimal and relate only to the exclusion zones (temporary) (500 m radius) that would be in place around the WIV when undertaking intervention activities. Therefore, the potential impact is considered to be localised and would result in no lasting effect.

Displacement to Commercial Shipping

Commercial shipping occurs in the region, with commercial shipping traffic comprising vessels such as:

- Bulk carriers (e.g. mineral ore, salt etc.) from Port Hedland and Dampier;
- Offtake tankers;
- Support vessels for offshore oil and gas activities; and
- LNG carriers from Dampier, Barrow Island and Ashburton North.

To reduce the likelihood of interactions between commercial vessels and offshore facilities, AMSA have introduced a series of shipping fairways within which commercial vessels are advised to navigate. The fairways are not mandatory, however, AMSA strongly recommends commercial vessels remain within the fairway when transiting the region. The use of shipping fairways is considered to be good seafaring practice, with AUSREP data from AMSA indicating cargo ships and tankers routinely navigate within the established fairways.

The presence of the WIV and/or project vessels will not result in impacts to commercial shipping beyond temporary, highly localised disruption to commercial shipping as the nearest marine fairway is approximately 0.18 km west of the Operational Area. The potential impacts associated with this Petroleum Activities Program may include displacement of vessels as they make slight course alterations to avoid the WIV and/or support vessel(s). Notably, shipping in the area is mainly related to the resources industry.

Interference with Existing Oil and Gas Infrastructure

Interactions with operators of other nearby facilities have the potential to occur, including the Goodwyn Alpha platform and associated well infrastructure. Given that the well intervention activity will be performed under the Goodwyn Alpha Permit to Work system, there is no potential for impact.

The nearest facility not operated by Woodside, is the Chevron-operated Wheatstone platform, which lies approximately 55 km south-west of the Operational Area. Given the distance between the Operational Area and petroleum activities undertaken by other operators, no impacts to other operators will occur as a result of the physical presence of the vessels.

For the fisheries considered active in the vicinity of the Operational Area, potential cumulative impacts to vessels that overlap the Operational Area would be localised with no lasting effect.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that the physical presence of the WIV and project vessels will not result in a potential impact greater than localised displacement of shipping, commercial/recreational fishing, oil and gas interests with no lasting effect.

Demonstration of ALARP

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)*[5]	*Benefit/Reduction in Impact*	*Proportio nality*	*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. 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. Control is also	Yes **C 1.1**

1 Qualitative measure

			Standard Practice	
Establishment of a 500 m petroleum safety zone around MODU and 500 m exclusion zone around the installation vessel.	F: Yes. CS: Minimal cost. Standard practice.	Establishment of a 500 m petroleum safety zone around MODU and installation vessels reduces the likelihood of interaction with other marine users.	Benefits outweigh cost/ sacrifice. Control is also Standard Practice	Yes **C 1.2**
Good Practice				
Australian Hydrographic Office (AHO) notified of activities and movements no less than four working weeks prior to scheduled activity commencement date of well intervention activities.	F: Yes CS: Minimal cost. Standard practice.	Notification to AHO will enable them to generate navigation warnings (Maritime Safety Information Notifications (MSIN) and Notices to Mariners (NTM) (including AUSCOAST warnings where relevant)).	Benefits outweigh cost/sacrifi ce. Control is Standard Practice.	Yes **C 1.3**
Notify relevant fishing industry government departments, representative bodies and licence holders of activities prior to commencement and upon completion of activities.	F: Yes CS: Minimal cost. 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/sacrifi ce. Control is also Standard Practice.	Yes **C 1.4**
Notify AMSA JRCC for the well intervention activities: • 24-48 hrs before operations commence •	F: Yes CS: Minimal cost. 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/sacrifi ce. Control is also Standard Practice.	Yes **C 1.5**
Notify AHO and AMSA JRCC of any extended delay in the timing of the Petroleum Activities Program.	F: Yes CS: Minimal cost. 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/sacrifi ce. Control is also Standard Practice.	Yes **C 1.6**
Establish and maintain a publicly available interactive map which provides stakeholders with updated information on activities being conducted as part of the Petroleum Activities Program including location of WIV.	F: Yes. CS: Minimal cost. Standard practice.	Interactive map provides additional/alternate method for marine users to obtain information on the timing of activities, thereby reducing the likelihood of interference with other marine users.	Benefits outweigh cost/sacrifi ce.	Yes **C 1.7**
Professional Judgement – Eliminate				
Limit well intervention activities to avoid peak shipping and peak	F: No. Shipping occurs year-round and	Not considered – control not feasible.	Not considered – control	No

commercial fishing activities.	cannot be avoided. SIMOPS with fishing seasons cannot be eliminated as exact timings for activities are not confirmed. CS: Not considered – control not feasible.		not feasible	

Professional Judgement – Substitute

No controls identified.

Professional Judgement – Engineered Solution

No 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 2.6.1**), Woodside considers the adopted controls appropriate to manage the impacts of the presence of the WIV and support vessels during the well intervention activity.

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 Statement

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, and AHO identified during impact assessment and stakeholder consultation. Feedback was received and issues raised have been considered in the impact assessment and finalisation of this EP. Further opportunities to reduce the impacts have been investigated above.

The impact assessment has determined that, given the adopted controls, the presence of the WIV and project vessels during the well intervention activity may result in negligible, localised impacts with no lasting effect (<1 month) to commercial fishing, recreational fishing, shipping and existing oil and gas infrastructure.

The adopted controls are considered consistent with industry good practice and professional judgement and meet the requirements and expectations of AMSA and AHO identified during impact assessment and stakeholder consultation. Further opportunities to reduce the impacts have been investigated above. 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 as outlined by Woodside's acceptability criteria in **Section 2.7.2**.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 1 Undertake the Petroleum Activities Program in a manner that prevents a substantially adverse effect on the sustainability of commercial fishing. **EPO 2** 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.1.1** Vessels to adhere to the navigation safety requirements including the *Navigation Act 2012* and any subsequent Marine Orders	**PS 1.1.1** Activity support vessels and MODU compliant with Navigation Act and Marine Order 21 (Safety of navigation and emergency procedures) 2012	**MC 1.1.1** Marine assurance inspection records demonstrate compliance with standard maritime safety procedures
	C. 1.2 Establishment of a 500 m safety zone around MODU and 500 m exclusion zone around the installation vessel.	**PS 1.2.1** No entry of unauthorised vessels within the 500 m safety exclusion zone	**MC 1.2.1** Records demonstrate breaches by unauthorised vessels within the safety zone are recorded.
			MC 1.2.2 Consultation records demonstrate that AHO has been notified prior to commencement of well intervention activities to allow generation of navigation warnings (MSIN and NTM [including AUSCOAST warnings where relevant]).
	C 1.3 Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date of well intervention activities.	**PS 1.3.1** Notification to AHO of activities and movements to allow generation of navigation warnings (MSIN and NTM [including AUSCOAST warnings where relevant]).	**MC 1.2.2** **See above**
	C 1.4 Notify relevant government departments, fishing industry representative bodies and licence holders of activities prior to commencement and upon completion of activities.	**PS 1.4.1** DPIRD, WAFIC, Mackerel Managed Fishery (Area 2) licence holders, Pilbara Trap licence holders and Pilbara Line licence holders notified prior to commencement and upon completion of activities.	**MC 1.4.1** Consultation records demonstrate that relevant stakeholders have been notified prior to commencement of well intervention activities.

	C 1.5 Notify AMSA JRCC for the well intervention activities24-48 hrs before operations commence	**PS 1.5.1** Notification to AMSA JRCC to prevent activities interfering with other marine users. AMSA's JRCC will require the WIV's details (including name, callsign and Maritime Mobile Service Identity), satellite 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.	**MC 1.5.1** Consultation records demonstrate that AMSA JRCC has been notified within required timeframes.
	C 1.6 Notify AHO and AMSA JRCC of any extended delay in the timing of the Petroleum Activities Program.	**PS 1.6.1** AHO and AMSA JRCC notified of any extended delay in the timing of the Petroleum Activities Program.	**MC 1.6.1** Consultation records demonstrate that AHO and AMSA JRCC were notified of extended delays in the timing of the Petroleum Activities Program.
	C 1.7 Establish and maintain a publicly available interactive map which provides stakeholders with updated information on activities being conducted as part of the Petroleum Activities Program including location of WIV.	**PS 1.7.1** Activity interactive map established and maintained throughout activities.	**MC 1.7.1** Records demonstrate interactive map was provided and available to stakeholders throughout activities.

6.6.2 Physical Presence: Disturbance to Benthic Habitat from ROV Operations and Equipment Lay-down

Context		
Remotely Operated Vehicles – **Section 3.8.4** Marine Growth Removal – **Section 3.6.9** Underwater Acoustic Positioning – **Section 3.6.8**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary														
Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Disturbance to seabed from ROV operations		X	X		X			A	F	-	-	GP	Broadly Acceptable	EPO 3
Removal of marine habitat growth on Xmas trees and wellheads.		X	X		X			A	F	-	-			
Disturbance to seabed from placement of acoustic transponders on seabed		X	X		X			A	F	-	-			
Disturbance to seafloor from equipment lay-down		X	X		X			A	F	-	-			

Description of Source of Impact

ROVs

ROVs may be used during well intervention activities for surveys, transponder deployment and retrieval, cleaning and for intervention support. The use of ROVs may result in temporary seabed disturbance and suspension of sediment causing increased turbidity 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 work class ROV is approximately 2.5 m by 1.7 m (4.25 m^2).

Subsea Cleaning of Infrastructure

Subsea cleaning and preparation activities include removing marine growth from infrastructure such as the Xmas trees (**Section 3.6.9).** Removing marine growth may be done in various ways (water jetting, brush systems, acid). Those that have the potential to impact the seabed include use of high-pressure water and/or brushes on ROVs.

Underwater Acoustic Positioning

Underwater acoustic positioning (long base line (LBL) and/or ultra-short baseline (USBL)) may be required to support intervention activities (see **Section 3.6.8**). 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) and have a typical footprint of approximately < 1 m^2. 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, the array transponders moored by clump weight are recovered by means of a hydrostatic release, which leaves the clump weight on the seabed. The transponders mounted on seabed frames will be removed by ROV.

Equipment lay-down

Equipment such as ROV frames and baskets may be placed on the seafloor during well intervention activities. Equipment lay-down is temporary and all equipment will be removed on the completion of well intervention activities.
Impact Assessment
ROV operations, subsea cleaning, and transponder or equipment lay-down are likely to result in localised, short-term, physical disturbance of benthic habitat and indirect disturbance to benthic habitats from sedimentation. ***Water and sediment quality*** Seabed disturbance may result in a decline in water quality as a result of increased suspended sediment concentrations from ROV operations close to the seabed. The use of water jetting to remove marine growth on the wellhead structures will result in temporary suspension of organic matter and localised increase in turbidity. Water jetting will be limited to what is necessary to perform an effective inspection. However, resuspended sediment loads are not likely to be significant due to the relatively small footprint for each activity described above. Given the short nature of each activity, and the small footprint, any impacts to water and sediment quality are likely to be localised and transient in nature. ***Benthic Habitats and Communities*** Benthic habitats within the Operational Area consist of soft, unconsolidated sediments which host sparse assemblages of filter- and deposit-feeding epifauna and infauna, as well as demersal fishes. These soft sediment habitats, and associated biological communities, are widely represented throughout the NWMR and are not considered to be of particular conservation significance. Direct seabed disturbance, including permanent modification of benthic communities, may result as a consequence of well intervention activities discussed above. These activities will typically disturb a relatively small area of soft sediment habitat, which is broadly represented in the Operational Area and wider NWS region. The removal of marine growth by water jetting or brushes, is likely to disturb a relatively small area of marine growth, and may be re-settled post well intervention activities. The estimated overall extent of such direct seabed disturbance is extremely small in relation to the extent of the soft sediment habitats which are broadly represented within the Operational Area and the wider NWS province. ***Ancient Coastline at 125 m depth contour*** The Operational Area overlaps the Ancient Coastline at 125 m Depth Contour KEF. The ecological values of the KEF are described in **Section 4.5.3**. These include the potential of enhanced productivity associated with sessile communities due to increased availability of nutrients and enhanced vertical mixing of water layers. While the Operational Area overlaps a small portion of the KEF, the ecological functions of the KEF (submerged coastline providing areas of hard substrate, diverse biological assemblages, enhanced productivity) are not predicted to be impacted by the Petroleum Activities Program. ROV activities near the seafloor may result in localised impacts to deep-water biota, as a result of elevated turbidity and the clogging of respiratory and feeding parts (turbidity) of filter-feeding organisms. However, elevated turbidity would only be expected to be very localised, and temporary, and is therefore not expected to have any significant impact to environment receptors, particularly given the low densities of benthic organisms at the water depths of the Operational Area. Based on the above assessment, seabed disturbance and water quality impacts are unlikely to impact on the ecological value of the Operational Area and surrounding environment, including the Ancient Coastline at 125 m Depth Contour KEF. Cumulative impacts in relation to other relevant petroleum activities are not predicted to occur as it is expected that any activities associated with the Petroleum Activities Program will be spatially and temporally separated from activities associated with the GWA infrastructure.
Summary of Potential Impacts to Environmental Value(s)
Given the adopted controls, seabed disturbance from the Petroleum Activities Program will result in localised impacts with no lasting effect (<1 month) to marine sediment, water quality and habitat (but not ecosystems) (i.e. Environment Impact F).

Demonstration of ALARP

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)*[6]	*Benefit/Reduction in Impact*	*Proportionality*	*Control Adopted*
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				

1 Qualitative measure

Any wet parked items will be tracked and removed from the seabed.	F: Yes. CS: Minimal cost. Standard practice.	Removing wet parked items will reduce the duration of impact.	Benefits outweigh cost/sacrifice	Yes **C 2.1**
Environmental monitoring of the seabed prior to and following the Petroleum Activities Program to assess any impacts to seabed.	F: Yes. CS: Significant. Monitoring of the seabed 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 about the seabed above what is provided by the Woodside Well Location and Site Appraisal Data Sheet. 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. Although adoption of this control could be used to verify EPOs, alternative controls identified also allow demonstration that the environmental outcome has been met based on the nature of the activity (i.e. predictable impacts) and relatively low sensitivity of the area.	No
Professional Judgement – Eliminate				
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 well intervention activities. 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. 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 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 2.6.1**), Woodside considers the adopted controls appropriate to manage the impacts of benthic habitat disturbance from ROV operations, subsea cleaning and preparation, acoustic transponder placement and ROV operations. 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 Statement The impact assessment has determined that, given the adopted controls, disturbance to benthic habitats from the Petroleum Activities Program may result in slight and short term effects (<1 year) or lower to habitat (but not affecting ecosystems function), physical and biological attributes of benthic habitats. The adopted controls are considered consistent with industry good practice and professional judgement. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of impact.			
Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 3 No impacts to benthic habitats greater than a consequence level of F[7] inside the Operational Area during the Petroleum Activities Program.	**C 2.1** Monitor inventory deployed to field and track removal of equipment during activity, and list residual infrastructure.	**PS 2.1.1** Any wet parked items will be tracked and removed from the seabed.	**MC 2.1.1** Surveys demonstrate removal of wet parked items.

[7] Defined as localised impacts with no lasting effect (<1 month) to marine sediment, water quality and habitat (but not ecosystems)

6.6.3 Routine Acoustic Emissions: Generation of Noise from WIV, Project Vessels, WIV, and Positioning Equipment

Context		
WIV Operations – **Section 3.8.1** Vessel Operations – **Section 3.8.1** Underwater Acoustic Positioning – **Section 3.6.8**	Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary														
Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Generation of acoustic signals from DP systems on WIV and support vessels.						X		A	F	-	-	GP PJ	Broadly acceptable	EPO 4
Generation of acoustic signals from WIV and support vessels during normal operations.						X		A	F	-	-			
Generation of acoustic signals from positioning equipment (transponders)						X		A	F	-	-			

Description of Source of Impact

Project vessels and the WIV will generate noise both in the air and underwater, due to the operation of thruster engines, propeller cavitation, intervention operations, on-board machinery etc. These noises will contribute to and have the potential to exceed ambient noise levels which typically 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).

WIV, Support vessels and Operation of Dynamic Positioning Systems

Vessels used for the Petroleum Activities Program are detailed in **Section 3.8**. The sound levels and frequencies generated by vessels varies with the size of the vessel, speed, engine type and the activity being undertaken. Large vessels typically produce higher sound levels at lower frequencies than small vessels, although significant variation may be found among vessels within the same group (Jiménez-Arranz et al., 2020). Sound levels tend to be greatest when engaging the throttle or thrusters, such as use of DP or when vessels are operating under load, compared with slow moving or idling vessels (Salgado Kent et al. 2016).

The WIV and general support vessels will not anchor within the Operational Area; therefore, vessels will use DP. Vessels maintain DP for varying durations during the Petroleum Activities Program, depending on the activity being undertaken. Sources of sound from the WIV are expected to occur primarily from cavitation in thrusters whilst under DP (Connell et. al., 2021).

The noise modelling conducted by JASCO for the Cooper Energy BMG P&A activities in the Bass Strait (Connell et al, 2021) provides a suitable analogue to the size and type of WIV and support vessels planned for use during the TPA03 well intervention. The WIV was modelled whilst under DP with a PSV (also under DP during resupply) in 132 m water depth at the Manta-2A well location. Given the water depth at the TPA03 location is 115 m, the modelling results for the WIV plus PSV at the Manta-2A well location are regarded as a suitable analogue for the same and similar vessels under DP at the TPA03 location.

Connell (2021) modelled the underwater broadband energy source level (ESL) for the WIV as 188.9 dB re 1 µPa (10 Hz to 25 kHz) at a water depth of 132.2 m in the Bass Strait. Broadband ESL for support vessels was also determined as 185.2 dB re 1 µPa (10 Hz to 25 kHz). Similarly, McCauley (1998) measured underwater broadband noise equivalent to approximately 182 dB re 1 µPa at 1 m (rms SPL) from a support vessel holding station using DP in the Timor Sea; Hannay et al. (2004) and McCauley (2005) have measured source level for support vessel with DP of 186 dB re 1 µPa at 1 m. Whilst the specific support vessels for this activity have not been identified, it is expected that they will be of a similar size to those described, and similar noise levels will be generated by vessels used for this Petroleum Activities Program.

The WIV may be on location for between 5 to 14 days, between December 2022 and March 2023. When ongoing, activities will be 24 hours per day, seven days per week.

Cumulative noise from the WIV and/or multiple project vessels operating in the Operational Area may result in slightly elevated noise levels, though this is not expected to significantly increase impacts to marine fauna. The WIV with a support vessel on standby are conservatively expected to have an overall combined source level of 194.9 dB re 1 µPa (rms SPL), which represents a doubling of noise output from the single loudest source (i.e. 188.9 dB + 6 dB). (Connell et al., 2021).

Underwater positioning equipment

An array of long baseline (LBL) and/or ultra-short baseline (USBL) transponders may be installed on the seabed to support intervention activities (**Section 3.6.8)**. These will be installed within a 500 m radius from the well and will be active whilst the WIV is on location.

Transponders typically emit pulses (impulsive noise) of medium frequency sound, generally within the range 21 to 31 kHz. The estimated SPL would be 180 to 206 dB re 1 µPa at 1 m (Jiménez-Arranz et al., 2020). 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). Transmissions from USBL transponders are similar to LBL transponders.

Table 6-2: Sources of aspect, and the operating frequency and noise levels

Source of aspect	Operating frequency (kHz)	Source Level		Sound category	Reference
		SPL (L_p)	***PK (L_{pk})***		
WIV (DP)	0.01-25	188.9	-	Continuous	Connell (2021)
Support vessels (DP)	0.01-25	181-186	-	Continuous	Connell (2021) McCauley (1998, 2005) Hannay (2004)
Positioning equipment	21-31	180-206	-	Impulsive	Jimenez-Arranz et al. (2020)

Cumulative noise sources

Cumulative noise from activities conducted under the GWA Operations EP in nearby infrastructure, may result in slightly elevated noise levels, though this is not expected to significantly increase impacts to marine fauna. Activities conducted under the GWA Operations EP would typically consist of one IMMR project vessel, and are unlikely to occur concurrently to well intervention activities.

Impact Assessment

Receptors

The Operational Area is located in waters 113 m deep. The fauna associated with this area will be predominantly pelagic species of fish, with migratory species such as cetaceans, whale sharks and marine turtles potentially present in the area seasonally (**Section 4.5.2.5**). Noise interference is a key threat to a number of migratory and threatened cetaceans and marine turtles identified as potentially occurring within Operational Area.

The Operational Area overlaps BIAs for flatback turtles (internesting) and whale sharks (foraging). Flatback turtles nest in the region between October and March, however, given water depths and distance from shore, the area does not constitute foraging or important internesting habitat. Satellite tracking of flatback turtle nesting populations (Barrow Island and mainland sites) indicates this species travels to the east of Barrow Island between nesting events, within WA mainland coastal waters less than 70 m deep (Chevron Australia Pty Ltd, 2015).

Whale sharks will be present between March and November. Cetaceans, such as pygmy blue whales and humpback whales, and other marine turtle species may also be present within the Operational Area seasonally; however, no

BIAs or other important areas for these species overlap the Operational Area. The BIAs for migrating humpback and pygmy blue whales are located 25 km and 43 km from the Operational Area respectively.

Whilst the Ancient Coastline KEF may be associated with outcroppings of hard substrate, no evidence of significant reefs associated with such outcroppings has been found in the Operational Area. Some demersal fish are likely to be associated with subsea infrastructure such as pipelines (McLean et al. 2017).

Potential Impact of Noise

Elevated underwater noise can affect marine fauna, including cetaceans, fish, turtles, 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)
- 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.

<u>Sound Propagation</u>

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.

<u>Marine Mammals</u>

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 (NRC, 2003; Erbe, 2012; Rolland et al., 2012). There is little information available regarding call masking in whales (Richardson et al., 1995), although it has been suggested that an observed lengthening of calls in response to low-frequency noise in humpback whales and orcas may be a response to auditory masking (Fristrup et al., 2003; Foote et al., 2004). Exposure to intense impulsive noise may be more hazardous to hearing than continuous noise.

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 6-3**. These thresholds have been adopted by the United States National Oceanic and Atmospheric Administration (NOAA) (National Marine Fisheries Service [NMFS], 2018; Southall et al., 2019; NOAA 2018).

Table 6-3: Thresholds for PTS, TTS and behavioural response onset in low-frequency (LF) and high-frequency (HF) cetaceans for impulsive and continuous noise

Hearing group	Impulsive			Continuous		
	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)	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	183	168	160	199	179	120
HF cetaceans	185	170		198	178	

Source: NMFS (2014, 2018; Southall, 2019; NOAA, 2018).

<u>Marine Turtles</u>

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, indicating that they have the highest hearing sensitivity in the frequency range 100 – 700 Hz (Bartol and Musick, 2003). 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).

Acute noise, or temporary exposure to loud noise, may result in the avoidance of important habitats and in some situations physical damage to marine turtles. McCauley et al. (2000) observed the behavioural response of caged sea turtles—green (Chelonia mydas) and loggerhead (Caretta caretta)—to an approaching seismic airgun. For received levels above 166 dB re 1 μPa (SPL), the turtles increased their swimming activity and above 175 dB re 1 μPa (SPL) they began to behave erratically, which was interpreted as an agitated state.

Proposed sound exposure thresholds for marine turtles are summarised in **Table 6-4** below. A Popper et al. (2014) review assessed thresholds for marine turtles and found qualitative results that the risk of behavioural disturbance was high for near field exposure, moderate for intermediate field exposure and low for far field exposure (Popper et al., 2014).

Table 6-4: Thresholds for PTS, TTS and behavioural response onset in marine turtles for impulsive and continuous noise

Hearing group	Impulsive			Continuous		
	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)**	**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)**
Marine turtles	204	189	166* 175⁺	220	200	(N) High (I) Moderate (F) Low

*Source: PTS and TTS thresholds (Finneran et al., 2017), * behavioural response threshold (NSF 2011), ⁺ behavioural disturbance threshold (McCauley et al. 2000).*

Note: The sound units provided in the table above for continuous noise 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).

Fish

The majority of fish species detect sounds from <50 Hz up to 500-1500 Hz (Popper and Hawkins, 2019). A smaller number of species can detect sounds over 3 kHz, while very few species can detect ultrasound over 100 kHz (Ladich and Fay, 2013). The critical issue for understanding whether an anthropogenic sound will affect the hearing of a fish is whether it is within the hearing frequency range of the fish and loud enough to be detectable above background ambient noise.

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 (including whale sharks) 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 considering differences in fish physiology; these are presented in

Table 6-5.

Table 6-5: Thresholds for PTS, TTS and behavioural response onset in fish, sharks and rays for impulsive and continuous noise

Hearing group	Impulsive			Continuous		
	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)**	**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)**
Fish: no swim bladder	216	186	(N) High (I) Moderate (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder not involved in hearing	203	186	(N) High (I) Moderate (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder involving hearing	203	186	(N) High (I) High (F) Moderate	170 dB rms SPL for 48-hours	158 dB rms SPL for 12-hours	(N) High (I) Moderate (F) Low
Impulsive noise:						

All criteria are presented as sound pressure, even for fish without swim bladders, since no data for particle motion exist.
Continuous noise:
rms SPL: root mean square of time-series pressure level, useful for quantifying continuous noise sources.
Relative risk (high, moderate, or low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).
Source: Popper et al. (2014)

WIV and Support Vessels Noise Impacts

Cetaceans

Connell et al. (2021) modelled acoustic emissions from the WIV, and with a project support vessel on DP, in similar water depths in the Bass Strait to the Operational Area. As described above, the WIV and support vessels are conservatively expected to have source levels of 188.9 dB re 1 µPa (rms SPL) and 185.2 dB re 1 µPa (rms SPL) respectively.

Modelling of sound propagation loss for the WIV on DP, predicted that noise levels would drop below 120 dB re 1 µPa (behavioural response threshold for continuous noise sources; **Table 6-3**) within 25.6 km. The modelling also estimated propagation of combined noise from the WIV and support vessel alongside, both operating on DP. The modelling predicted combined noise levels from the two vessels would drop below 120 dB within 28.7 km.

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 Operational Area, 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.

Table 6-6 describes maximum horizontal distances for PTS and TTS onset. For the WIV operating on DP, PTS onset is predicted to occur within 0.1 km for LF cetaceans and is not predicted for HF cetaceans. For TTS onset, the maximum predicted distance was 3.49 km for LF cetaceans and 0.05 km for HF cetaceans. For the WIV with support vessel alongside, PTS onset could occur within 0.11 km for LF cetaceans and is not predicted for HF cetaceans. TTS onset could occur within 3.82 km and 0.06 km for LF and HF cetaceans respectively. However, PTS and TTS criteria exceedances are based upon exposure for 24-hours by a stationary receptor. The SEL_{24h} criterion is a cumulative metric that reflects the dosimetric impact of sound energy accumulated over a 24-hour period and assumes that an animal is consistently exposed to such noise levels at a fixed location. The radii that correspond to SEL_{24h} therefore represent a highly unlikely scenariofor SEL-based exposure since, more realistically, marine fauna would not stay in the same location or at the same range for 24-hours (Connell et al., 2021). PTS and TTS thresholds are highly unlikely to be exceeded for cetaceans transiting through the Operational Area. Furthermore, the Operational Area is surrounded by open water, with no restrictions (such as shallow waters, embayments) on an animal's ability to avoid the activities.

Pygmy blue and humpback whales may occur in Operational Area, during migratory periods, as well as other transitory cetaceans. Interactions between whales and vessels typically results in avoidance behaviour, with whales generally moving away from vessels (Bauer 1986; Stamation et al., 2010). Therefore, potential impacts to pygmy blue whales and humpback whales from predicted noise levels are expected to be limited to behavioural impacts within a localised area around vessels with no lasting effect. As the pygmy blue whale migration BIA is 39 km from the Operational Area and modelling of sound propagation for the WIV on DP predicted that noise levels would drop below the behavioural response threshold for continuous noise sources (120 dB re 1 uPa) within 25.6 km, the activity is not expected to cause a behavioural response in pygmy blue whales within the migration BIA.

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 Operational Area, 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.

Table 6-6: Maximum (R_{max}) horizontal distances (km) to frequency-weighted SEL_{24h} PTS and TTS thresholds for cetaceans

Hearing group	Frequency weighted SEL_{24h} threshold ($L_{E,24h}$; dB re 1 µPa²·s)	WIV operations (R_{max} distance, km)	WIV operations with support vessel on DP (R_{max} distance, km)
PTS			
LF cetaceans	199	0.1	0.11
HF cetaceans	198	-	-
TTS			
LF cetaceans	179	3.49	3.82
HF cetaceans	178	0.05	0.06

NB. A dash indicates the level was not reached within the limits of the modelled resolution (20 m).

Marine Turtles

Five species of marine turtle may occur in the Operational Area: flatback, green, hawksbill, loggerhead and leatherback turtles. As discussed above, there is a paucity of data regarding responses of marine turtles to continuous underwater noise. However, given the thresholds outlined in **Table 6-4**, it is reasonable to expect that marine turtles may demonstrate avoidance or attraction behaviour to the noise generated by the Petroleum Activities Program.

As described above, acoustic modelling (Connell et al., 2021) was conducted for scenarios including the WIV, and the WIV and support vessel on DP. Based on the application of the multiple SEL_{24h} thresholds (Finneran et al., 2017), PTS was not predicted to occur within the modelling resolution (20 m), and turtles could potentially experience TTS within 0.09 km from the WIV and 0.11 km from the WIV with support vessel on DP alongside (**Table 6-7**). However, marine turtles within the Operational Area are expected to be transient, and unlikely to remain with 110 m of the vessels for 24-hours, and therefore TTS thresholds are not expected to be reached. Behavioural impacts to marine turtles from continuous noise sources generated by the Petroleum Activities Program are expected to be short-term and localised,

Table 6-7: Maximum predicted horizontal distances (R_{max}) to PTS and TTS thresholds for marine turtles

Hearing group	Sound exposure threshold	WIV operations (R_{max} distance, km)	WIV operations with support vessel on DP (R_{max} distance, km)
Marine turtles	**PTS**		
	220 dB re 1 µPa².s (SEL_{24h})	-	-
	TTS		
	200 dB re 1 µPa².s (SEL_{24h})	0.09	0.11

N.B. A dash indicates the threshold was not reached within the limits of the modelling resolution (20 m).

Fish, Sharks and Rays

Sound produced by the project vessels on DP could cause recoverable injury or TTS to some fish species with a swim bladder involved in hearing, but only if the fishes are in very close proximity to the sound source for extended periods.

It is expected that potential impact to demersal and pelagic fish and sharks/rays will be limited to a behavioural response. Behavioural responses are expected to be short-lived, with duration of effect less than or equal to the duration of exposure. While fish may initially be startled and move away from the sound source, once the source moves on fish would be expected to move back into the area.

The Operational Area overlaps a small proportion of the foraging BIA for whale sharks and they may be seasonally present between March and November (with the annual peak aggregation at Ningaloo Reef between April and May) (**Figure** 4-4). Behavioural disturbance to whale sharks as a result of vessel noise may result in a temporary deviation on their migration route, which covers a wide area and is not spatially restricted. Potential impacts from acoustic emissions on fish, sharks and rays are likely to be restricted to localised and temporary avoidance behaviour whilst transiting through the Operational Area, and individuals impacted are unlikely to represent a significant proportion of the population with the Operational Area and the NWS region overall.

Cumulative impacts

The Operational Area is located 12 km from the producing GWA facility and 0.18km East of the nearest shipping fairway. Therefore, there is the potential for cumulative impacts from underwater noise emissions associated with shipping

vessels and GWA IMR vessel activities. The combined sound fields are likely to result in a marginal increase the maximum range to the behavioural response threshold for LF cetaceans (i.e. >15 km). Notably, IMR activities that may occur at the GWA platform are likely to be conducted by one project vessel, meaning this additional cumulative noise source would be very limited. Therefore, the potential for significant cumulative impacts from underwater noise emissions to occur from concurrent activities around the GWA platform is minimal.
Summary of Potential Impacts to environmental value(s)
It is considered that noise generated by the WIV and support vessels and positioning transponders will not result in a potential impact greater than localised impacts, with no lasting effect on marine fauna.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[8]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures: • Support vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. • Support vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean or turtle shows signs of being disturbed, support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. • Support vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	F: Yes. 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 adopted based on legislative requirements – must be adopted.	Yes **C 3.1**

1 Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[8]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Good Practice				
Use of aircraft to carry out visual observations for pygmy blue whale foraging activity (aerial survey).	F: Yes CS: Time/ cost associated with chartering aircraft and use of dedicated MFOs.	Aerial surveys could assist in identifying pygmy blue whale foraging activity over a larger monitoring zone.	Disproportionate. The cost/ sacrifice outweighs benefit gained. As the Operational Area does not overlap the pygmy blue whale migration and foraging BIAs, presence of PBWs carrying out opportunistic foraging activities in the area is not likely. Adequate observations are able to be made from support vessel bridge crews. It is not expected that an aircraft would add significantly more value than this, to warrant deployment.	No
Move support vessel(s) away from WIV (>3.6 km) if foraging pygmy blue whale(s) observed within 500 m – when support vessel is not being used to perform functionality as required by Safety Case	F: Yes 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 foraging Pygmy Blue Whales	Disproportionate. The cost/ sacrifice outweighs benefit gained. As the Operational Area does not overlap the pygmy blue whale migration and foraging BIAs, presence of PBWs carrying out opportunistic foraging activities is not likely.	No
The use of dedicated Marine Fauna Observers (MFOs) on project vessels for the duration of the Petroleum Activities Program to watch for whales and provide direction on and monitor compliance with Part 8 of the EPBC Regulations.	F: Yes. However, activity support 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. In the event of a cetacean (or other sensitive fauna) in close proximity to project	Given that support vessel bridge crews already maintain a constant watch during operations, additional MFOs would not further reduce the likelihood or consequence of impact.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[8]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
	vessels, it is unlikely that DP (the most significant source of underwater noise expected during the Petroleum Activities Program) will be deactivated given it is a safety critical requirement for project vessels to hold station. As such, an MFO implementing management / shut down zones is considered to be ineffective. CS: Additional cost of MFOs			
Undertake site-specific acoustic modelling	F: Yes, feasible to undertake site-specific modelling; however, the generation of noise from these sources is already well understood and this noise cannot be eliminated due to operating requirements. CS: Additional cost of modelling.	Assessment of potential impacts of underwater acoustic emissions based on applicable analogue modelling results. Given that noise cannot be eliminated due to operating requirements, modelling would not further reduce the likelihood or consequence of impact, noting that no activities of significant noise generation (i.e. explosives) are proposed.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
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 safety exclusion zone around the HIV. CS: Introduces unacceptable safety risk.	Not considered – control not feasible.	Not considered – control not feasible.	No
Eliminate the use of DP on vessels during the Petroleum Activities Program.	F: No. Both WIV and support vessels are required to reliably hold station during the Petroleum Activities Program. Failure to do so may lead to loss of separation between vessels and infrastructure. This would result in unacceptable safety and environmental risk. CS: Not considered, control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[8]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Elimination of noise from the project vessels (including WIV and support vessels), and positioning transponders.	F: No. The generation of noise from these sources cannot be eliminated due to operating requirements. CS: Inability to conduct the Petroleum Activities Program. Loss of project.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Substitute				
Avoid peak migration periods for migratory cetaceans.	F: Yes. Migration periods for cetaceans that may occur in the Operational Area (pygmy blue and humpback whales) are well known. CS: Potentially significant. Woodside has not finalised the schedule for the Petroleum Activities Program, and some activities may be undertaken on an opportunistic basis and in succession to one another while a vessel is available. Precluding operations during cetacean migration periods may impose a considerable cost and operational burden, while resulting in little environmental benefit.	No overlap between Operational Area and pygmy blue whale and humpback whale migration BIAs. Avoiding migration periods would reduce the likelihood of impacts to cetaceans. However, given that the predicted impacts from noise sources associated with the Petroleum Activities Program are considered to be localised with no lasting effect, the overall benefit is minimal.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
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), Woodside considers the potential impacts from noise generated from the Petroleum Activities Program 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 Statement The impact assessment has determined that noise disturbance from the WIV, support vessels and transponders may result in localised impacts to species with no lasting effect. BIAs overlapping the Operational Area include flatback turtle internesting and whale shark foraging BIAs. Migration BIAs for humpback and pygmy blue whales are located 25 and 43 km from the Operational Area, respectively. 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 6.8**). The adopted controls are considered consistent with industry good practice and professional judgement. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of impact.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 4 No impacts to marine fauna from noise emissions with a consequence level greater than F[9] during the Petroleum Activities Program.	**C 3.1** EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures: • Support vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. • Support vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean or turtle shows signs of being disturbed, support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. • Support vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	**PS 3.1.1** Vessels will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to manage the risk of fauna collision.	**MC 3.1.1** Records demonstrate no breaches with EPBC Regulations 2000 Part 8 Division 8.1 Interacting with cetaceans and Woodside Marine Charterers Instructions. **MC 3.1.2** Records demonstrate reporting cetacean ship strike incidents to the National Ship Strike Database.

[9] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors'.

6.6.4 Routine and Non-routine Discharges: WIV and Support Vessels

Context		
Project Vessels– **Section 3.8**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Routine discharge of sewage, grey water and putrescible wastes to marine environment from project vessels			X					A	F	-	-	LCS	Broadly Acceptable	EPO 5
Routine discharge of deck and bilge water to marine environment from project vessels			X					A	F	-	-			

Routine discharge of brine or cooling water to the marine environment from project vessels			X					A	F	-	-			

Description of Source of Impact

Vessel and HIV Operations

Sewage, grey water and putrescible wastes

The WIV and project vessels routinely generate small volumes of treated sewage, putrescible waste and grey water (impact assessment based on approximate discharge of 15 m^3) which is discharged to the marine environment,using an average volume of 75 L/person/day. Using a rate of 0.375 m^3/person/day as a guide (NERA, 2017), it is expected that vessel discharges will range from ~ 45 m^3/day from the WIV (maximum 120 people onboard) to ~ 7.5 m^3/day from a support vessel.

- Food waste:
- Vessel crew and passengers will generate food waste, estimated to be in the order of 1—2 kg per person per day, which will be discharged to the marine environment under controlled conditions.
- 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 WIV or support vessel. Bilge water can contain water, oil, detergents, solvents, chemicals, particles and other liquids, solids or chemicals.
- Variable water discharge from WIV/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.
- Cooling water from machinery engines and brine water produced during the desalination process of reverse osmosis to produce potable water onboard project vessels and WIV.

Brine

Reverse osmosis (RO), distillation or desalination plants on board vessels and the WIV 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 to 50 percent 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 m^3/d.

Impact Assessment

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). 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 and short duration of the activity (WIV on station for 5 to 14 days), any routine and non-routine discharges of sewage and greywater and putrescible wastes from activities associated with the well intervention will result in no lasting change to water quality. Therefore, impacts to water quality within the operational area 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 Operational Area. 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.

Sediment Quality

Impacts associated with routine and non-routine deck and bilge water discharges will be limited to the area surrounding the discharge source of the vessel. Due to the dispersive nature of the discharges within the highly mixed offshore marine environment, any toxins associated with transient surface discharges from well intervention activities are not expected to reach marine sediments at concentrations that will result in notable changes to sediment quality.

Marine Fauna
Discharge of food waste into the marine environment has the potential to attract some opportunistic marine fauna including fish and seabirds to the area in response to the increased food availability or, indirectly because of attraction of prey species. However, given the small quantities of food waste to be disposed, and the temporary nature of the activity, any attraction is likely to be minor, temporary and localised.
It is possible that marine fauna transiting the localised area may come into contact with vessel discharges (e.g. marine turtles, humpback whales, whale sharks, as they traverse the Operational Area, **Section 4.5.2**). Whilst the likely presence of marine fauna varies at different times of the year depending on migration, foraging and breeding patterns in the region, the potential for impact remains low due to the localised nature of discharges and rapid dilution in the open ocean waters of the Operational Area.
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 operational area. The Operational Area 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.
Aesthetic Values
The composition of sewage and greywater may include physical particulate matter such as solids composed of floating, settle able, colloidal and dissolved matter which can affect aspects of aesthetics such as ambient water colour, the presence of surface slicks/sheens and odour. However, given vessels will be transient during the discharge of sewage and greywater, this will promote mixing and dilution of the waste.
Given the distance of the project offshore, the proximity of water quality changes to the discharge source, the rapid consumption of matter by planktonic species and bacteria, and the spatial nature of tourism and recreation activities and coastal settlements (i.e. on or near the shoreline); impacts to receptors associated with changes in aesthetic values are not expected to occur.
Summary of Potential Impacts to Environmental Value(s)
The overall impact significance level for routine and non-routine discharges from vessels is F based on no lasting effect to marine fauna.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[10]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 95 – Marine 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. CS: Minimal cost. Standard practice.	No reduction in likelihood or consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 4.1**

1 Qualitative measure

Marine Order 96 – Marine pollution prevention – sewage (as appropriate to vessel class) which includes the following requirements: • a valid International Sewage Pollution Prevention (ISPP) Certificate, as required by vessel class • a sewage treatment plant approved by AMSA or an issuing body • a sewage comminution and disinfection system • a sewage holding tank sized appropriately to contain all generated waste (black and grey water) • discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 nm from the nearest land • 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 • discharge of sewage will occur at a moderate rate while support vessel is proceeding (more than four knots), to avoid discharges in environmentally sensitive areas.	F: Yes. CS: Minimal cost. Standard practice.	No reduction in likelihood or consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 4.2**
Where there is potential for loss of primary containment of oil and chemicals on the WIV, deck drainage must be collected via a closed drainage system, e.g. drill floor.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of contaminated deck drainage water being discharged to the marine environment. No change in consequence would occur.	Benefits outweigh cost/sacrifice.	**Yes** **C 4.3**
Marine Order 91 – Marine pollution prevention – oil (as relevant to vessel class) requirements, which includes mandatory measures for processing oily water before discharge: • Machinery space bilge/oily water shall have International Maritime Organisation (IMO)-approved oil filtering equipment (oil/water	F: Yes. CS: Minimal cost. Standard practice.	No reduction in likelihood or consequence would result.	Controls based on legislative requirements – must be adopted.	Yes **C 4.4**

separator) with an online monitoring device to measure OIW content to be less than 15 ppm before discharge. • IMO-approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capable of recirculating if OIW concentration exceeds 15 ppm. • 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. • There shall be a waste oil storage tank available, to restrict oil discharges. • If machinery space bilge discharges cannot meet the oil content 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. • Valid International Oil Pollution Prevention (IOPP) Certificate.				
Chemicals will be selected with the lowest practicable environmental impacts and risks subject to technical constraints	F: Yes. 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 **C 4.5**
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, putrescible and bilge wastes.	F: Not feasible. Would present additional safety and hygiene hazards resulting from the storage, loading and transport of the waste material. Distance of activity offshore also makes the implementation of this control not feasible. 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 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 2.6.1**), Woodside considers the adopted controls appropriate to manage the impacts of planned routine discharges from the WIV and project 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 Statement The impact assessment has determined that, given the adopted controls, routine and non-routine discharges from the WIV and support vessels may result in localised impacts with no lasting effect (<1 month) to water quality and species. BIAs within the Operational Area include pygmy blue whale distribution, flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. However, these species are not expected to be impacted. The adopted controls are considered consistent with industry legislation, codes and standards, and professional judgement and meet the requirements of Australian Marine Orders. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of impact.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 5 No impact to water quality greater than a consequence level of F[11] from discharge of sewage, greywater, putrescible wastes, bilge and deck drainage to the marine environment during the Petroleum Activities Program.	**C 4.1** Marine Order 95 – Marine pollution prevention – garbage (as appropriate to vessel class) which requires putrescible waste and food scraps be passed through a macerator, so they are able to pass through a screen with no opening wider than 25 mm.	**PS 4.1.1** WIV and support vessels compliant with Marine Order 95 – Marine pollution prevention – garbage.	**MC 4.1.1** Records demonstrate WIV and support vessels are compliant with Marine Order 95.
	C 4.2 Marine Order 96 – Marine pollution prevention – sewage (as appropriate to vessel class) which	**PS 4.2.1** WIV and support vessels compliant with Marine Order 96 – Marine pollution prevention – sewage (as	**MC 4.2.1** Records demonstrate WIV and support vessels are compliant with Marine Order 96.

[11] Defined as 'F - No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors'.

	includes the following requirements: • a valid ISPP Certificate, as required by vessel class • a sewage treatment plant approved by AMSA or an issuing body • a sewage comminution and disinfection system • a sewage holding tank sized appropriately to contain all generated waste (black and grey water) • discharge of sewage which is not comminuted or disinfected will only occur at a distance of more than 12 nm from the nearest land • 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 • discharge of sewage will occur at a moderate rate while support vessel is proceeding (more than four knots), to avoid discharges in environmentally sensitive areas.	appropriate to vessel class).	
	C 4.3 Where there is potential for loss of primary containment of oil and chemicals on the WIV, deck drainage must be collected via a closed drainage system, e.g. drill floor.	**PS 4.3.1** Contaminated drainage contained, treated and/or separated before discharge.	**MC 4.3.1** Records demonstrate WIV has a functioning bilge/oily water management system.
	C 4.4 Marine Order 91 – Marine pollution prevention – oil (as relevant to vessel class) requirements, which includes mandatory measures for processing	**PS 4.4.1** Discharge of machinery space bilge/oily water meet oil content standard of less than 15 ppm without dilution.	**MC 4.4.1** Records demonstrate discharge specification met for WIV and support vessels.

	oily water before discharge: • Machinery space bilge/oily water shall have IMO-approved oil filtering equipment (oil/water separator) with an online monitoring device to measure OIW content to be less than 15 ppm before discharge. • IMO-approved oil filtering equipment shall also have an alarm and an automatic stopping device or be capable of recirculating if OIW concentration exceeds 15 ppm. • 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. • There shall be a waste oil storage tank available, to restrict oil discharges. • If machinery space bilge discharges cannot meet the oil content 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. • Valid IOPP Certificate.		
	C 4.5 Chemicals will be selected with the lowest practicable environmental impacts and risks subject to technical constraints	**PS 4.5.1** Reduces to ALARP the impact potential of all chemicals intended or likely to be discharged into the marine environment	**MC 4.5.1** Records demonstrate chemical selection, assessment and approval process for selected chemicals is followed

6.6.5 Routine and Non-routine Discharges: Subsea Fluids, Tank wash and Marine Riser Clean-out

Context		
Subsea Intervention Riser System and Well Control Package Installation – **Section 3.6.3** Subsea Equipment Preservation Chemicals – **Section 3.6.6** Marine Growth Removal – **Section 3.6.9** Project Fluids – **Section 3.7**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	*Environmental Value Potentially Impacted*							*Evaluation*						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Routine and non-routine discharge of tank wash residue		X	X		X			A	F	-	-	GP PJ	Broadly Acceptable	EPO 6
Routine and non-routine discharge of subsea intervention riser system fluids		X	X		X	X		A	F	-	-			
Routine and non-routine discharge of chemicals used for removal of marine growth.		X	X		X	X		A	F	-	-			
Routine and non-routine discharge of marine riser contents		X	X		X	X		A	F					

Description of Source of Impact

Tank Wash Residue/Bulk Discharge

Well intervention activities may require the use of an inhibited MEG/brine package, to assist with equalising pressure. The maximum quantity of MEG/brine package carried will be 450 bbl and will be stored in designated brine tanks on the WIV (**Section 3.6.6**). Following completion of all intervention operations, excess MEG/brine fluids will be discharged back at shore base. It is recognised that there may be a contingency scenario that requires bulk discharge of remaining MEG/brine fluids overboard. The pits and associated equipment/infrastructure are typically cleaned out at the completion of operations. Tank wash residue is operationally discharged with less than 1% oil contamination by volume, with no contamination expected. Tank wash residue over 1% oil by volume is sent to shore for disposal. No oil contamination is expected, given no hydrocarbons are planned for use.

Subsea Fluids (Well Intervention Fluids, Control Fluids and Other Subsea Fluids)

Subsea fluids are likely to be released during well intervention activities including during Xmas tree valve actuation. Should repair activities be required, including pressure/leak testing, valve functioning, flushing, hot stab change out or Xmas tree repair or replacement, environmental discharges may occur. All well intervention activities that result in subsea control fluid discharges are likely to only discharge small, intermittent volumes**.**

The WOCS/WORS is connected via a riser. The WOCS/WORS is operated using open hydraulic systems (utilising water-based control fluids). Each time a pressure and function test schedule is undertaken, between 1000L and 3000

L of water-based fluid is released to the marine environment, of this approximately 4% is control fluid additive (**Section 3.6.3**). WOCS/WORS operation includes function and pressure testing approximately every 21 days, and a function test approximately every seven days, excluding the week a pressure test is conducted (**Section 3.6.3**).

Marine Riser Contents

An EDS (Emergency Disconnect Sequence) may be implemented if the WIV is required to rapidly disengage from the well. EDS aims to leave the Xmas tree and Lower Riser Package (LRP) of the WOCS/WORS in a secure condition but will result in the loss of the fluids/gases in the annular space between the EDS and LRP following disconnection (<1 m^3). Riser column contents will be retained by the EDP retainer valve and pressure will be displaced via the surface choke manifold.

Marine Growth Removal

During marine growth removal activities, it may be necessary to remove marine growth from the Xmas tree and wellhead using acid (typically sulphamic acid).

Impact Assessment

Pelagic and benthic habitats in the Operational Area are considered to be of low sensitivity (no known significant epibenthic habitat or infauna habitat). Although the Ancient Coastline at 125 m Depth Contour KEF overlaps with the Operational Area, the values and sensitivities of this KEF occur on a broad scale outside of the Operational Area (**Section 4.5.3**). Coupled with the low toxicity of the fluids to be used for the Petroleum Activities Program, the likelihood of any significant impact to marine biota is considered low.

Tank wash residue/Bulk Discharge

Unused MEG/brine may be disposed onshore or unused product and tank wash may be discharge to the marine environment within the Operational Area. Tank wash residue is operationally discharged with less than 1% oil contamination by volume, with no contamination expected (**Section 3.6.4**). Tank wash residue over 1% oil by volume is sent to shore for disposal. MEG is considered a PLONAR chemical, with low potential for toxicity and bioaccumulation. Impacts to water quality are likely to be localised and temporary, given the relatively small volume and concentration of hydrocarbon in the discharge, low toxicity, and the rapid dispersion in the open ocean environment of the Operational Area.

Subsea Fluids (WOCS/WORS / Xmas tree and Well Intervention Activity 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. 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.

Marine Riser contents

Marine riser contents that may be released to the marine environment may result in a localised decline in water quality. However, given the open ocean environment, hydrographic conditions, relatively small discharge volumes, and temporary nature of the activity, any impacts on the marine environment are expected to be negligible.

Marine Growth Removal

The use of water jetting and acid washing 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 intervention activities to take place. Due to the very minor quantities of acid used, the limited duration and rapid dispersion in the water column, impacts to the marine environment are expected to be negligible.

Summary of Potential Impacts to Environmental Value(s)				
The overall impact significance level for routine and non-routine discharges from subsea fluids is F based on no lasting effect on water quality and therefore it is not expected that there will be impacts to marine fauna.				
Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[12]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				
Fluids and additives intended or likely to be discharged to the marine environment will have an environmental assessment completed before use.	F: Yes. 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 **C 5.1**
Chemical reviews will be performed on all previously approved chemicals to confirm potential chemical impacts are reduced to ALARP.	F: Yes. CS: Minimal cost. Standard practice.	Reviews will ensure chemicals selected for Drilling and Completions fluids remain ALARP.	Benefits outweigh cost/sacrifice.	Yes **C 5.2**
Professional Judgement – Eliminate				
Do not use control fluids.	F: No. Control fluids are critical to the operation of the WOCS/WORS. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Return bulk unused inhibited MEG/brine package for onshore disposal where possible.	F: Yes. CS: Minor	Transfer of excess MEG/brine package for onshore disposal would eliminate the bulk discharge to the marine environment and eliminate the likelihood and consequence of impacts from such activities.	Benefits outweigh cost/sacrifice.	Yes **C 5.3**
Professional Judgement – Substitute				

[13] Defined as 'F - No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors'.

No additional controls identified.				
Professional Judgement – Engineered Solution				
Tank wash residue will be measured for oil content before discharge.	F: Yes. CS: Minimal cost. Standard practice.	Ensuring less than 1% oil content will provide a small reduction in consequence when residue is discharged to the environment.	Benefits outweigh cost/sacrifice.	Yes **C 5.4**
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 2.6.1**), Woodside considers the adopted controls appropriate to manage the impacts of subsea fluids. 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 Statement The impact assessment has determined that, given the adopted controls, the discharge of routine and non-routine subsea fluids may result in localised impacts with no lasting effect (<1 month) to marine sediment, water quality and habitat (but not ecosystems). Feedback was received and issues raised have been considered in the impact assessment and finalisation of this EP. The adopted controls are considered consistent with industry good practice and professional judgement. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of impact.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 6 No impact to water quality or marine biota greater than a consequence level of F[13] from subsea fluids during the Petroleum Activities Program.	**C 5.1** Fluids and additives intended or likely to be discharged to the marine environment will have an environmental assessment completed before use.	**PS 5.1.1** All chemicals, planned to be used and intended or likely to be discharged to the marine environment reduced to ALARP using the chemical assessment process.	**MC 5.1.1** All chemicals, planned to be used and intended or likely to be discharged to the marine environment reduced to ALARP using the chemical assessment process.
	C 5.2 Chemical reviews will be performed on all previously approved chemicals to confirm potential chemical impacts are reduced to ALARP.	**PS 5.2.1** Acceptability of previously approved chemicals are re-evaluated to ensure ALARP and alternatives are considered.	**MC 5.2.1** Records confirm reviews have occurred, and any actions/changes are implemented.
	C 5.3 Unused MEG/brine will be returned to port/staging point for disposal where possible.	**PS 5.3.1** Return all unused MEG/Brine for onshore disposal where possible.	**MC 5.3.1** Records demonstrate that unused MEG/ brine is returned to port/ staging point for disposal where possible.
		PS 5.3.2 In a contingency scenario, bulk operational discharges must be conducted under WIV's permit to work (PTW) system.	**MC 5.3.2** Records confirm that the WIV has an appropriate PTW for bulk discharges, if required to be performed in a contingency scenario.

[13] Defined as 'F - No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors'.

	C 5.4 Tank wash residue will be measured for oil content before discharge.	**PS 5.4.1** Achieve oil concentration <1% by volume prior to discharge.	**MC 5.4.1** Records demonstrate that discharge criteria were met prior to discharge or contained.

6.6.6 Routine and Non-routine Atmospheric Emissions

Context		
Subsea Intervention Activities – **Section 3.6** Project Vessels and Support Activities – **Section 3.8** Contingent Activities – **Section 3.9**	Socioeconomic and Cultural – **Section 4.6**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Exhaust emissions from internal combustion engines and incinerators on WIV, support vessels and helicopters				X				A	F	-	-	LCS GP	Broadly acceptable	EPO 7
Venting at surface				X				A	F	-	-			
Small volume gas releases subsea				X				A	F	-	-			

Description of Source of Impact

DP Vessel Fuel Consumption

The Petroleum Activities Program is estimated to be completed between 5 to 14 days and when underway, activities will be 24 hours per day, seven days per week. 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 Vessel such as the proposed WIV will consume approximately 50t/d when compared to similar scenarios. Allowing for mobilisation assumptions and up to two weeks for Intervention activities it is expected that in this time 1050 tonnes of fuel maybe consumed.

Support Vessel Fuel Consumption

There is the potential for up to two Support Vessels to operate out of KBSB supporting the well intervention activity, although emissions produced will be substantially less than that of the MODU. Given that expected operation for the WIV is expected to be approximately 2 weeks and using an estimated fuel use of 5 t/d for support vessels (Energy Institute 2000), it is expected that approximately 140 tonnes of fuel would be consumed in this time.

Using an estimated fuel use of 600 L/r (Energy Institute 2000) and applying aviation fuel emissions factor from NGER. The potential for multiple helicopter runs has been considered in greenhouse gas summations.

Cold venting of residual gas

During well intervention activities there are several scenarios that may cause small amounts of gas to be vented directly to atmosphere in an intrinsically safe manner via the choke manifold onboard the WIV. Due to the small quantities of gas, it is not viable to flare this gas. These sources of direct gas emissions include:

Riser disconnect – Riser will be disconnected at the end well intervention activities. Pressurised gas will be vented to the Atmosphere.

Wireline tool string & tool change – During the well intervention activity it is estimated that there will be 3 to 5 tool changes which will cause a small quantity of venting to the atmosphere via the wireline lubricator.

Surface returns - Small volumes of hydrocarbon gas from annular spaces will be cold vented via a choke manifold in a controlled and safe manner from the WIV.

Small volume gas releases subsea

Removal of a tree cap – A Tree cap may be in place if the well was previously shut-in. An EDS may be implemented if the WIV is required to rapidly disengage from the well. EDS aims to leave the wellhead and Lower Riser Package of the WOCS/WORS in a secure condition but will result in the loss of the fluids/gases in the riser following disconnection.

Table 6-8 – GHG Emissions sources and quantities

Source	GHG Emissions released (CO2-e t)[14]
DP Vessel Operations	2,845
Support vessel Operations	379
Helicopter operations	6.8
Cold venting – Riser disconnect (~1800PSI)	27
Cold venting - Tool change (5 changes)	<1
Cold venting – Surface returns	<1
Cold venting – Removal of tree cap	<1
Total Estimated GHG Emissions	**3,258**

Impact Assessment

Fuel combustion, incineration, and venting have the potential to result in localised, temporary reduction in air quality. Potential impacts include a localised reduction in air quality, generation of dark smoke and contribution to greenhouse gas emissions. Given the short duration and exposed location of project vessels (which will lead to the rapid dispersion of the low volumes of atmospheric emissions), the potential impacts are expected to be localised and of no lasting effect.

The air quality within the Operational Area is typical of an unpolluted tropical offshore environment and the wider offshore NWMR, and is likely to be of high quality. Atmospheric emissions from fuel combustion and incineration on project vessels (including generation of dark smoke) have the potential to result in localised reduction in air quality in the immediate vicinity of the release point, with no lasting effect.

Given the offshore location of the Operational Area, 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.

Venting of hydrocarbon gases may result in a temporary gas plume and a localised contribution to greenhouse gas emissions. During cold venting intervention activities discharge of riser gas volumes of 4 m^3 at 1800 PSI are expected. During tool change (approx. five changes) cold venting of 0.3 m^3 is expected. There is potential for human health effects for workers in the immediate vicinity of atmospheric emissions. However, due to the remote offshore location of the Operational Area, any risks associated with off-site human health effects are negligible beyond the immediate zone of release and dispersion. Given the isolated location of the Petroleum Activities Program, these low volumes of atmospheric emissions will be rapidly dispersed. Therefore, the potential impacts are expected to be localised and no cumulative impacts are anticipated when considered in the context of existing oil and gas operations in the region.

GHG emissions attributed to the WIV, 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.

[14] Diesel – 0.836t/m^3 | Conversion factor (t Diesel fuel) to (t CO_2e) = 2.7094 | GHG factor (CH_4) = 84t CO_2e | Source: NGERS 2021

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).

There is a breeding BIA for the wedge-tailed shearwater overlapping the Operational Area. The nearest potential seabird roosting habitat, the Montebello Islands, lies approximately 76 km south of the Operational Area at the closest point. Given, the low numbers of transient individuals expected to potentially occur within the Operational Area, combined with the highly dispersed nature of project air emissions; no adverse impacts to wedge-tailed shearwaters are anticipated due to changes in air quality.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that the release of a small volume of greenhouse gases will not result in a potential impact greater than a temporary impact to local air quality with no lasting effect.

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[15]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 97 (Marine Pollution Prevention – Air Pollution), which details requirements for: • International Air Pollution Prevention (IAPP) Certificate, required by vessel class • use of low sulphur fuel when available • Ship Energy Efficiency Management Plan, where required by vessel class • onboard incinerator to comply with Marine Order 97.	F: Yes CS: Minimal cost	Legislative requirements to be followed may slightly reduce the likelihood of air pollution.	Control based on legislative requirements – must be adopted	Yes **C 6.1**
Reporting of GHG emissions as required by regulatory requirements	F: Yes. 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 **C 6.2**
Good Practice				
Vessel operations planned such that fuel consumption and therefore subsequent emissions are minimised. Examples may include such	F: Yes CS: Schedule delays	Managing vessel operations including vessel speeds, use of project vessels, cleaning of biofouling, preventative maintenance and turning	Potential benefit outweighs cost/sacrifice.	Yes **C 6.3**

1 Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[15]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
aspects as vessel speeds, cleaning of biofouling, preventative maintenance on equipment such as thrusters, or turning off equipment when not in use.		off equipment when not in use can reduce fuel usage and subsequent GHG / air emissions		
Contracting strategy and evaluation for hire of support vessels includes consideration of vessel emissions parameters and low carbon / alternative fuels.	F: Yes. CS: Fuel cost over the contract is considered in evaluation of responses, allowing for competitive consideration of low carbon alternatives (batteries).	Minimise cost and emissions through eco-efficiency approach recognising cost of fuel and carbon emissions over the contract term.	Benefits outweigh cost/sacrifice.	Yes **C 6.4**
Contractors will be engaged to identify additional GHG emissions reduction opportunities.	F: Yes CS: Minimal – Good Practise	Through sharing aspirations and collaborating new opportunities may be identified and implemented to further reduce emissions.	Benefits outweigh cost/sacrifice	Yes **C 6.5**
Professional Judgement – Eliminate				
Do not combust fuel.	F: No. There are no WIVs or vessels that do not use internal combustion engines. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Professional Judgement – Substitute				
Fuel types selected to reduce expected GHG emissions.	F: Yes CS: Monetary cost of fuel, logistics associated with fuel type supply (especially With regard to international vessels) and fuel inventory management for international vessels which may be required to change fuel type	Alternative fuel types such as Marine Gas Oil and Marine Diesel Oil (MGO & MDO) can reduce GHG emissions during use when compared to heavy or intermediate fuel oils (HFO or IFO)	Potential benefit outweighs cost/sacrifice.	Yes **C 6.6**
Professional Judgement – Engineered Solution				
Use moored MODU to complete well intervention	F: Y CS: Significant additional cost to source alternative larger MODU	Minor reduction in air emissions due to reduction in DP use.	Cost/sacrife outweighs benefits.	No

Demonstration of ALARP

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)*[15]	*Benefit/Reduction in Impact*	*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 2.6.1**), Woodside considers the adopted controls are considered good oil-field practice/industry best practice, and appropriate to manage the impacts of fuel combustion 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 Statement

The impact assessment has determined that, given the adopted controls, routine atmospheric emissions from fuel combustion and venting may result in localised impacts to air quality with no lasting effect (<1 month).

The adopted controls are considered consistent with industry legislation, codes and standards, and professional judgement and meet the requirements of Australian Marine Orders. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of impact.

Environmental Performance Outcomes, Standards and Measurement Criteria

Outcomes	*Controls*	*Standards*	*Measurement Criteria*
EPO 7 Emissions to atmosphere as a result of fuel combustion and incineration limited to those necessary to complete the Petroleum Activities Program.	**C 6.1** Marine Order 97 (Marine Pollution Prevention – Air Pollution) which details requirements for: • International Air Pollution Prevention (IAPP) Certificate, required by vessel class • use of low sulphur fuel when available • Ship Energy Efficiency Management Plan, where required by vessel class • onboard incinerator to comply with Marine Order 97.	**PS 6.1.1** WIV and project vessels compliant with Marine Order 97 (marine pollution prevention – air pollution) to restrict emissions to those necessary to perform the activity. Vessel marine assurance process conducted prior to contracting vessels, to ensure suitability and compliance with vessel combustion certification/ Marine Order requirements.	**MC 6.1.1** Marine Assurance inspection records demonstrate compliance with Marine Order 97.
	C 6.2 Reporting of GHG emissions as required by regulatory requirements	**PS 6.2.1** GHG emission regulatory reporting undertaken as required	**MC 6.2.1** Records demonstrate required regulatory GHG emission reported
	C 6.3 Vessel operations will be planned such that fuel consumption is minimised where practicable. Examples may include such aspects as vessel speeds, cleaning of biofouling, preventative maintenance on equipment such as thrusters, or turning off	**PS 6.3.1** Vessel operations planned, where practicable, to minimise fuel consumption and associated GHG/air emissions	**MC 6.3.1** Plan/records show fuel use/emissions have been considered in vessel operations.
		PS 6.3.2 Relevant vessel crew aware of requirement to consider GHG/air	**MC 6.3.2** Awareness training records include information on

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[15]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
	equipment when not in use.	emissions in vessel operations.	consideration of fuel use/GHG emissions for vessel operations.	
	C 6.4 Contracting strategy and evaluation for hire of support vessels includes consideration of vessel emissions parameters and low carbon / alternative fuels.	**PS 6.4.1** Evaluation of tenders of support vessels considers emissions parameters and low carbon / alternative fuels.	**MC 6.4.1** Records demonstrate that emissions were considered in tender evaluations.	
	C 6.5 Contractors will be engaged to identify additional GHG emissions efficiencies	**PS 6.5.1** Contractors engaged prior to mobilisation on energy/ GHG emissions efficiencies.	**MC 6.5.1** Minutes of meetings with contractor including any identified opportunities.	
		PS 6.5.2 Opportunities identified implemented, where technically feasible and ALARP.	**MC 6.5.2** Records demonstrate that opportunities, if identified, to reduce GHG emissions have been implemented during the activity.	
	C 6.6 Fuels types selected to reduce expected GHG emissions.	**PS 6.6.1** Project vessels will not use heavy fuel oil (HFO) or intermediate fuel oil (IFO)	**MC 6.6.1** Records show project vessels use alternative fuels to HFO / IFO	

6.6.7 Routine Light Emissions: External Lighting on WIV and Project Vessels

Context		
Project Vessels and Support Activities – **Section 3.8**	Biological Environment – **Section 4.5** Socioeconomic and Cultural – **Section 4.6**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
External light emissions onboard WIV and project vessels					X		A	F	-	-	-	PJ	Broadly Acceptable	EPO 8
Underwater ROV					X		A	F	-	-	-			

Description of Source of Impact

Vessel Operations

Routine light emissions include light sources that alter the ambient light conditions in an environment at night. The WIV and project vessels will routinely use external lighting to navigate and conduct safe operations at night throughout the Petroleum Activities Program. Lighting levels will be determined primarily by operational safety and navigational requirements under relevant legislation, specifically the *Navigation Act 2012*. The WIV and support vessels will be lit to maintain operational safety on a 24-hour basis. External light emissions from the WIV and project vessels are typically managed to maintain good night vision for crew members. Vessel/WIV lighting will also be used to communicate the vessel's presence to other marine users (i.e. navigation/warning lights). Lighting is required for safely operating project vessels/WIV and cannot reasonably be eliminated.

The vessels/WIV that may be required for the Petroleum Activities Program are outlined in **Section 2.8**. External lighting is located on vessel/WIV decks, with most external lighting directed towards working areas such as the main decks.

The activity is expected to take between 5 to 14 days and will take place 24 hours, 7 days a week.

Lighting from vessels/WIV may appear as a direct light source from an unshielded lamp with direct line of sight to the observer or through sky glow. Direct lighting falling upon a surface is referred to as light spill. Sky glow is the diffuse glow caused by light that is screened from view, but through reflection and refraction creates a glow in the atmosphere. The distance at which direct light and sky glow may be visible from the source depends on the characteristics of vessel/WIV lighting (including height above sea level) and environmental conditions (e.g. cloud cover). The extent of line of sight visibility for vessels of similar sizes to those proposed to be used as part of this activity, with MODU lighting regarded as conservative, has previously been measured by Woodside as 30 km (Woodside Energy Limited, 2014).

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 WIV. Therefore, light emissions from the WIV and vessels are expected to be below 1.00 Lux within 300 m from the source.

During support activities, underwater lighting is generated over short periods of time while ROVs are in use, as well as from deck lighting. Given the typical intensity of ROV lights and the attenuation of light in seawater, light from ROVs will be localised to the vicinity of the ROV and vessels.

Cumulative light sources

Cumulative light from activities conducted under the GWA Operations EP in nearby infrastructure may result in slightly elevated ambient light levels, though this is not expected to significantly increase impacts to marine fauna given the short-term nature of this well intervention activity and distance from the GWA platform. Further, vessel based IMR activities conducted under the GWA Operations EP are likely to consist of one project vessel, and are unlikely to occur concurrently to well intervention activities.

Impact Assessment

Receptors that have important habitat within a 20 km buffer of the Operational Area were considered for the impact assessment, based on recommendations of the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (NLPG). 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, and fledgling seabirds grounded in response to artificial light 15 km away (Commonwealth of Australia, 2020).

Light emissions can affect fauna in two main ways:

- Behaviour: Many organisms are adapted to natural levels of lighting and the natural changes associated with the day and night cycle, as well as the night time phase of the moon. Artificial lighting has the potential to create a constant level of light at night that can override these natural levels and cycles.
- Orientation: Species such as marine turtles and birds may also use lighting from natural sources to orient themselves in a certain direction at night. In instances where an artificial light source is brighter than a natural source, the artificial light may act to override natural cues leading to disorientation.

The fauna within the Operational Area are predominantly pelagic fish and zooplankton, with a low abundance of transient species such as marine turtles, whale sharks, whales and migratory seabirds. Additionally, there is no known critical habitat within the Operational Area for EPBC listed species, although as described in **Section 4.5.2** there are BIAs for interesting buffer flatback turtles, breeding wedge-tailed shearwaters, and foraging whale sharks that overlap the Operational Area.

Oceanic Seabirds and/ or Migratory Shorebirds

Artificial 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 as a result of collision (Longcore and Rich, 2004; Gaston et al., 2014). The nearest emergent land that could be used for roosting or nesting habitat is the Montebello Islands (about 76 km from the Operational Area). The Operational Area may be occasionally visited by seabirds and migratory shorebirds, and overlaps a breeding and foraging BIA for the wedge-tailed shearwater. The breeding period for wedge-tailed shearwaters at Montebello Islands occurs from August to April (**Section 4.5.2.5**).

The most vulnerable life stages for seabirds and migratory shorebirds are nesting adults or fledglings. Nesting or fledgling seabirds and migratory shorebirds are vulnerable to artificial lighting within 20 km of the nesting location (Commonwealth of Australia, 2020). For shearwater species, fledglings are predominantly impacted by onshore lighting sources, which can override sea finding cues and attract fledglings further inland, preventing them from reaching the sea (Mitkus et al., 2018; Telfer et al., 1987). Artificial light can also impact important behaviour of nesting adults (e.g. adult nest attendance, maintaining nest sites) or confuse shearwater species, resulting in injury or mortality as a result of birds colliding with structures (Cianchetti-Benedetti et al., 2018; Rodriguez et al., 2017). As the Operational Area is about 76 km from the nearest emergent land, impacts to adult nesting or fledgling seabirds and migratory shorebirds are not expected. Artificial light from the Petroleum Activities Program is not predicted to disrupt critical breeding behaviours within important nesting habitat, or displace seabirds from nesting habitat.

Migratory shorebirds may be present in or fly through the region between July and December, and again between March and April as they complete migrations between Australia and offshore locations (Department of Environment, 2015). The risk associated with collision from seabirds and shorebirds attracted to the light is considered to be low, based on the intermittent and localised nature of the activities in the Operational Area, as well as the distance offshore. Impacts are expected to be limited to temporary behavioural disturbance to isolated individuals, and is not expected to disrupt important migration patterns of migratory seabirds.

Foraging adult seabirds may occur within the Operational Area. Foraging adult seabirds, including shearwaters, are less susceptible to impacts from artificial light than fledglings or nesting adult seabirds. However, they are still vulnerable as artificial light can interact with offshore foraging behaviour which may occur during the day or night.

Foraging adult wedge-tailed shearwaters may be attracted to sources of light emissions to feed on fish drawn to the light, or may be attracted to vessel light during periods of low visibility (Catry et al., 2009; Whittow 1997). During the breeding period at the Muiron Islands off Exmouth Gulf (from around August to April, peak November), adult wedge-tailed shearwaters were observed taking a combination of short (1–4 days) or long (6–30 days) foraging trips from the Muiron Islands, travelling over large areas across the north west of Australia towards Indonesia (Cannell et al., 2019). During the breeding period, foraging adult wedge-tailed shearwaters were observed travelling up to around 1000 km from the breeding colony (Cannell et al., 2019). Although the breeding and foraging BIA overlapping the Operational

Area is defined as the area within around 70-80 km from the Montebello Islands, wedge-tailed shearwaters on the NWS have been observed foraging beyond the breeding and foraging BIA. Based on the large area where foraging is known to occur, the Operational Area does not represent a significant portion of the known foraging area for the wedge-tailed shearwaters. Therefore, impacts to wedge-tailed shearwaters are likely to be limited to localised behavioural disturbance to isolated transient individuals. Artificial lighting from the Petroleum Activities Program is not expected to significantly impact foraging or displace seabird species from important foraging habitat.

Marine Reptiles

Turtle hatchlings emerge from the nest and orient towards the sea. After entering the water, hatchlings use a combination of cues (wave direction and currents) to orient and travel into offshore waters. Impacts to the sea-finding behaviour of hatchlings are more common for light sources behind a beach, as lighting offshore will orient emerging hatchlings towards the sea. Artificial light at close distances can also impact hatchling dispersal once they are in the water. Light spill may 'entrap' hatchling swimming behaviour, reducing the success of their seaward dispersion and potentially increasing their exposure to predators via silhouetting (Salmon et al., 1992).

The nearest turtle nesting locations (the Montebello Islands) are about 76 km south-west of the Operational Area, therefore there is no potential for lighting impacts to flatback, green and loggerhead hawksbill turtle hatchling emergence.

Additionally, since the Operational Area is located >76 km from turtle nesting beaches in the Montebello Islands, the risk of significant numbers of dispersing hatchlings becoming attracted to direct light or sky glow from project vessels/WIV is not considered credible. This is supported by the findings of a desktop lighting impact assessment for the Scarborough Project, conducted by Pendoley Environmental (PENV, 2020). At a range of >76 km, the density of dispersing hatchlings is expected to be low and very few individuals will be at risk of attraction. For any isolated individuals potentially attracted to light spill from project vessels/WIV, following sunrise, any effect of these light sources on hatchlings will be eliminated allowing dispersal behaviour to resume.

Any impacts to hatchling turtles from artificial light will be limited to possible localised behavioural impacts to isolated individual hatchlings offshore, with no lasting effect to the species.

Although the flatback turtle interesting BIA is within the Operational Area and individuals may migrate and forage in the Operational Area, 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/WIV are unlikely to result in displacement of, or behavioural changes to individuals in these life stages (PENV, 2020).

Fish

Lighting from ROV or project vessel/WIV activities during the Petroleum Activities Program may result in the localised aggregation of fish around the ROV or below the vessel/WIV. These aggregations of fish due to light are considered localised and temporary. Any long-term changes to fish species composition or abundance is considered highly unlikely. Any localised impacts to marine fish are not expected to impact on any commercial fishers in the area. Krill or plankton may also aggregate around the source of light. These aggregations of fish, krill or plankton would be confined to a small area and would only occur when the ROV is in use. Based on the short duration and localised nature of the Petroleum Activities Program, these aggregations are not expected to attract either pygmy blue whales or humpback whales. A whale shark foraging BIA overlaps the Operational Area and this localised increase in fish extends to those comprising the whale shark's diet. However, lighting from ROV or support vessel/WIV activities is not expected to have any negative impacts on whale shark behaviour.

Cumulative Impacts

The Operational Area is located 12 km from the producing GWA facility, therefore, there is the potential for cumulative impacts from the routine light emissions arising from activities conducted under the GWA Operations EP, including IMMR activities on adjacent infrastructure. However, activities associated with the GWA Operations EP are likely to be conducted by one project vessel and unlikely to occur concurrently. Therefore, the potential for significant cumulative impacts to occur to seabird, fish and marine reptile species from light emissions to occur from concurrent activities around the GWA platform is minimal. Light emissions from vessels using the nearby shipping fairway will only be temporary in nature as they transit through and therefore unlikely to be of sufficient duration to cause cumulative impacts.

Summary of Potential Impacts to Environmental Value(s)

Light emissions from the project vessels will not result in an impact greater than localised and temporary disturbance to fauna in the vicinity of the Operational Area, with no lasting effect (i.e. Environment Impact – F).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[16]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				
Where activities overlap a wedge-tailed shearwater BIA and will occur during the breeding period (August–April) the following measures will be implemented, consistent with the NLPG (2020): • extinguish outdoor/deck lights not necessary for safety and/or navigation at night • use available block-out blinds on portholes and windows not necessary for safety and/or navigation at night • manage seabird landings appropriately and record interactions	F: Yes, however a minimum level of lighting is required on the WIV and vessels for safety. CS: Minimal.	Negligible benefit in impact reduction for nesting adult seabirds or fledging seabirds as nearest potential nesting site is not predicted to be impacted by light. Potential for slight reduction in impact to individual foraging and migrating seabirds that may pass through the Operational Area, as identified in the NLPG.	Potential benefits outweigh the cost/sacrifice	Yes **C 7.1**
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.	Yes **C 7.2**
Lighting modifications (shielding, directional lighting) to minimise over water light spill and light emissions during peak turtle hatchling season (Dec to Mar).	F: Yes, lighting is able to be modified on the vessels CS: Financial cost of changes and time associated with implementing these	Reducing light spill over water and overall light glow from a vessel can reduce the likelihood that hatchling behaviour will be influenced. Due to the distance from turtle nesting beaches (>76 km, benefits in	Cost/sacrifice outweighs benefit.	No

1 Qualitative measure

		implementing this control are expected to be minimal.		
Implement a Seabird Management Plan that includes: Standardisation and maintenance of record keeping and reporting of seabird interactions Procedures on seabird intervention, care and management Regulatory reporting requirements for seabirds (unintentional death of or injury to seabirds that constitute MNES)	F: Yes. CS: Minimal cost/sacrifice.	Implementing a Seabird Management Plan will minimise potential for light attraction and vessel interaction with seabirds.	While the control does not result in significant reduction of impacts, it is good practice and not at significant cost.	Yes **C 7.3**
Professional Judgement – Eliminate				
No use of external lighting during Petroleum Activities Program.	F: No. Light management will be consistent with that required to provide a safe working environment onboard WIV and support vessels. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Restrict the Petroleum Activities Program to daylight hours, eliminating the need for external work lights.	F: No. Components of the Petroleum Activities Program cannot safely be completed within a 12-hour day shift. As such, the need for external lighting cannot safely be eliminated. CS: Not considered – control not feasible	Not considered – control not feasible	Not considered – control not feasible	No
Vary the timing of the Petroleum Activities Program to avoid peak turtle nesting periods (December to February).	F: Yes. Avoidance of turtle nesting periods is technically feasible, although is not considered to be practicable. CS: Not considered – control not feasible.	Negligible or no reduction consequence given the distance of the nesting areas to the Operational Area.	Grossly disproportionate. Implementation of the control requires considerable cost sacrifice for minimal environmental benefit.	No

Vary the timing of the Petroleum Activities Program to avoid peak breeding and migration periods for seabirds and migratory shorebirds.	F: No. The peak breeding and migration periods of seabirds and migratory shorebirds that may occur within the Operational Area spans all seasons. CS: Significant cost and schedule impacts due to delays in securing vessels/WIV for specific timeframes.	Not considered, control not feasible.	Not considered, control not feasible.	No
Professional Judgement – Substitute				
Substitute external lighting with light sources designed to minimise impacts to seabirds, shorebirds and marine turtles: • use flashing/ intermittent lights instead of fixed beam • use motion sensors to turn lights on only when needed • use luminaires with spectral content appropriate for the species present • avoid high intensity light of any colour.	F: Yes. Replacement of external lighting with lighting appropriate for turtles and seabirds is technically feasible, although is not considered to be practicable. CS: Significant cost sacrifice. The retrofitting of all external lighting on the WIV, etc., would result in considerable cost and time expenditure. Considerable logistical effort to source sufficient inventory of the range of light types onboard the WIV.	Given the potential impacts to turtles, nesting seabirds and fledglings during this activity are insignificant, implementation of this control would not result in a reduction in consequence. Potential for minor reduction in impact to individual foraging seabirds that may transit the Operational Area, as outlined in the NLPG.	Grossly disproportionate. Implementation of the control requires considerable cost sacrifice for minimal environmental benefit. The cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Engineered Solution				
No additional controls identified.				

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 2.6.1**), Woodside considers the potential impacts from routine light emissions from the WIV and project vessels to be ALARP in its current risk state. 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 Statement

The impact assessment has determined that, given the adopted controls, routine light emissions from external lighting on the WIV and project vessels may result in localised and temporary behavioural disturbance to species within the Operational Area, with no lasting effect (<1 month). BIAs overlapping the Operational Area include the flatback turtle internesting buffer, whale shark foraging, and wedge-tailed shearwater breeding. 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**).

On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, Woodside considers this an acceptable level of impact.

Environmental Performance Outcomes, Standards and Measurement Criteria

Outcomes	*Controls*	*Standards*	*Measurement Criteria*
	C 7.1	**PS 7.1.1**	**MC 7.1.1**

EPO 8 No impacts to marine fauna from light emissions with a consequence level greater than F[17] during the Petroleum Activities Program.	Where activities overlap a wedge-tailed shearwater BIA and will occur during the breeding period (August–April) the following measures will be implemented, consistent with the NLPG: • extinguish outdoor/deck lights not necessary for safety and/or navigation at night • use available block-out blinds on portholes and windows not necessary for safety and/or navigation at night • manage seabird landings appropriately and record interactions	Pre-mobilisation WIV/vessel inspections will identify vessel operational controls to minimise light to safety and/or navigation requirements.	Pre-mobilisation WIV/vessel inspection records include identification of vessel operational controls to minimise light to safety and/or navigation requirements.
		PS 7.1.2 WIV/Project vessels will have a procedure, with the requirement to use available block-out blinds on portholes and windows not necessary for safety and/or navigation when operating at night.	**MC 7.1.2** WIV/vessel contractor procedures include requirement to use available block-out blinds not necessary for safety and/or navigation when operating at night.
		PS 7.1.3 Record observed bird trappings and collisions and implement care and release steps.	**MC 7.1.3** Records maintained of bird interactions and any care and release steps implemented, as required.
	C 7.2 Lighting will be limited to the minimum required for navigational and safety requirements, with the exception of emergency events.	**EPS 7.2.1** Lighting will be limited to that required for safe work/navigation.	**MC 7.2.1** Inspection verifies no excessive light being used beyond that required for safe work/ navigation.
	C 7.3 Develop a Seabird Management Plan that includes: • Standardisation and maintenance of record keeping and reporting of seabird interactions • Procedures on seabird intervention, care and management • Regulatory reporting requirements for seabirds (unintentional death of or injury to seabirds that constitute MNES)	**EPS 7.3.1** Implementation of the Seabird Management Plan to minimise potential for light attraction.	**MC 7.3.1** Records demonstrate Seabird Management Plan implemented.

[17] Defined as ‘No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptor’.

6.7 Unplanned Activities (Accidents, Incidents, Emergency Situations)

6.7.1 Quantitative Spill Risk Assessment Methodology

6.7.1.1 Credible spill scenarios

As part of the risk identification process, Woodside identified the range of credible hydrocarbon spill scenarios that may occur from the Petroleum Activities Program. These scenarios are considered in the risk assessments of accidental hydrocarbon spill scenarios (**Sections 6.7.2** to **6.7.3**), and include:

- uncontrolled subsea release to the marine environment lasting 71 days.
- a vessel collision resulting in about 250 m³ of marine diesel instantaneously released.

6.7.1.1.1 Uncontrolled subsea release

An uncontrolled subsea release has previously been modelled for the Greater Western Flank-3 and Lambert Deep EP at the GDA-05 well location (**Table 6-9**). Woodside has undertaken comparison of the GWA condensate at GDA-05, and determined that it possesses a similar chemical composition to TPA03 condensate (**Table 6-9, Table 6-10**). Based on these chemical similarities, GWA condensate appropriately represents the expected behaviour of TPA03 condensate during a subsea release. The modelled scenario is also located in close proximity and represents a comparatively larger release volume, such that there is a high confidence that the GDA-05 modelling provides a conservative representation of environmental risk from the TPA-03 worst case credible spill scenario. Thus the oil spill model related to a subsea well blow-out at the GDA05 well location has been applied here to the TPA03 Well Intervention EP. The physical characteristics of the GWA condensate, along with marine diesel, as used in the hydrocarbon spill modelling studies, are provided in **Table 6-11.**

Table 6-9: GDA05 & TPA03 Blowout characteristics

Characteristics	GDA05	TPA03 [3]
Condensate type	Condensate comparison has been performed between the TPA and GWA reservoirs in the appendix below, key comparisons indicate: • GWA and TPA03 condensate have very similar hydrocarbon profiles, including the same residues (0.8%) • GWA condensate contains slightly more longer chain hydrocarbon – 8.37% (GWA) vs. 7.93% (TPA) propane and above	
Res Pressure (psia)	4703	2412
Condensate gas ratio (stb/mmscf)	40.5	29
Total condensate blowout (m^3)	108,843	56,441
Permit area	WA-5-L	WA-5-L
Water depth (at well)	125 m	113 m
Exist within the same impact region?	Yes, the TPA03 and GDA05 wells are located ~6 km apart. Given the GDA05 blowout scenario is more conservative and already located in close proximity to TPA03, there is a high confidence that all sensitive receptors potentially contacted by a TPA03 release will be represented in the GDA05 modelling.	

6.7.1.1.2 Vessel collision

An instantaneous release of 1000 m^3 of marine diesel following a vessel collision has previously been modelled for the Goodwyn Alpha (GWA) Facility Operations EP. The modelled release location was approximately 1.6 km from the TPA03 well where the intervention activity will occur. This modelling provides a conservative assessment of the risks associated with a worst case vessel collision scenario of 250 m^3 marine diesel, and hence has been adopted here in the TPA03 Well Intervention EP.

6.7.1.2 Spill Risk Assessment Methodology

GDA05 quantitative hydrocarbon spill modelling was undertaken by RPS, on behalf of Woodside, using a three-dimensional (3D) hydrocarbon spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program), which is designed to simulate the transport, spreading and weathering of specific hydrocarbon types under the influence of changing meteorological and oceanographic forces.

A stochastic modelling scheme was followed in this study, whereby SIMAP was applied to repeatedly simulate the defined credible spill scenarios using different samples of current and wind data. These data samples 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 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.

During each simulation, the SIMAP model records the location (by latitude, longitude and depth) of each of the particles (representing a given mass of hydrocarbons) on or in the water column, at regular time steps. For any particles that contact a shoreline, the model records the accumulation of hydrocarbon mass that arrives on each section of shoreline over time, less any mass that is lost to evaporation and/or subsequent removal by current and wind forces.

The collective records from all simulations are then analysed by dividing the study region into a 3D grid. For surface hydrocarbons (floating oil), the sum of the mass in all hydrocarbon particles located within a grid cell, divided by the area of the cell, provides hydrocarbon concentration estimates in that grid cell at each model output time interval. For entrained and dissolved aromatic hydrocarbon particles, concentrations are calculated at each time step by summing the mass of particles within a grid cell and dividing by the volume of the grid cell. The process is also subject to the application of spreading filters that represent the expected mass distribution of each distinct particle. The concentrations of hydrocarbons calculated for each grid cell, at each time step, are then analysed to determine whether concentration estimates exceed defined threshold concentrations.

All hydrocarbon spill modelling assessments undertaken 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. This assessment is done by post-processing the sensitivity test results and analysing time-series of median and maximum concentrations in the water and on the surface.

Table 6-10 Similarities in chemical composition of GWA and TPA03 condensates

GWA	%	Cumulative (gas/condensate)	TPA	%	Cumulative (gas/condensate)
Hydrogen Sulfide	0.00	91.64	Hydrogen Sulfide	0.00	92.07
Carbon Dioxide	1.54		Carbon Dioxide	2.26	
Nitrogen	1.10		Nitrogen	0.83	
Methane	82.57		Methane	82.71	
Ethane	6.43		Ethane	6.27	
Propane	2.82	8.37	Propane	2.69	7.93
iso-Butane	0.42		iso-Butane	0.39	
n-Butane	0.94		n-Butane	0.87	
iso-Pentane	0.31		iso-Pentane	0.29	
n-Pentane	0.37		n-Pentane	0.35	
Hexanes	0.44		Hexanes	0.42	
Heptanes	0.69		Heptanes	0.67	
Octanes	0.75		Octanes	0.73	
Nonanes	0.40		Nonanes	0.39	
Decanes	0.28		Decanes	0.25	
Undecanes PLUS	0.95		Undecanes PLUS	0.88	

Table 6-11: Hydrocarbon characteristics used in oil spill modelling

Hydrocarbon Type	Initial Density (g/cm^3)	Viscosity (cP)	Component BP (°C)	Volatiles <180 °C	Semi volatiles 180–265 °C	Low Volatility (%) 265–380 °C	Residual (%) >380 °C	Aromatic (%) of whole oil <380 °C BP
				Non-Persistent			Persistent	
GWA condensate	0.7449 @ 15 °C	1.61 @ 15 °C	% of total	65.9	22.5	10.8	0.8	16.3
			% aromatics	9.1	4.2	3	-	-
Marine diesel	0.829 @ 25 °C	4.0 @ 25 °C	% of total	6.0	34.6	54.4	5.0	3.0
			% aromatics	1.8	1.0	0.2	-	-

6.7.1.3 Environment that May Be Affected and Hydrocarbon Contact Thresholds

The outputs of the quantitative hydrocarbon spill modelling were used to assess the environmental consequence, if a credible hydrocarbon spill scenario occurred, in terms of 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 EMBA.

As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean transport mechanisms, the EMBA combines the potential spatial extent of the different fates. The EMBA also includes areas that are predicted to experience shoreline contact with hydrocarbons above threshold concentrations.

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, and the EMBA represents the total extent of all the locations where hydrocarbon thresholds could be exceeded from all modelling runs. Furthermore, as the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean transport mechanism, a different EMBA is presented for each fate. These EMBA together define the spatial extent for the existing environment, which is described in **Section 4**. Hydrocarbon contact below the defined thresholds may occur outside the EMBA and socio-cultural EMBA; however, the effects of these low exposure values will be limited to temporary exceedance of water quality triggers. The area within which this may occur in the event of a worst-case credible spill is presented in **Appendix D: Figure 5-1**.

The spill modelling outputs are presented as areas that meet threshold concentrations for surface, entrained and dissolved hydrocarbons for the modelled scenarios. Surface spill 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 to selecting thresholds was taken by adopting the guideline impact thresholds (NOPSEMA, 2019) for floating, entrained, dissolved and accumulated hydrocarbons. Hydrocarbon thresholds are presented in **Table 6-12** and described in the following subsections.

Table 6-12: Summary of 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)
GWA Condensate	10	100	50	100	1
Marine Diesel	10	100	50	100	1

Surface Hydrocarbon Threshold Concentrations

The spill modelling outputs defined the EMBA for surface hydrocarbon spills (contact on surface waters) using the ≥10 g/m^2 threshold (dull metallic colours) based on the relationship between film thickness and appearance (Bonn Agreement, 2015) (**Table 6-13**). This threshold concentration, expressed in terms of g/m^2, is geared towards informing potential oiling impacts for wildlife groups and habitats that may break through the surface slick from the water or the air (e.g. emergent reefs, vegetation in the littoral zone and air-breathing marine reptiles, cetaceans, seabirds and migratory shorebirds).

Thresholds for registering biological impacts resulting from contact of surface slicks have been estimated by different researchers at about 10–25 g/m^2 (French et al., 1999; Koops et al., 2004; NOAA, 1996; French-McCay, 2018). 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/m^2 threshold is the reported level of oiling to instigate impacts to seabirds, and is also applied to other wildlife, although 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 have a lower toxicity due to changes in their composition over time. Potential impacts to shoreline sensitive receptors may be markedly reduced in instances where there is extended duration until the slick contacts the shoreline.

Woodside recognises that hydrocarbons may be visible at low concentrations of approximately 1 g/m^2. Therefore, the threshold for visible surface oil (1 g/m^2) was 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 6-12**, may also result in socio-cultural impacts. Potential impacts to socio-cultural values assessed within these EMBAs include the following:

- protected areas
- National and Commonwealth Heritage Listed places
- tourism and recreation
- fisheries.

The boundaries of the two EMBAs may differ due to the different thresholds, hydrodynamics and weathering of the released hydrocarbons.

Table 6-13: 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

Dissolved Hydrocarbon Threshold Concentration

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).

Entrained Hydrocarbon Threshold Concentration

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.

Accumulated Hydrocarbon Threshold Concentrations

Owens and Sergy (1994) define accumulated hydrocarbon <100 g/m^2 to have an appearance of a stain on shorelines. French-McCay (2009) defines accumulated hydrocarbons ≥100 g/m^2 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/m^2 has therefore been adopted to define the EMBA for both a condensate and diesel spill. Further, any ecological impacts at the accumulated thresholds concentration EMBA may also result in socio-cultural impacts.

6.7.1.4 Scientific Monitoring

A planning area for scientific monitoring is also described in **Section 5.7** of the Oil Spill Preparedness and Response Mitigation Assessment (**Appendix D**). This planning area has been defined with reference to the low exposure entrained value of 10 ppb detailed in NOPSEMA Bulletin #1 Oil Spill Modelling (2019). This low exposure threshold is based on the potential for exceeding water quality triggers.

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.

6.7.2 Unplanned Hydrocarbon Release: Loss of Well Containment (Subsea Well Blowout)

Context		
Subsea Intervention Activities – **Section 3.6**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5** Socioeconomic and Cultural – **Section 4.6**	Stakeholder Consultation – **Section 5**

Risks Evaluation Summary														
Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Loss of hydrocarbons to marine environment due to loss of well containment	X	X	X	X	X	X	X	B	B	1	M	LCS GP PJ RB A CV SV	Acceptable	EPO 9

Description of Source of Risk

Background

Woodside has identified a subsea well blowout as the scenario with the worst-case credible environmental outcome as a result of loss of well containment. A loss of well containment is an uncontrolled release of reservoir hydrocarbon or other well fluids to the environment. A blowout is an incident where formation fluid flows out of the well after all the downhole well barriers fail and the WOCS/WORS and Xmas tree barriers fail to seal. Woodside has identified that two scenarios could lead to a subsea well blowout and loss of well containment:

- Loss of Containment to the seafloor. In this scenario, a catastrophic failure of the WOCS/WORS occurs and the XMAS tree and multiple downhole barriers also fail to seal the well, resulting in an uncontrolled subsea release of TPA03 condensate for 71 days. This scenario has been considered the worst-case scenario for the proposed activities.
- A 5-day surface blowout escalates to a 66-day subsea blowout as a result of a WIV Catastrophic Equipment Failure during Intervention. During the 5-day surface release, hydrocarbon loss would be restricted because the well completion tubulars will still be in place, and because the TRSV flapper, subsea Xmas tree valves and WOCS/WORS valves will be closed. These restrictions to containment loss would reduce the total hydrocarbon spill volume compared to scenario (1), above. Therefore, scenario (1) has been adopted as the worst-case scenario for the proposed activities.

The WOMP explains the appropriate standards and practices, within the Woodside Management System, which are used to manage well integrity and loss of containment risks. The key governing process used to reduce loss of containment risk to ALARP, include:

Well Lifecycle Management

Drilling and Completions (D&C) Standards and Practices

- Engineering Standard – Well Barriers
- D&C Risk Management Procedure
- D&C Change Management Procedure
- Process Safety Critical Role Competency Procedure.

The TPA03 Well Intervention WOMP, which will detail well specific integrity risks and controls measures, will be prepared and submitted for approval in future.

Industry Experience

A risk assessment by AMSA of oil spills in Australian ports and waters (Det Norske Veritas 2011) concluded that:

- overall national exceedance frequency for oil spills from offshore drilling in Australia is 0.033 for spills > 1 tonne/year decreasing to 0.008 for spills > 100 tonnes/year
- probability of a blow-out from a well intervention is 1 x 10^{-4} (0.0001, or 0.01%), considerably lower than drilling activities (International Association of Oil and Gas Producers 2010).

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 containment events that have resulted in significant releases or significant environmental impacts.

Therefore, in accordance with the Woodside Risk Matrix, a loss of well containment and resulting blowout event corresponds to a 'highly unlikely' event as it has occurred many times in the industry, but not in the Company.

Credible Scenario – Loss of Well Containment

The credible worst-case scenario to be considered during the TPA-03 well intervention is an uncontrolled subsea release to environment lasting 71 days. This time frame has been selected because:

- The Mutual Aid Memorandum of Understanding informed a likely relief well drilling and response time following the Montara well loss of containment in 2009 (77 days); and
- Internal Woodside guidelines and procedures indicate that appropriate modelling and response times for well based spill scenarios is reservoir-specific, and reliant on drilling times.

Table 6-14 Timeframe for completion of relief well

Phase	Description	Time for Completion (days)
Mobilisation of relief MODU	Sourcing a MODU through Australian Petroleum Production and Exploration Association (APPEA) Memorandum of Understanding (MoU) and mobilisation. Preparation and mooring spread installation	36.6
Relief well drill time	Drill well	16.7
Intersect and kill	Relief well intersects uncontrolled well, kills well, ceasing release of hydrocarbons. Plus NPT allowance	17.3
	Total days	**71**

Quantitative Hydrocarbon Spill Modelling – Loss of Well Containment

Spill modelling previously undertaken by RPS, on behalf of Woodside, determined the fate of hydrocarbon released from the loss of well containment scenario, based on the assumptions in **Table 6-11**. The modelled release rate provided assumes the worst case scenario for the largest oil volume release. Modelling considered metocean conditions throughout the year; this was done to inform the determination of consequence of loss of well control during intervention at any time of the year.

Well intervention blowout scenarios are analogous to production blowout when considering rates, flow constraints and response options. For this reason, the production well blowout scenario that has previously been modelled for GDA05, located approximately 6 km away, was deemed a conservative representation of the well intervention subsea blowout that may occur for the TPA03 well, and has been adopted throughout this section. The similarities between GDA05 and TPA03 credible well blowout are outlined in **Table 6-15**, and the similarities between GWA and TPA03 condensates are outlined in **Table 6-10**.

Table 6-15: Summary of modelled credible scenario – loss of well containment due to subsea well blowout

Parameter	*GDA05*	*TPA03*
Total discharge at Seabed	71 days 108, 843 m^3	71 days 56, 441 m^3

Res pressure (psia)	4703	2412
Condensate to gas ratio (stb/mmscf)	40.5	29
Water Depth at well	125 m	113 m
Permit Area	WA-5-L	WA-5-L

Hydrocarbon Characteristics

GWA condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In favourable evaporation conditions, about 89% of the oil is predicted to evaporate within the first 24 hours. Under 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 the winds are of greater strength on average, entrainment of GWA condensate into the water column will be significant (**Figure 6-2**). Approximately 24 hours after the spill, around 14% of the oil mass is forecast to have entrained and a further 81% is forecast to have evaporated, leaving <1% of the oil floating on the water surface. Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay and/or evaporate over time scales of several weeks to a few months. This long weathering duration will extend the area of potential effect, requiring the break-up and dispersion of the slicks and droplets to reduce concentrations below acceptable thresholds.

As outlined in **Section 6.7.1**, GWA and TPA condensates are chemically similar. Therefore, TPA condensate is expected to behave in the same manner as GWA condensate, outlined above, in the event of a loss of well containment.

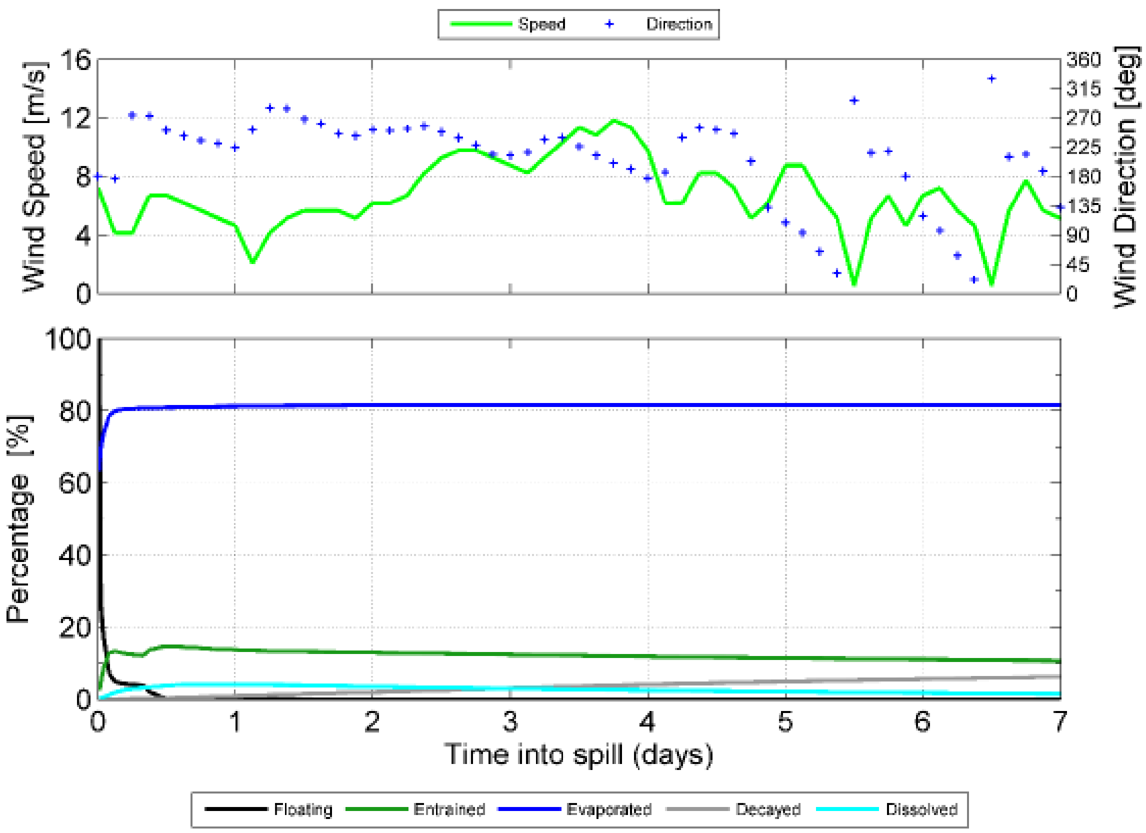

Figure 6-1: Proportional mass balance plot representing the weathering of GWA Condensate spilled onto the water surface as a one-off release (50 m^3 over one hour) and subject to variable wind at 27 °C water temperature and 25 °C air temperature

Subsea Plume dynamics

The well blowout surface/subsea release that has been modelled forecasts the size of the hydrocarbon droplets that would be released from the well as determined by the OILMAP model.

The results of the OILMAP simulation predict that the discharges will generate a cone of rising gas that will entrain the hydrocarbons droplets and ambient sea water up to the water surface. This outcome was calculated by the model for both scenarios at all discharge rates specified throughout the blowout period. The mixed plume is initially forecast to jet towards the water surface with a vertical velocity of between 15 m/s and 17 m/s, gradually slowing and increasing in plume diameter as more ambient water is entrained. The diameter of the central cone of rising water and oil at the point of surfacing is predicted to be about 16 m.

Given the discharge velocity and turbulence generated by the expanding gas plume, the release is predicted to generate large droplet sizes ranging from 94 µm to 432 µm. These droplets will be subject to mixing due to turbulence generated by the lateral displacement of the rising plume, as well as vertical mixing induced by wind and breaking waves. Therefore, despite reaching the surface due to the lift produced by the rising plume, the droplets then tend to remain within the wave-mixed layer of the water column (3 - 10 m deep, depending on the conditions), where they can resist surfacing due to their weak buoyancy relative to other mixing processes.

Consequence Assessment
Potential impacts to environmental values

EMBA

Quantitative hydrocarbon spill modelling results are shown in **Table 6-16** and have been used to define the EMBA (**Sections 4.1** and **6.7.1.3**).

Surface Hydrocarbons

Quantitative hydrocarbon spill modelling results for surface hydrocarbons are shown in **Figure 4-1**. In the event of the loss of well containment scenario occurring, surface hydrocarbons at or above 1 g/m^2 are forecast to potentially occur up to 265 km from the release site. Surface oil concentrations greater than the 10 g/m^2 threshold could occur up to 81 km from the spill site. Rankin Bank is the only receptor with surface hydrocarbons above the 10 g/m^2 threshold (**Table 6-16**), however it is noted that Rankin Bank lies about 18 m below the surface.

Entrained Hydrocarbons

Entrained hydrocarbons at concentrations equal to or greater than the 100 ppb threshold is predicted to be found up to around 804 km from the release site. Contact by entrained hydrocarbons at concentrations equal to or greater than 100 ppb is predicted at Montebello AMP (90%), Montebello State MP (43%), and Gascoyne MP (43%), as well as several other sensitive receptors with probabilities of less than 40% (**Table 6-16**). The maximum entrained hydrocarbons concentration forecast for any receptor is predicted to be 4400 ppb at Montebello AMP.

Dissolved Hydrocarbons

Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 50 ppb thresholds are predicted to be found up to around 747 km from the release site. Contact by dissolved aromatic hydrocarbons at concentrations equal to or greater than 50 ppb is predicted to be greatest at Rankin Bank (100%) and Montebello AMP (88%), as well as several other sensitive receptors with probabilities of less than 40% (**Table 6-16**). The maximum dissolved aromatic hydrocarbon concentration forecast for any receptor is predicted as 8400 ppb at Montebello AMP (40%).

Accumulated Hydrocarbons

The potential for accumulation of oil on shoreline, occurring above thresholds concentrations (100 g/m^2), is low with a maximum probability of shoreline accumulation at any location ≤8%. The maximum accumulated volume is 71 m^3 forecast at the Pilbara Islands (Southern Island Group) and a maximum local accumulated concentration of 3493 g/m^2 forecast at the same receptor. The Pilbara Islands (Southern Island Group) receptor is predicted to be contacted by shoreline hydrocarbons 20 days from the release (**Table 6-16**). The Pilbara Islands (Southern Island Group) receptor is the only receptor predicted to be contacted by shoreline oil above 1000 g/m^2.

Summary of Potential impacts to environmental values

Table 6-16 presents the full extent of the EMBA, i.e. the sensitive receptors and their locations that may be exposed to hydrocarbons (surface, entrained and dissolved) at or above the set threshold concentrations in the unlikely event of a major hydrocarbon release from a loss of well containment during the Petroleum Activities Program. Details of these receptors are outlined in **Section 4**. The potential biological and ecological impacts of an unplanned hydrocarbon release as a result of a loss of well containment during the Petroleum Activities Program are presented in the following sections.

Table 6-16: Key receptor locations and sensitivities potentially contacted above impact thresholds by the loss of well containment 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 and fate (%) Note: the probability is based on stochastic modelling of 100 hypothetical worst-case spills under a variety of weather and metocean conditions					
		Physical		Biological																						Socioeconomic and Cultural										
		Water Quality	Sediment Quality	Marine Primary Producers			Other Communities / Habitats								Protected Species									Other Species							Socio-cultural EMBA		Ecological EMBA			
		Open water – (pristine)	Marine Sediment – (pristine)	Coral reef	Seagrass beds / Macroalgae	Mangroves	Spawning/nursery areas	Open water – Productivity/upwelling	Non-biogenic 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 (foraging and internesting areas and significant nesting beaches)	Sea snakes	Whale sharks	Sharks and rays	Seabirds and/or migratory shorebirds	Pelagic fish populations	Resident /Demersal Fish	Fisheries – commercial	Fisheries – traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	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)
Offshore[18]	Argo-Rowley Terrace AMP	✓						✓							✓	✓			✓			✓	✓	✓		✓			✓		-	-	-	8	5	-
	Montebello AMP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		8	-	-	90	88	-
	Carnarvon Canyon AMP	✓	✓					✓		✓														✓	✓	✓			✓		-	-	-	2	1	-
	Gascoyne AMP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	-	-	-	43	33	-
	Rankin Bank	✓	✓	✓			✓	✓		✓						✓				✓		✓		✓	✓	✓		✓			40	-	8	10	100	-
Islands	Montebello Islands (including State Marine Park)	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		1	-	-	43	38	5
	Barrow Island (including State Nature Reserves, State Marine Park and Marine Management Area)	✓	✓	✓	✓		✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	-	-	-	34	36	-
	Pilbara Islands – Southern Island Group (Serrurier, Thevenard and Bessieres Islands – State Nature Reserves)	✓	✓		✓		✓		✓			✓		✓		✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓		7	-	-	38	36	8
	Muiron Islands (WHA, State Marine Park)	✓	✓	✓	✓		✓	✓		✓		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓		5	-	-	38	26	8
	Lowendal Islands	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓		-	-	-	12	3	-
	Rowley Shoals –	✓	✓	✓	✓		✓	✓		✓	✓	✓				✓			✓	✓		✓	✓	✓	✓			✓	✓		-	-	-	4	-	-

[18] Note: hydrocarbons cannot accumulate on open ocean, submerged receptors, or receptors not fully emergent.

Environmental setting	Location / name	Open water – (pristine)	Marine Sediment – (pristine)	Coral reef	Seagrass beds / Macroalgae	Mangroves	Spawning/nursery areas	Open water – Productivity/upwelling	Non-biogenic 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 (foraging and internesting areas and significant nesting beaches)	Sea snakes	Whale sharks	Sharks and rays	Seabirds and/or migratory shorebirds	Pelagic fish populations	Resident /Demersal Fish	Fisheries – commercial	Fisheries – traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (1-10 g/m^2)	Accumulated hydrocarbons (10–100 g/m^2)	Surface hydrocarbon (≥10 g/m^2)	Entrained hydrocarbon (≥100 ppb)	Dissolved aromatic hydrocarbon (≥50 ppb)	Accumulated hydrocarbons (>100 g/m^2)
		Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure [WM0000PG10055394])																													**Probability of hydrocarbon contact and fate (%)** Note: the probability is based on stochastic modelling of 100 hypothetical worst-case spills under a variety of weather and metocean conditions					
		Physical		**Biological**																						**Socioeconomic and Cultural**					**Socio-cultural EMBA**		**Ecological EMBA**			
		Water Quality	*Sediment Quality*	*Marine Primary Producers*			*Other Communities / Habitats*								*Protected Species*									*Other Species*												
	Clerke Reef & Imperieuse Reef State Marine Parks																																			
Mainland (nearshore waters)	Ningaloo Coast (North, Middle & South; WHA, and State Marine Park)	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		-	-	-	24	20	1
	Exmouth Gulf West	✓	✓		✓		✓					✓			✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓			-	-	-	4	2	-
Submerged Features	Glomar Shoals	✓	✓				✓			✓												✓		✓	✓	✓					-	-	-	-	10	-

Summary of Potential Impacts to Environmental Values(s)	
Summary of Potential Impacts to protected species	
Setting	***Receptor Group***
Offshore	***Cetaceans*** A range of cetaceans were identified as potentially occurring within the Operational Area and wider EMBA (**Section 4.5.2.3**). In the event of a loss of well containment, surface, entrained, and dissolved hydrocarbons exceeding environmental impact threshold concentrations may drift across habitat for cetacean species. Migratory routes and BIAs of cetaceans considered to be MNES may be affected, including humpback whales and pygmy blue whales (northbound and southbound migrations). Cetaceans that have direct physical contact with surface, entrained, or dissolved aromatic hydrocarbons may suffer surface fouling, ingestion of hydrocarbons (from prey, water and sediments), aspiration of oily water or droplets, and inhalation of toxic vapours (Deepwater Horizon Natural Resource Damage Assessment Trustees [DHNRDT] 2016). This may result in the irritation of sensitive membranes such as the eyes, mouth, digestive and respiratory tracts, and organs. Other potential impacts include impairment of the immune system, neurological damage (Helm et al. 2015), reproductive failure, other adverse health effects (e.g. lung disease, poor body condition), and mortality (DHNRDT 2016). Physical contact with hydrocarbons is likely to have biological consequences for these species. Given cetaceans maintain thick skin and blubber, external exposure to hydrocarbons may result in irritation to skin and eyes. Hydrocarbons may also be ingested, particularly by baleen whales (e.g. pygmy blue whales and humpback whales), which feed by filtering large volumes of water. Geraci (1988) has identified behavioural disturbance through avoidance of spilled hydrocarbons in several species of cetacean, suggesting that cetaceans have the ability to detect surface slicks. However, observations during spills have recorded larger whales (both mysticetes and odontocetes) and smaller delphinids travelling through and feeding in oil slicks. During the Deepwater Horizon spill, cetaceans were routinely seen swimming in surface slicks offshore and nearshore (Aichinger Dias et al. 2017). In a review of the impacts of large scale hydrocarbon spills on cetaceans, it was found that exposure to oil from the Deepwater Horizon resulted in increased mortality to cetaceans in the Gulf of Mexico (DHNRDT 2016), and long-term population level impacts to killer whales were linked to the Exxon Valdez tanker spill (Matkin et al. 2008). Cetacean populations that are resident within the EMBA may be susceptible to impacts from spilled hydrocarbons if they interact with an area affected by a spill. Such species are more likely to occupy coastal waters (refer to the Mainland and Islands section below for additional information). Suitable habitat for oceanic toothed whales (e.g. sperm whales) and dolphins is broadly distributed throughout the region and as such, impacts are unlikely to affect an entire population. Other species identified in **Section 4.5.2.3** may also have possible transient interactions with the EMBA (refer to **Table 6-16** or the list of receptor locations for cetaceans). Pygmy blue whales and humpback whales are known to migrate seasonally through the wider EMBA; however, the migration BIAs in the region for both species do not overlap the Operational Area. A major spill in May to November would coincide with humpback whale migration through the waters off the Pilbara and North West Cape **(Figure 4-8**). A major spill in April–August or October would coincide with pygmy blue whale migration (**Figure 4-7**). Both pygmy blue and humpback whales are baleen whales, so are most likely to be significantly impacted by toxic effects when feeding. However, feeding during migrations is low level and opportunistic, with most feeding for both species occurring in the Southern Ocean. Fresh hydrocarbons (i.e. typically in the vicinity of the release location) may have a higher potential to cause toxic effects when ingested, while weathered hydrocarbons are considered to be less likely to result in toxic effects. As such, the risk of ingestion of hydrocarbons is low. Pygmy blue whale and humpback whale migrations are protracted through time and space (i.e. the whole population will not be within the EMBA), and as such, a spill from the loss of well integrity is unlikely to affect an entire population. There is a small possibility that the dugong breeding, calving, and nursing BIAs in the Exmouth Gulf will be contacted by entrained and dissolved hydrocarbons above threshold concentrations (**Table 6-16**). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore cetacean species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions. Potential impacts to inshore cetaceans and other marine mammals are discussed in the Mainland and Islands (nearshore) impacts discussion below.

Summary of Potential Impacts to Environmental Values(s)	
	Marine Turtles Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon spills (NOAA 2010). Therefore, contact with surface slicks or entrained hydrocarbon can result in hydrocarbons adhering to body surfaces (Gagnon and Rawson 2010) causing irritation of mucous membranes in the nose, throat and eyes, leading to inflammation and infection (NOAA 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 includes an increase in the production of white blood cells, and even a short exposure to hydrocarbons may affect the functioning of the salt gland (Lutcavage et al. 1995). Hydrocarbons in surface waters may also impact turtles when they surface to breathe as they may 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 (NOAA 2010). Contact with entrained hydrocarbons can result in hydrocarbons adhering to body surfaces, causing irritation of mucous membranes in the nose, throat and eyes and leading to inflammation and infection (Gagnon and Rawson 2010). An internesting BIA for flatback turtles overlaps the Operational Area (**Table 4-8**). However, the Operational Area is unlikely to represent an important habitat for marine turtles as there is an absence of potential nesting or foraging habitat (i.e. no emergent islands, reef habitat or shallow shoals) and the water is deep (~113 m). There are significant nesting and foraging sites along the mainland coast and islands of the region, including Dampier Archipelago and the Montebello Islands, and a number of BIAs overlap the EMBA (**Section 4.5.2.2** and **Figure 4-5**). In particular, the internesting BIAs and habitat critical to the survival of a species for green, loggerhead and hawksbill turtles extend for ~20 km from known nesting locations, and for ~60 km for flatback turtles. It is noted that well intervention activities will only be undertaken in Q1 2023, which coincides with several species' peak hatching season (November to April), where higher numbers of turtles may be present (refer to **Table 4-14**). Oil from an ongoing loss of containment could be present during nesting season depending on the timing of a spill. In summary, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore foraging marine turtles, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions. Potential impacts to nesting marine turtles are discussed in the Mainland and Islands (nearshore) impacts discussion below.
	Sea snakes Impacts to sea snakes from direct contact with hydrocarbons are likely to result in similar physical effects to those recorded for marine turtles. They may include potential damage to the dermis and irritation to mucus membranes of the eyes, nose and throat (International Tanker Owners Pollution Federation [ITOPF] 2011a). They may also be impacted when they return to the surface to breathe and inhale the toxic vapours associated with the hydrocarbons, resulting in damage to their respiratory system. In general, sea snakes frequent the waters of the continental shelf area around offshore islands and potentially submerged shoals (water depths <100 m; see Submerged Shoals below). It is acknowledged that sea snakes may be present in the Operational Area and are present in the wider EMBA. Their abundance is not expected to be high in the deepwater and offshore environment. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore sea snakes, with consequence severity dependent on the duration and extent of a spill in relation to the distribution of sea snakes. Potential impacts to inshore and offshore reef associated sea snakes are discussed in the Submerged Shoals and Banks and Mainland and Islands (nearshore) impacts discussion below.
	Sharks, Sawfish and Rays Hydrocarbon contact may affect whale sharks through ingestion of entrained or dissolved hydrocarbons, particularly if feeding. Whale sharks may transit offshore open waters when migrating to and from Ningaloo Reef, where they aggregate for feeding from March to July (see Mainland and Islands (nearshore waters) below). Whale sharks are known to feed in the Operational Area and EMBA, and both areas overlap the whale shark foraging BIA identified in **Section 4.5.2.1**, within which whale sharks are seasonally present between April and October (**Section 4.5.2.5**). Impacts to sharks and rays may occur through direct contact with hydrocarbons, or through contamination of the tissues and internal organs, either

Summary of Potential Impacts to Environmental Values(s)	
	through direct contact or through 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 via coating of the gills inhibiting gas exchange. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore shark, sawfish and ray species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions. Potential impacts to inshore and offshore reef associated sharks, sawfish and rays are discussed in the Submerged Shoals and Banks and Mainland and Islands (nearshore) impacts discussion below.
	Seabirds and/or Migratory Shorebirds Offshore waters are potential foraging grounds for seabirds associated with the coastal roosting and nesting habitat (e.g. Ningaloo, Muiron Islands and the Barrow/Montebello/Lowendal Island Group). There are confirmed foraging grounds off Ningaloo and the Barrow/Montebello/Lowendal Island Group. Foraging and breeding BIAs for a number of seabirds and migratory shorebirds overlap with the EMBA (**Section 4.5.2.4**): • the wedge-tailed shearwater • White-tailed Tropicbird • the roseate tern • the lesser crested tern • the fairy tern 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 to ingestion of hydrocarbons when preening to remove hydrocarbons; both impacts may result in mortality (Hassan and Javed 2011). Seabirds generally do not exhibit avoidance behaviour to floating hydrocarbons. Physical contact of seabirds with surface slicks is by several exposure pathways—primarily immersion, ingestion, and inhalation. Such contact with hydrocarbons may result in (AMSA 2013, International Petroleum Industry Environmental Conservation Association [IPIECA] 2004): • plumage fouling and hypothermia (loss of thermoregulation) • decreased buoyancy and consequent increased potential to drown • inability to fly or feed • anaemia • pneumonia, and • irritation of eyes, skin, nasal cavities and mouths. Longer-term exposures may potentially impact seabird populations through loss of reproductive success, malformation of eggs or chicks (AMSA 2013), or mortality of individuals from oiling of feathers or the ingestion of hydrocarbons. A hydrocarbon spill may result in surface slicks disrupting a significant portion of the foraging habitat for seabirds, including foraging BIAs, which are generally associated with breeding habitats. Seabird distributions are typically concentrated around islands, so hydrocarbons near nesting/roosting areas may result in increased numbers of seabirds being impacted, with many species of seabirds, such as the wedge-tailed shearwater and the various species of tern, foraging relatively close to breeding islands/colonies. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore seabirds and migratory shorebirds, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions. Potential impacts to coastal and offshore island associated birds are discussed in the Mainland and Islands (nearshore) impacts discussion below.

Summary of Potential Impacts to Environmental Values(s)	
Submerged Shoals and Banks	***Marine Turtles*** There is the potential for marine turtles to be present at submerged shoals such as Rankin Bank and Glomar Shoals, which have potential to be contacted by entrained hydrocarbons above the threshold concentration. Rankin Bank and Glomar Shoals may, at times, be foraging habitat for marine turtles, given the coral and filter feeding biota associated with this area. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to foraging marine turtles, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions. Potential impacts to nesting and internesting marine turtles are discussed in the Mainland and Islands (nearshore) impacts discussion below.
	Sea snakes There is the potential for sea snakes to be present at submerged shoals such as Rankin Bank. The potential impacts of exposure are as discussed previously in Offshore – Sea snakes. Sea snake species in Australia generally show strong habitat preferences (Heatwole and Cogger 1993); species that have preferred habitats associated with submerged shoals may be disproportionately affected by a hydrocarbon spill affecting such habitat. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore reef associated sea snakes, with consequence severity dependent on the duration and extent of a spill in relation to the distribution of sea snakes. Potential impacts to inshore sea snakes are discussed in the Mainland and Islands (nearshore) impacts discussion below.
	Sharks, Sawfish and Rays There is the potential for resident shark and ray populations to be impacted directly from hydrocarbon contact, or indirectly through contaminated prey or loss of habitat. Spill model results indicate Rankin Bank and Glomar Shoals are predicted to be contacted by dissolved and entrained hydrocarbons above threshold concentrations. Shark and ray species that have associations with submerged shoals may be more susceptible to a reduction in habitat quality resulting from a hydrocarbon spill. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to offshore reef associated shark, sawfish and ray species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions. Potential impacts to inshore associated sharks, sawfish and rays are discussed in the Mainland and Islands (nearshore) impacts discussion below.
Mainland and Islands (Nearshore Waters)	***All Species*** The information provided on protected species in this section is in addition to that provided in the preceding Offshore and Submerged Banks and Shoals sections. Refer to these preceding sections for additional discussion of protected species.
	Cetaceans and Dugongs In addition to a number of whale species that may occur in nearshore waters (refer to **Section 4.5.2.3** for the full list of EPBC listed cetacean species identified by the PMST with potential to occur within the EMBA), coastal populations of small cetaceans and dugongs are known to reside or frequent nearshore waters, including the Ningaloo Coast, Muiron Islands, Montebello/Barrow/ Lowendal Islands Group, Pilbara Southern Island Group (see **Table 6-16**) which may be potentially impacted by entrained and dissolved hydrocarbons exceeding threshold concentrations in the event of a loss of well containment. The Exmouth Gulf is a known humpback whale aggregation area on the annual southern migration (September to December); therefore, humpbacks moving into the Gulf may be exposed to entrained hydrocarbons above thresholds levels. However, entrained hydrocarbons concentrations above the threshold are not expected within Exmouth Gulf itself. No hydrocarbon contact at or above threshold concentrations is expected for Camden Sound, an important calving area for humpback whales. The potential impacts of exposure are as discussed previously in Offshore – Cetaceans. However, nearshore populations of cetaceans and dugongs are known to exhibit site fidelity and are often resident populations. Therefore, avoidance behaviour may have greater impacts to population functioning. Nearshore dolphin species (e.g. spotted bottlenose dolphins) may exhibit higher site fidelity than oceanic species, although Geraci (1988) observed relatively little impacts beyond behavioural disturbance. Additional potential environment impacts may also include the potential for dugongs to ingest hydrocarbons when feeding on oiled seagrass stands, or indirect impacts to dugongs due to loss of this food source due to dieback in worst-affected areas. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to inshore cetacean species and dugongs, with consequence severity dependent on the

Summary of Potential Impacts to Environmental Values(s)	
	actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.
	Marine Turtles Several marine turtle species use nearshore waters and shorelines for foraging and breeding (including internesting), with significant nesting beaches along the mainland coast and islands in potentially impacted locations such as the Muiron, Montebello, Barrow, Lowendal and Pilbara Islands Groups. A number of BIAs have been identified for marine turtles, including nesting, internesting and foraging areas as discussed previously in Offshore – Marine Turtles. There are distinct breeding seasons, as detailed in **Section 4.5.2.2**. The nearshore waters of these turtle habitat areas may be exposed to entrained hydrocarbons exceeding the threshold concentration. Accumulated shoreline hydrocarbons above the threshold concentration of 100 g/m^2 are predicted at Muiron, Montebello, and Pilbara Island Groups, as well as the Ningaloo coast. It is noted that well intervention activities will be undertaken between January - March and this coincides with some turtle species' peak hatching season where higher numbers of turtles may be present (refer to **Table 4-14**). However, oil from an ongoing loss of containment could be present during nesting season depending on the timing of a spill. The potential impacts of exposure are as discussed previously in Offshore – Marine Turtles. In the nearshore environment, turtles can ingest hydrocarbons when feeding (e.g. on oiled seagrass stands/macroalgae) or can be indirectly affected by loss of food source (e.g. seagrass due to dieback from hydrocarbon exposure) (Gagnon and Rawson 2010). In addition, hydrocarbon exposure can impact turtles during the breeding season in nearshore waters. A worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to foraging marine turtles, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.
	Sea snakes Impacts to sea snakes for the mainland and island nearshore waters from direct contact with hydrocarbons may occur and may include potential damage to the dermis and irritation to mucous membranes of the eyes, nose and throat (ITOPF 2011a). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to sea snakes, with consequence severity dependent on the duration and extent of a spill in relation to the distribution of sea snakes.
	Sharks, Sawfish and Rays Whale sharks and manta rays are known to frequent the Ningaloo coast and the Exmouth Gulf, as well as several islands including the Muiron Islands (forming feeding aggregations in late summer/autumn). Whale sharks and manta rays generally transit along the nearshore coastline and are vulnerable to surface, entrained and dissolved aromatic hydrocarbon spill impacts, with both taxa having similar modes of feeding. Whale sharks are versatile feeders, filtering large amounts of water over their gills, catching planktonic and nektonic organisms (Jarman and Wilson 2004). Whale sharks at Ningaloo Reef have been observed using two different feeding strategies, including passive subsurface ram-feeding and active surface feeding (Taylor 2007). Passive feeding involves swimming slowly at the surface with the mouth wide open. During active feeding, sharks swim high in the water with the upper part of the body above the surface with the mouth partially open (Taylor 2007). Individuals that are present in worst-affected spill areas would have the potential to ingest toxic amounts of entrained or dissolved aromatic hydrocarbons into their body. Large amounts of ingested hydrocarbons may affect endocrine and immune systems in the longer term. The presence of hydrocarbons may displace whale sharks from the area where they normally feed and rest, and potentially disrupt migration and aggregations to these areas in subsequent seasons. Whale sharks may also be affected indirectly by surface, entrained or dissolved aromatic hydrocarbons through the contamination of their prey. The preferred food of whale sharks are fish eggs and phytoplankton, which are abundant in the coastal waters of Ningaloo Reef in late summer/autumn, driving the annual arrival and aggregation of whale sharks in this area. If the spill event occurred during the spawning season, this important food supply (in worst spill-affected areas of the reef) may be diminished or contaminated. The contamination of their food supply and the subsequent ingestion of this prey by the whale shark may also result in long-term impacts as a result of bioaccumulation. There is the potential for other resident sharks and rays (e.g. sawfish species identified in **Section 4.5.2.1**) populations to be impacted directly from hydrocarbon contact or indirectly through

Summary of Potential Impacts to Environmental Values(s)	
	contaminated prey or loss of habitat. **Table 6-16** indicates the receptor locations predicted to be contacted by entrained hydrocarbons above the threshold concentration where impacts to the benthic communities of nearshore and subtidal communities could occur, potentially resulting in habitat loss. Therefore, the consequences to resident shark and ray populations (if present) from loss of habitat, may result in a disruption to a significant portion of the population; however, it is not expected to impact the overall viability of the population. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to inshore associated shark, sawfish and ray species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.
	Seabirds and/or Migratory Shorebirds In the event of a major spill, there is the potential for seabirds, and resident, non-breeding overwintering shorebirds that use the nearshore waters for foraging and resting, to be exposed to entrained, dissolved, and accumulated hydrocarbons. This could result in lethal or sublethal effects. Although breeding oceanic seabird species can travel long distances to forage in offshore waters, most breeding seabirds tend to forage in waters near their breeding colony. This results in relatively higher seabird densities in these areas during the breeding season, making these areas particularly sensitive in the event of a spill. 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 (IPIECA 2004). Whether the toxicity of ingested hydrocarbons is lethal or sublethal 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 loss of adult birds. Important areas for foraging seabirds and migratory shorebirds are identified in **Section 4.5.2.4**. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to nearshore associated seabirds and migratory shorebirds, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements, breeding seasons and distributions.
Summary of potential impacts to other species	
Setting	***Receptor Group***
All Settings	***Pelagic Fish Populations*** Fish mortalities are rarely observed to occur as a result of hydrocarbon spills (ITOPF 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, so 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 are able to 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 are capable of avoiding water contaminated with high concentrations of hydrocarbons. However, sublethal impacts to adult and juvenile fish may be possible, given long-term exposure (days to weeks) to polycyclic aromatic hydrocarbon (PAH) concentrations (Hjermann et al. 2007), which are typically the most toxic components of hydrocarbons. Light molecular weight aromatic hydrocarbons (i.e. one- and two-ring molecules) are generally soluble in water, which increases bioavailability to gill-breathing organisms such as fish. The effects of exposure to oil on the metabolism of fish appears 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 the organ 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 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

Summary of Potential Impacts to Environmental Values(s)	
	developmental timing for larvae and eggs exposed to even low concentrations over prolonged timeframes (days to weeks) (Fodrie and Heck 2011). Subtler, chronic effects on the life history of fish as a result of exposure in early life stages to hydrocarbons include disruption to complex behaviours 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). PAHs have also been linked to increased mortality and stunted growth rates of early life history (pre-settlement) of reef fishes, as well as behavioural impacts that may increase predation of post-settlement larvae (Johansen et al. 2017). However, the effect of a hydrocarbon spill on a population of fish in an area with fish larvae and/or eggs, and the extent to which any of the adverse impacts may occur, depends greatly on prevailing oceanographic and ecological conditions at the time of the spill and its contact with fish eggs or larvae. Demersal species are associated with the Ancient Coastline KEF, which overlaps the Operational Area. Additional KEFs that may host relatively diverse or abundant fish assemblages compared to relatively featureless continental shelf habitats that occur within the wider EMBA are: • Continental Slope Demersal Fish Communities KEF (44 km west), which has a highly diverse fish assemblage with a high degree of endemism (DAWE, 2021) • Glomar Shoals KEF (76 km north-east), which are used by several commercial and recreational fish species (DAWE, 2021) • Exmouth Plateau KEF (157 km west), which is an important area of biodiversity (DAWE, 2021) • Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF (227 km south-west), which has been shown to host demersal fish (BMT Oceanica 2016) • Commonwealth Waters adjacent to Ningaloo Reef KEF (273 km south-west), which has high biological productivity and hosts a yearly aggregation of whale sharks (DAWE, 2021). Mortality and sublethal effects may impact populations located close to a well blowout and within the EMBA for entrained/dissolved aromatic hydrocarbons. Additionally, if prey (infauna and epifauna) surrounding the well location and within the EMBA is contaminated, this can result in the absorption of toxic components of the hydrocarbons (PAHs), potentially impacting fish populations that feed on these. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to pelagic fish species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.
Summary of Potential Impacts to Marine Primary Producers	
Setting	***Receptor Group***
Submerged Shoals	The waters overlying the Rankin Bank and Glomar Shoals have the potential to be exposed to entrained hydrocarbons above threshold concentrations (≥100 ppb). Potential biological impacts could include sublethal stress and, in some instances, total or partial mortality of sensitive benthic organisms such as corals and the early life stages of resident fish and invertebrate species. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to primary producer groups at these sites.
Mainland and Islands (nearshore waters)	***Coral Reef*** The quantitative spill risk assessment indicates there would be potential for coral reef habitat to be exposed to entrained hydrocarbons ≥100 ppb at locations including the Montebello AMP, Carnarvon Canyon MAP, Gascoyne AMP, several island groups, and the Ningaloo Coast (**Table 6-16**). Exposure to entrained hydrocarbons (≥100 ppb) has the potential to result in lethal or sublethal toxic effects to corals and other sensitive sessile benthos within the upper water column (top 20 m), including upper reef slopes (subtidal corals), reef flat (intertidal corals) and lagoonal (back reef) coral communities. Mortality in a number of coral species is possible, and this could result in the reduction of coral cover and change in the composition of coral communities. Sublethal effects to corals may include polyp retraction, changes in feeding, bleaching (loss of zooxanthellae), increased mucous production resulting in reduced growth rates, and impaired reproduction (Negri and Heyward 2000). This could result in impacts to the shallow water fringing coral communities/reefs of the offshore islands (e.g. Barrow/Montebello/Lowendal/Muiron Islands, Pilbara Southern Island Groups) and the Ningaloo Coast. With reference to Ningaloo Reef, wave-induced water circulation flushes the lagoon and may promote removal of entrained hydrocarbons from this particular reef habitat. Under typical conditions, breaking waves on the reef crest induce a rise in water level in the lagoon, creating a pressure gradient that drives water in a strong outward flow through channels. These channels are across as much as 15% of the length of Ningaloo Reef (Taylor and Pearce 1999).

Summary of Potential Impacts to Environmental Values(s)	
	If a spill occurs at the time of coral spawning at potentially affected coral locations, or in the general peak period of biological productivity, there is the potential for a significant reduction in successful fertilisation and coral larval survival, due to the sensitivity of coral early life stages to hydrocarbons (Negri and Heyward 2000). Such impacts are likely to result in the failure of recruitment and settlement of new population cohorts. In addition, some non-coral species may be affected via direct contact with entrained hydrocarbons, resulting in sublethal impacts and in some cases mortality—particularly early life-stages of coral reef animals (reef-attached fishes and reef invertebrates), which can be relatively sensitive to hydrocarbon exposure. Coral reef fish are site-attached, have small home ranges, and as reef residents they are at higher risk from hydrocarbon exposure than non-resident, more wide-ranging fish species. The exact impact on resident coral communities will depend on actual hydrocarbon concentration, duration of exposure and water depth of the affected communities. Over the worst-affected sections of reef habitat, coral community live cover, structure and composition may reduce, manifested by loss of corals and associated sessile biota. Recovery of these impacted reef areas typically relies on coral larvae from neighbouring coral communities that have either not been affected or only partially impacted. For example, there is evidence that Ningaloo Reef corals and fish are partly self-seeding, with the supply of larvae from locations within Ningaloo Reef of critical importance to the healthy maintenance of the coral communities (Underwood 2009). Recovery at other coral reef areas may not be aided by a large supply of larvae from other reefs, with levels of recruits after a disturbance event only returning to previous levels after the numbers of reproductive corals had also recovered (Gilmour et al. 2013). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in large scale impacts to coral populations within the EMBA, with long-term effects (recovery >10 years) likely. The consequence severity is predicted to be greatest at reefs closest to the potential release location (e.g. Montebello Islands).
	Seagrass Beds/Macroalgae Spill modelling has predicted that entrained hydrocarbons above threshold concentrations have the potential to contact a number of nearshore locations that support biologically diverse, shallow subtidal and intertidal communities. The variety of habitat and community types, from the upper subtidal to the intertidal zones support a high diversity of marine life and are used as important foraging and nursery grounds by a range of invertebrate and vertebrate species. Depending on the trajectory of the entrained plume, macroalgal/seagrass communities including the Montebello AMP, Barrow/Montebello/Lowendal/Muiron Islands, the Pilbara Islands (documented as low and patchy cover), and the Ningaloo Coast (patchy and low cover associated with the shallow limestone lagoonal platforms), all have the potential to be exposed (see **Table 6-16** for a full list of receptors within the EMBA). Exposure to entrained hydrocarbons may result in mortality, depending on actual entrained exposure concentrations received and duration of exposure. Physical contact with entrained hydrocarbon droplets could cause sublethal stress, causing reduced growth rates and reduced tolerance to other stress factors (Zieman et al. 1984). Toxicity effects can also occur due to absorption of soluble fractions of hydrocarbons into tissues (Runcie et al. 2010). However, the potential for toxicity effects of entrained hydrocarbons may be reduced by weathering processes that should lower the content of soluble aromatic components before contact occurs. Mangrove habitat at Montebello AMP, Barrow/Montebello/Lowendal Islands may be contacted by entrained hydrocarbons within the EMBA (see **Table 6-16**). Entrained hydrocarbons may adhere to the sediment particles and in low-energy environments such as in mangroves, deposited sediment-bound hydrocarbons are unlikely to be removed naturally by wave action and may be deposited in layers by successive tides (NOAA 2014). Hydrocarbons may persist in the sediment, potentially causing chronic sublethal toxicity impacts beyond immediate physical and acute effects, which may delay recovery in an affected area. Recovery of mangroves from any impacts could be long-term (>10 years). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to seagrass beds and macroalgae communities within the EMBA, with consequence severity predicted to be greatest at receptors closest to the potential release location (e.g. Montebello Islands).
Summary of Potential Impacts to Other Habitats and Communities	
Setting	***Receptor Group***
Offshore	***Benthic Fauna Communities*** In the event of a major release at the seabed, the stochastic spill model predicted hydrocarbons droplets would be entrained, rapidly transporting them to the sea surface. As a result, the low sensitivity benthic communities associated with the unconsolidated, soft sediment habitat and any

Summary of Potential Impacts to Environmental Values(s)	
	epifauna (filter feeders) associated with KEFs within the wider EMBA are not expected to have widespread exposure to released hydrocarbons (Ancient Coastline at 125 m Depth Contour KEF, Continental Slope Demersal Fish Communities KEF, Canyons KEF, Exmouth Plateau KEF, Glomar Shoals and Commonwealth Waters adjacent to Ningaloo Reef KEF (**Section 4.5.3**). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to seabed and associated epifauna and infauna within the EMBA, with impacts predicted to be greatest for habitats closest to the potential release location.
	Open Water – Productivity/Upwelling Primary production by plankton (triggered by sporadic upwelling events in the offshore waters) is an important component of the primary marine food web. Planktonic communities are generally mixed, including phytoplankton (cyanobacteria and other microalgae), secondary consuming zooplankton (e.g. copepods), and the eggs and larvae of fish and invertebrates (meroplankton). Exposure to hydrocarbons in the water column can result in changes in 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, direct effects of contamination may include 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 surface, 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 (ITOPF 2011a). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to plankton populations within the EMBA, with impacts predicted to be greatest for habitats closest to the potential release location.
	Filter Feeders Entrained hydrocarbons above the 100 ppb ecological thresholds will be limited to the top 20 m of the water column beyond the immediate source. Entrained hydrocarbons are therefore not expected to impact filter feeder habitats in deep offshore waters including filter feed communities associated with the Ancient Coastline at 125 m Depth Contour KEF, Glomar Shoals and Continental Slope Demersal Fish Communities KEF, Canyons KEF, Exmouth Plateau KEF, and Commonwealth Waters adjacent to Ningaloo Reef KEF. Refer to 'mainland and islands (nearshore waters) for a description of potential impacts to filter feeders in shallower waters.
Mainland and Islands (Nearshore Waters)	***Open Water – Productivity/Upwelling*** Nearshore waters and adjacent offshore waters surrounding the offshore islands (e.g. Montebello/ Barrow/Lowendal Islands Group) and to the west of the Ningaloo Reef system are known locations of seasonal upwelling events and productivity. The seasonal productivity events are critical to krill production, which supports megafauna aggregations such as whale sharks and manta rays in the region. This has the potential to result in lethal and sublethal impacts to a certain portion of plankton in affected areas, depending on concentration and duration of exposure and the inherent toxicity of the hydrocarbon. However, recovery would occur (see Offshore description above). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to plankton populations within the EMBA.
	Spawning/Nursery Areas Fish (and other commercially targeted taxa) in their early life stages (eggs, larvae and juveniles) are at their most vulnerable to lethal and sublethal impacts from exposure to hydrocarbons, particularly if a spill coincides with spawning seasons or reaches nursery areas close to the shore (e.g. seagrass and mangroves) (ITOPF 2011a). Fish spawning (including for commercially targeted species such as snapper and mackerel) occurs in nearshore waters at certain times of the year, and nearshore waters are also inhabited by higher numbers of juvenile fishes than offshore waters. Modelling indicated that, in the event of a major spill, there is potential for entrained hydrocarbons to occur in the surface water layers above threshold concentrations in nearshore waters, including Montebello/Barrow/Lowendal Islands Group, Pilbara Southern Islands Groups, Ningaloo Coast, and the Muiron Islands. This has the potential to result in lethal and sublethal impacts to a portion of fish larvae in areas contaminated above impact thresholds, depending on concentration and duration of exposure and the inherent toxicity of the hydrocarbon. Although there is the potential for spawning/nursery habitat to be impacted (e.g. mangroves and seagrass beds, discussed above), losses of fish larvae in worst-affected areas are unlikely to be of major consequence to fish stocks compared with significantly larger losses through natural predation, and the likelihood that most nearshore areas would be exposed is low (i.e. not all areas in the region would be affected). This is

Summary of Potential Impacts to Environmental Values(s)	
	supported by a study in the Gulf of Mexico, which used juvenile abundance data from shallow-water seagrass meadows as indices of the acute, population-level responses of young fishes to the Deepwater Horizon spill. Results indicated that there was no change to the juvenile cohorts following the Deepwater Horizon spill. Additionally, there were no significant post-spill shifts in community composition and structure, nor were there changes in biodiversity measures (Fodrie and Heck 2011). Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major long-term impacts to spawning fish and/or nursery areas within the EMBA, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to key spawning periods and locations.
	Non-biogenic Reefs The reef communities fringing the Pilbara region (e.g. Pilbara islands) may be exposed to entrained hydrocarbons (at or above the threshold concentration), and consequently exhibit lethal or sublethal impacts resulting in partial or total mortality of keystone sessile benthos, particularly hard corals; thus, potential community structural changes to these shallow, nearshore benthic communities may occur. If these reefs are exposed to entrained hydrocarbons, impacts are expected to result in localised long-term effects. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to non-biogenic reefs within the EMBA.
	Filter Feeders Hydrocarbon exposure to shallow nearshore filter feeding communities (<20 m depth) (e.g. Montebello Islands) may occur. Exposure to entrained aromatic hydrocarbons has the potential to result in lethal or sublethal toxic effects. Sublethal impacts, including mucus production and polyp retraction, have been recorded for gorgonians exposed to hydrocarbon (White et al. 2012). Any impacts may result in localised long-term effects to community structure and habitat. Nearshore filter feeders that are present in shallower water <20 m may potentially be impacted by entrained hydrocarbon through lethal/sublethal effects, although given the distance from source hydrocarbons are expected to be less toxic due to the weathering process. Such impacts may result in localised, long term effects to community structure and habitat. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to filter feeders within the EMBA.
Key Ecological Features	***Key Ecological Features*** KEFs potentially impacted by the hydrocarbon spill from a loss of well containment event are detailed in **Section 4.5.3**. Although these KEFs are primarily defined by seabed geomorphological features, they can indicate a potential for increased biological productivity and, therefore, ecological significance. The consequences of a hydrocarbon spill from a loss of well containment event are predicted to result in minor impacts to values of the KEFs affected (for the values of each KEF, see **Section 4.5.3**). Impacts to benthic habitats are not predicted given the maximum depth of entrained hydrocarbons above 100 ppb is predicted to be 20 m beyond the immediate source. Potential impacts to associated pelagic communities may occur as described above and below. The KEFs within the EMBA have relatively broad-scale distributions and are unlikely to be significantly impacted. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to the ecological values of KEFs within the EMBA, with impacts predicted to be greatest for habitats closest to the potential release location.
Summary of Potential Impacts to Water Quality	
Setting	***Aspect***
All Settings	***Open Water – Water Quality*** Water quality would be affected due to hydrocarbon contamination above impact thresholds. These are defined by the EMBA descriptions for each of the entrained and dissolved hydrocarbon fates and their predicted extent. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to water quality within the EMBA, with impacts predicted to be greatest for areas closest to the potential release location.

Summary of potential impacts to marine sediment quality	
Setting	***Receptor Group***
Offshore	***Marine Sediment Quality*** Studies of hydrocarbon concentrations in deep-sea sediments in the vicinity of a catastrophic well blowout indicated hydrocarbon from the blowouts can be incorporated into sediments (Romero et al. 2015). Proposed mechanisms for hydrocarbon contamination of sediments include sedimentation of hydrocarbons and direct contact between submerged plumes and the seabed (Romero et al. 2015). In the event of a major hydrocarbon release at the seabed, modelling indicates that a pressurised release of hydrocarbon would form droplets that would be transported into the water column to the surface (i.e. transported away from the seabed). As a result, the extent of potential impacts to the seabed area at and surrounding the release site would be largely confined to a localised footprint. Marine sediment quality would be reduced as a consequence of hydrocarbon contamination for a small area within the immediate release site for a long to medium term, as hydrocarbons in sediments typically undergo slower weathering and degradation (Diercks et al. 2010, Liu et al. 2012). There is the potential for floating and entrained hydrocarbons to sink following extensive weathering and adsorption of sediment particles, which may result in the deposition of hydrocarbons to the seabed in areas distant from the release location. Such hydrocarbons are expected to be less toxic due to the weathering process. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in slight, short-term impacts to offshore sediment quality within the EMBA, with impacts predicted to be greatest for areas closest to the potential release location.
Mainland and Islands (Nearshore waters)	***Marine Sediment Quality*** Entrained hydrocarbons (at or above the defined threshold) are predicted to potentially contact shallow, nearshore waters of identified islands and mainland coastlines. Such hydrocarbon contact may lead to reduced marine sediment quality through adherence to sediment. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to sediment quality within the EMBA, with impacts predicted to be greatest for areas closest to the potential release location.

Summary of Potential Impacts to Air Quality
A hydrocarbon release during a loss of well containment has the potential to result in short-term reduction in air quality. There is potential for human health effects on workers in the immediate vicinity of atmospheric emissions. The ambient concentrations of VOCs released from diffuse sources is difficult to accurately quantify, although their behaviour and fate is predictable in open offshore environments, as VOC emissions disperse rapidly by meteorological factors such as wind and temperature. VOC emissions from a hydrocarbon release in such environments are rapidly degraded in the atmosphere by reaction with photochemically produced hydroxyl radicals. Given the remote likelihood of occurrence of a loss of well containment, the temporary nature of any VOC emissions (from either gas surfacing or weathering of liquid hydrocarbons from a loss of well containment), the predicted behaviour and fate of VOCs in open offshore environments, and the significant distance from the Operational Area to the nearest sensitive airshed (town of Dampier ~170 km away), a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to air quality within the EMBA, with impacts predicted to be greatest for areas closest to the potential release location.

Summary of Potential Impacts to Protected Areas
The quantitative spill risk assessment results indicate that the open-water environment protected within a number of Commonwealth AMPs (refer to **Table 6-16**) may be affected by released hydrocarbons in the event of a loss of well containment. In the Remote likelihood of a major spill occurring, entrained hydrocarbons may contact the identified key receptor locations of islands and mainland coastlines and shoreline accumulation may occur above the socio-cultural threshold (but below the ecological threshold) at limited locations, resulting in the actual or perceived contamination of protected areas as identified for the EMBA. Impact on the protected areas is discussed in the sections above for ecological values and sensitivities, and below for socioeconomic values. Additionally, such hydrocarbon contact may alter stakeholder understanding and/or perception of the protected marine environment, given these represent areas are largely unaffected by anthropogenic influences and contain biologically diverse environments.

<table>
<tr><th colspan="2">Summary of Potential Impacts to Socioeconomic Values</th></tr>
<tr><td>Setting</td><td>Receptor Group</td></tr>
<tr><td rowspan="3">Offshore</td><td>Fisheries – Commercial
A hydrocarbon release during a loss of well containment event has the potential to result in direct impacts to target species of the Mackerel Managed Fishery and the Pilbara Line and Pilbara Trap State fisheries within the defined EMBA (refer Section 4.6.2). Lethal and sublethal effects may impact localised populations of targeted species within the EMBA for entrained/dissolved hydrocarbons. However, entrained hydrocarbons are likely to be confined in the upper water column; therefore, demersal species are less likely to be exposed to hydrocarbons than pelagic species. A major loss of hydrocarbons from the Petroleum Activities Program may also lead to an exclusion of fishing from the spill-affected area for an extended period.
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 its efficacy depends on the magnitude of the hydrocarbon 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 seafood contamination 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 would 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 of time, and subsequent potential for minor economic impacts to affected commercial fishing operators.
Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major, long-term impacts to commercial fisheries within the EMBA, particularly for pelagic fisheries and fisheries with most of their effort focused within the EMBA (e.g. Pilbara Demersal Scalefish Managed Fishery and Mackerel Managed Fishery). Potential impacts to inshore fisheries are discussed in the Mainland and Islands (nearshore) impacts discussion below, and the impact assessment relating to spawning is discussed above.</td></tr>
<tr><td>Tourism including Recreational Activities
Recreational fishers predominantly target large tropical species, such as emperor, snapper, grouper, mackerel, trevally and other game fish. Recreational angling activities include shore-based fishing, private boat and charter boat fishing, with peak activity between April and October (Smallwood et al. 2011) for the Exmouth region. Recreational fishing is mainly concentrated around the coastal waters and islands, including the Montebello Islands, and other islands and reefs in the region (DoF, 2011). In the event of an oil spill, fish in these areas could be affected by hydrocarbons above threshold concentrations. Impacts on species that are recreationally fished are described above under Summary of Potential Impacts to Other Species.
A major loss of hydrocarbons from the Petroleum Activities Program may lead to exclusion of marine nature-based tourist activities, resulting in a loss of revenue for operators. Tourism is a major industry for the region and visitor numbers would likely reduce if a hydrocarbon spill were to occur, based on the perception of hydrocarbon spills and associated impacts.
Therefore, a worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term impacts to tourism and recreation within the EMBA.</td></tr>
<tr><td>Offshore Oil and Gas Infrastructure
A hydrocarbon release during a loss of well containment event has the potential to result in disruptions to production at existing petroleum facilities (platforms and FPSOs), as well as activities such as drilling and seismic exploration. For example, facility water intakes for cooling and fire hydrants could be shut off if contacted by floating hydrocarbons, which could in turn lead to the temporary cessation of production activities. Spill exclusion zones established to manage the spill could also prohibit access for activity support vessels as well as offtake tankers approaching facilities off the North West Cape. The impact on ongoing operations of regional production facilities would be determined by the nature and scale of the spill and metocean conditions. Furthermore, decisions on the operation of production facilities in the event of a spill would be based primarily on health and safety considerations. The closest production facilities are:
• GWA platform (operated by Woodside): 12 km from the Operational Area
• NRC platform (operated by Woodside): 31 km from the Operational Area
Operation of these facilities is likely to be affected in the event of a well blowout spill. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in slight, short-term impacts to oil and gas industry within the EMBA.</td></tr>
</table>

Summary of Potential Impacts to Socioeconomic Values	
Submerged Shoals	***Tourism and Recreation*** A hydrocarbon release during a loss of well containment event has the potential to result in a temporary prohibition on charter boat recreational fishing/diving and any other marine nature-based tourism trips to Rankin Bank and Glomar Shoals. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in minor, short-term impacts to tourism and recreational activities within the EMBA.
Mainland and Islands (Nearshore Waters)	***Fisheries – Commercial*** <u>Nearshore Fisheries</u> In the event of a loss of well containment, there is the possibility that target species in some areas used by a number of state fisheries could be affected (refer to **Section 4.6.2** for fisheries within the wider EMBA). Targeted fish, prawn, mollusc and lobster species could experience sublethal stress, or in some instances mortality, depending on the concentration and duration of hydrocarbon exposure and its inherent toxicity. <u>Prawn Managed Fisheries</u> In the event of a major spill, the modelling indicated the entrained and dissolved EMBA may extend to nearshore waters, including the actively fished areas of the designated Exmouth Gulf Prawn Managed Fishery and Nickol Bay Prawn Managed Fishery. Prawn habitat usage differs between species in the post-larval, juvenile and adult stages (Dall et al. 1990) and direct impacts to benthic habitat due to a major spill have the potential to impact prawn stocks. For example, juvenile banana prawns are found almost exclusively in mangrove-lined creeks (Rönnbäck et al. 2002), whereas juvenile tiger prawns are most abundant in areas of seagrass (Masel and Smallwood 2000). Adult prawns also inhabit coastline areas but tend to move to deeper waters to spawn. In the event of a major spill, a range of subtidal habitats that support juvenile prawns may be exposed to hydrocarbons above impact thresholds, including: • Montebello Islands • Barrow Island • Lowendal Islands • Pilbara Southern Island Group • Ningaloo Coast. Localised loss of juvenile prawns in the worst spill-affected areas is possible. Whether lethal or sublethal effects occur will depend on duration of exposure, hydrocarbon concentration and weathering stage of the hydrocarbon, and its inherent toxicity. Furthermore, seafood consumption safety concerns and a temporary prohibition on fishing activities may lead to subsequent potential for economic impacts to affected commercial fishing operators. <u>Demersal fisheries</u> The modelling indicated the entrained and dissolved EMBA may extend into management areas for the following fisheries: • Western Deepwater Trawl Fishery • North West Slope Trawl Fishery. • Pilbara Trap Fishery • Pilbara Line Fishery In the event of an oil spill, fishing effort would be excluded from the affected areas, and fish exposed to hydrocarbons may be inedible. Therefore, a worst-case hydrocarbon spill scenario has the potential to result in major, long-term impacts to commercial fisheries within the EMBA.
	Tourism and Recreation In the event of a major spill, the nearshore waters of offshore islands and reefs as well as the Ningaloo coast could be reached by entrained and dissolved hydrocarbons depending on prevailing wind and current conditions. There is also a low probability of shoreline accumulation above the socio-cultural threshold (but not the ecological threshold) at limited locations. As these locations offer a number of amenities such as fishing, swimming and using beaches and surrounds, they have a recreational value for local residents and visitors. If a well blowout event resulted in hydrocarbon contact, there could be restricted access to beaches for a period of days to weeks, until natural weathering, tides, currents or oil spill response (e.g. shoreline clean-up if safe to do so) removes the hydrocarbons. In

<table>
<tr><th colspan="2">Summary of Potential Impacts to Socioeconomic Values</th></tr>
<tr><td></td><td>the event of a well blowout, tourists and recreational users may also avoid areas due to perceived impacts, including after the oil spill has dispersed.

There is the potential for stakeholder perception that this environment will be contaminated over a large area and for the longer term, resulting in a prolonged period of tourism decline. Oxford Economics (2010) assessed the duration of hydrocarbon spill-related tourism impacts and found that, on average, it took 12 to 28 months to return to baseline visitor spending. There is likely to be significant impacts to the tourism industry, wider service industry (hotels, restaurants and their supply chain) and local communities in terms of economic loss as a result of spill impacts to tourism. Recovery and return of tourism to pre-spill levels will depend on the size of the spill, effectiveness of the spill clean-up, and change in any public perceptions regarding the spill (Oxford Economics 2010).

Therefore, a worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term impacts to tourism and recreational activities within the EMBA.</td></tr>
<tr><td></td><td>Cultural Heritage

There are a number of historic shipwrecks identified in the vicinity of the Operational Area (Table 4-8). The closest known wrecks are those of the McDermott Derrick Barge No. 20, and the McCormack, near the Montebello Islands and about 43 km from the Operational Area, at the closest point. The modelling results do not predict surface slicks contacting the identified wrecks, and the majority of entrained hydrocarbons are expected to occur close to the surface. However, shipwrecks in the subtidal zone could be exposed to entrained and dissolved hydrocarbons. Marine life that shelter and take refuge in and around these wrecks may be affected by in-water toxicity of dispersed hydrocarbons. The consequences of such hydrocarbon exposure may include large fish species moving away and resident fish species and sessile benthos such as hard corals exhibiting sub-lethal and lethal impacts (which may range from physiological issues to mortality).

Entrained hydrocarbons above the threshold concentration are predicted at the Montebello/ Barrow/ Lowendal islands. There is also a low probability of shoreline accumulation above the socio-cultural threshold (but not the ecological threshold). However, artefacts, scatter and rock shelters are on land above the high water mark on Barrow and Montebello islands; therefore, no contact is predicted for these areas.

Within the wider EMBA are several designated heritage places (Section 4.6.1). These places are also covered by other designations such as World Heritage Area. Potential impacts are discussed in the sections above.</td></tr>
<tr><th colspan="2">Summary of Potential Impacts to Environmental Value(s)</th></tr>
<tr><td colspan="2">In the highly unlikely event of a major hydrocarbon spill due to a loss of well integrity, the EMBA includes the areas listed in Table 6-16, including the sensitive offshore marine environments and associated receptors of the Argo-Rowley Terrace AMP, Montebello AMP, Gascoyne AMP, Carnarvon Canyon AMP and Rankin Bank. In summary, long term- impacts may occur at sensitive nearshore and shoreline habitats, particularly areas of the Barrow and Montebello Islands, as a result of a major spill of hydrocarbon from well intervention activities within the Operational Area.

The overall environmental consequence is defined as ‘B – Major, long term impact (ten to 50 years) on highly valued ecosystem, species, habitat, physical or biological attributes’.</td></tr>
</table>

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [19]	***Benefit in Impact/Risk Reduction***	***Proportionalit y***	***Control Adopted***
Legislation, Codes and Standards				
OPGGS (Resource Management and Administration) Regulations 2011: accepted WOMP which describes the well integrity outcomes, control measures and performance criteria used to demonstrate how the risk of loss of well integrity is managed to ALARP including the well design and barriers to be used to prevent a loss of well integrity, which aligns with industry guidance and good practice.	F: Yes. 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 a loss of well integrity event occurring. Although the consequence of a blowout would not be reduced, the reduction in likelihood reduces the overall risk.	Benefits outweigh cost/sacrifice.	Yes **C 8.1**
Maintain well mechanical integrity to contain reservoir fluids within the well envelope in compliance with Woodside Performance Standards for Safety Critical Elements.	F: Yes CS: Costs associated are standard practice.	This control ensures well barriers (downhole and Xmas tree) are in place and verified, reducing the likelihood and overall risk of a blowout occurring.	Benefits outweigh cost/sacrifice.	Yes In accordance with Regulation 31. See below.
In accordance with Regulation 31 of the Environment Regulations, the SCE technical Performance Standard(s) to prevent environment risk relevant for an unplanned loss of well containment, is provided for in Woodside's current Goodwyn Alpha (GWA) Facility Operations Environment Plan, accepted by NOPSEMA on 3 March 2022. The relevant control, PS 13.1, is P10 – Wells to – ensure that a well retains the mechanical integrity to contain reservoir fluids within the well envelope at all times.				
In the event of a spill, emergency response activities implemented in accordance with the OPEP (per **Table 7-4**).	F: Yes. CS: Costs associated with implementing response strategies, vary dependant on nature and scale of spill event. Standard practice.	This control would not reduce the likelihood, but response activities may reduce the consequence.	Benefits outweigh cost/sacrifice.	Yes **C 8.2**
Arrangements supporting the activities in the OPEP (per **Table 7-4**) will be tested to ensure the OPEP can be implemented as planned.	F: Yes. CS: Moderate costs associated with exercises. Standard practice.	Testing the OPEP activities would not reduce the likelihood, but response activities may reduce the consequence.	Benefits outweigh cost/sacrifice.	Yes **C 8.3**
Good Practice				

[19] Qualitative measure.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [19]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Subsea WOCS/WORS installed, and function tested during well intervention activities. The WOCS/WORS shall meet the Woodside Well Control Procedure, Woodside Specification for MODU Deployed Subsea Installation or Workover Equipment and Services and shall be subject to NORSOK D-010 Risk Assessment.	F: Yes. CS: Standard practice. Required by Woodside standards.	Testing of the WOCS/WORS 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 reduction in likelihood reduces the overall risk ranking.	Benefits outweigh cost/sacrifice.	Yes **C 8.4**
Mitigation: Oil Spill Response	Refer to **Appendix D**			
Professional Judgement – Eliminate				
Do not intervene with well	F: No CS: Intervention is required to maintain production to end of field life for Tidepole field.	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 well intervention activities, the cost/ sacrifice outweighs the benefit gained.	No
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls identified.				
Risk Based Analysis				
A quantitative spill risk assessment was performed (refer **Section 6.7.1**).				
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 B, **Section 2.6.1**), Woodside considers the adopted controls appropriate to manage the risks and consequences of a highly unlikely unplanned hydrocarbon release as a result of a loss of well integrity. 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 ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [19]	***Benefit in Impact/Risk Reduction***	***Proportionalit y***	***Control Adopted***

Demonstration of Acceptability

Acceptability Criteria and Assessment

Principles of ESD

The impact and risk evaluation has taken into account the following relevant principles of ESD:

decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations

the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations

the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.

Internal Context

The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including:

Woodside Health, Safety, Environment and Quality Policy (**APPENDIX A**)

Woodside Risk Management Policy (**APPENDIX A**)

Engineering Standards – Well Barriers

Well Acceptance Criteria Procedure

Drilling and Completions – Well Control Procedure

Woodside Specification for MODU Deployed Subsea Installation or Workover Equipment and Services Source Control Emergency Response Planning Guideline (SCERP Guidelines)

Oil spill preparedness and response strategies are considered applicable to the nature and scale of the risk and associated impacts of the response are reduced to ALARP (**APPENDIX D).**

External Context

During stakeholder consultation with relevant persons, DoT requested to be consulted on spill risks with a potential to impact State Waters (**Section 5**). Woodside has also consulted with AMSA on spill response strategies. In accordance with the MoU between Woodside and AMSA, a copy of the Oil Pollution First Strike Plan was provided to AMSA and DoT. No additional queries or concerns relating to a loss of well integrity hydrocarbon spill risk were raised during stakeholder engagement.

Other Requirements

Impact assessment has been informed by risk-based analysis, including hydrocarbon spill modelling. The proposed control measures are consistent with industry legislation, codes and standards, good practice and professional judgement including:

NORSOK D-010 for WOCS/WORS function testing

APPEA *Memorandum of Understanding: Mutual Assistance* for relief well drilling is in place. Woodside develops an activity SCERP, including the Relief Well Plan, which is signed off by the Drilling Engineering Manager and maintains a list of rigs that are currently operating in Australia (refer also to **Appendix D**).

OPGGS (Resource Management and Administration) Regulations 2011 to have an accepted WOMP and application for well intervention activities

NOPSEMA will be notified of reportable and recordable incidents, if required, in accordance with **Section 7.8.** A mutual aid MoU for relief well drilling is in place and the Drilling Engineering Manager maintains a list of rigs that are currently operating in WA.

The EMBA overlaps a number of BIAs for threatened and migratory species, as well as a number of State and Commonwealth MPAs and the Ningaloo Coast. As demonstrated in **Section 6.8**, the residual risk of accidental hydrocarbon release from loss of well integrity is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential impacts. 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**).

Acceptability Statement

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)*** [19]	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
The impact assessment has determined that an accidental hydrocarbon release as a result of a loss of well integrity represents a moderate current risk rating and may result in major, long-term impacts (10 - 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes. BIAs within the Operational Area include flatback turtle interesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. 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 likelihood of a loss of well integrity occurring is highly unlikely, given the adopted controls. The adopted controls are considered consistent with industry legislation, codes and standards, and professional judgement and a risk-based assessment has been conducted to better understand the potential consequences and plan oil spill response. The adopted controls also meet the requirements and expectations of Australian Marine Orders, AMSA and AHO identified during impact assessment and stakeholder consultation. As demonstrated in **Section 6.8**, the potential impacts of hydrocarbon release from loss of well integrity is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans. Regard has been given to relevant conservation advice during the assessment of potential risks. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of risk.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 9 No loss of well integrity resulting in loss of hydrocarbons to the marine environment during the Petroleum Activities Program.	**C 8.1** Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: Accepted Well Operations Management Plan (WOMP). The WOMP describes the well integrity outcomes, control measures and performance criteria used to demonstrate how the risk of loss of well integrity is managed to ALARP including the well design and barriers to be used to prevent a loss of well integrity, which aligns with industry guidance and good practice.	**PS 8.1.1** Wells intervened in compliance with the accepted WOMP	**MC 8.1.1** Acceptance letter from NOPSEMA demonstrates the WOMP was accepted by NOPSEMA before the activity commenced.
			MC 8.1.2 Records demonstrate the verification documentation as listed in the WOMP is available.
	C 8.2 In the event of a spill emergency response activities implemented in accordance with the OPEP (per **Table 7-4**).	**PS 8.2.1** In the event of a spill the OPEP (per **Table 7-4**) requirements are implemented.	**MC 8.2.1** Completed incident documentation.
	C 8.3 Arrangements supporting the activities in the OPEP (per **Table 7-4**) will be tested to ensure the OPEP can be implemented as planned.	**PS 8.3.1** Exercises/tests will be conducted in alignment with the frequency identified in **Table 7-6.**	**MC 8.3.1** Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 8.3.2 Woodside's procedure demonstrates a minimum	**MC 8.3.2** Emergency Management dashboard confirms that

		level of trained personnel, for core roles in the OPEP (per **Table 7-4**), are maintained.	minimum level of personnel trained for core OPEP roles are available.
	C 8.4 Subsea WOCS/WORS installed and function tested during well intervention operations.	**PS 8.4.1** Subsea WOCS/WORS specification, installation and function testing compliant with internal Woodside Standards and international requirements (NORSOK D-010) as agreed by Woodside and WIV contractor.	**MC 8.4.1** Records demonstrate that WOCS/WORS specifications and function testing were in accordance with minimum standards for the expected well intervention conditions as agreed by Woodside and WIV contractor.
For oil spill response outcomes, standards and MC refer to **Appendix D**.			

6.7.3 Unplanned Hydrocarbon Release: Vessel Collision

Context		
Project vessels – **Section 3.8**	Physical environment – **Section 4.4** Biological environment **– Section 4.5** Socio-economic environment – **Section 4.6**	Stakeholder consultation – **Section 5**

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***							
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/Habitat	Species	Socio-Economic	Decision Type	Consequence	Likelihood	Current Risk Rating	ALARP Tools	Acceptability	Outcome
Loss of hydrocarbons to marine environment due to a vessel collision (e.g. support vessels or other marine users)			X		X	X	X	A	D	1	M	LCS GP PJ	Broadly Acceptable	EPO 10

Description of Source of Risk

Background

The temporary presence of the WIV and support vessels in the Operational Area will result in a navigational hazard for commercial shipping within the immediate area (as discussed in **Section 6.6.1**). This navigational hazard could result in a third party vessel colliding with the WIV or a support vessel which could release hydrocarbons.

The largest fuel storage tank considered in suitable WIVs is 492 m^3, with all fuel storage tanks located on the inboard side of the pontoons below the water line. As such, a spill from those tanks as a result of a vessel collision is not credible.

The marine diesel storage capacity of a subsea support vessel can be in the order of 1000 m^3 (total), which is typically distributed throughout the hull of the vessel in multiple, isolated tanks. Individual fuel tanks range in size from 22-250 m^3 in volume. These vessels typically have double walled tanks, which are located midship (not bow or stern). Vessels are not anchored and travel at low speeds when relocating within the Operational Area or providing support.

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 6-17**). The scenarios considered damage to single and multiple fuel storage tanks in a project vessel and WIV due to dropped objects and various combinations of vessel to vessel and vessel to WIV collisions. In summary:

- It is not a credible scenario that a fuel storage tank on the suitable WIVs considered would be damaged due to the location of the tanks on the inboard side of the pontoons, below the waterline.
- It is not a credible scenario that a collision between the project support vessel and WIV would damage any storage tanks, due to the location of the tanks on both vessel types, and secondary containment.
- It is credible that the fuel tanks of a project support vessel would rupture following collision with third party vessels (i.e. commercial shipping, other petroleum related vessels and commercial fishing vessels). However, this situation was assessed as being 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 WIV (exclusion areas), and the construction and placement of storage tanks. In this situation, the full volume of the largest storage tank on a support vessel would be lost. The largest tank of the support vessel is unlikely to exceed 250 m³.

Given the offshore location of the Operational Area, vessel grounding is not considered a credible risk.

Table 6-17: Summary of credible hydrocarbon spill scenario as a result of vessel collision

Scenario	Hydrocarbon Volumes	Preventative and Mitigation Controls	Credibility
Breach of WIV fuel tanks due to support vessel collision.	The largest fuel oil storage tank onboard the suitable WIVs considered have a capacity of 492 m³.	Fuel tanks are located on the inside of pontoons and protected by location below water line, protection from other tanks, e.g. bilge tanks. The draught of vessel and location of tanks in terms of water line prevent the tanks from being breached.	Not credible Due to location of tanks.
Breach of support vessel fuel tanks due to collision with WIV.	Activity support vessel has multiple marine diesel tanks typically ranging between 22 to 105 m³ each.	Typically, double wall tanks that are located mid ship (not bow or stern). Slow support vessel speeds when in proximity to WIV.	Not credible Collision with WIV 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 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 250 m³ each.	Typically, double wall tanks that are located midship (not bow or stern). Vessels are not anchored and steam at low speeds when relocating within the Operational Area or providing stand-by cover. Normal maritime procedures would	Credible Activity support vessel – other vessel collision could potentially result in the release from a fuel tank.

		apply during such vessel movements.	
Loss of well control due to third party vessel (e.g. large bulk carrier) collision with WIV during well intervention activities	Loss of containment of reservoir fluids – see **Section 6.7.2** for estimated volumes.	Refer to **Section 6.7.2** for mitigation controls.	Credible See **Section 6.7.2**.

Quantitative Hydrocarbon Risk Assessment

Modelling of a 1000 m^3 surface release of marine diesel was available for Woodside's Greater Western Flank-3 and Lambert Deep EP, conducted in 2019. The release location used for the spill modelling is approximately 1.6 km from the TPA03 well. The modelled spill volume of 1000 m^3 is greater than the worst-case credible release volume of 250 m^3 for this hydrocarbon spill risk assessment. However, the results of the modelling can be used to demonstrate that a much larger marine diesel spill in the vicinity of the Operational Area has an EMBA that is not predicted to include any surface slicks above threshold volumes entering WA state waters, or any shoreline contact or accumulation. Basing the impact assessment for a vessel collision scenario on this modelling is considered highly conservative and consequently, the EMBA for a 250 m^3 surface release of marine diesel within the Operational Area would be considerably smaller than the EMBA described in this EP.

The modelling assessed the extent of a marine diesel spill volume of 1000 m^3 for all seasons, using an historic sample of wind and current data for the region. The modelling was conducted by RPS using a three-dimensional hydrocarbon spill trajectory and weathering model (SIMAP, Spill Impact Mapping and Analysis Program) (RPS, 2019).

Hydrocarbon Characteristics

Marine diesel is a mixture of both volatile and persistent hydrocarbons. Predicted weathering of marine diesel, based on typical conditions in the region, indicates that about 35% by mass would be expected to evaporate over the first 24 hours **(**Figure 6-2) (RPS, 2019). After this time the majority of the remaining hydrocarbon is entrained into the upper water column, leaving only a small proportion of the oil floating on the water surface (<1%). Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay and/or evaporate over time scales of several weeks to a few months, thereby extending the area of potential effect.

Given the environmental conditions experienced in the Operational Area, marine diesel is expected to undergo rapid spreading and this, together with evaporative loss, is likely to result in a rapid dissipation of the spill. Marine diesel distillates tend not to form emulsions at the temperatures found in the region. The characteristics of the marine diesel are given in **Table 6-18**.

Table 6-18: Characteristics of the marine diesel

Hydrocarbon type	Initial density (g/cm^3) at 25 ºC	Viscosity (cP @ 25 ºC)	Component BP (ºC)	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
			% of aromatics	1.8	1.0	0.2	-

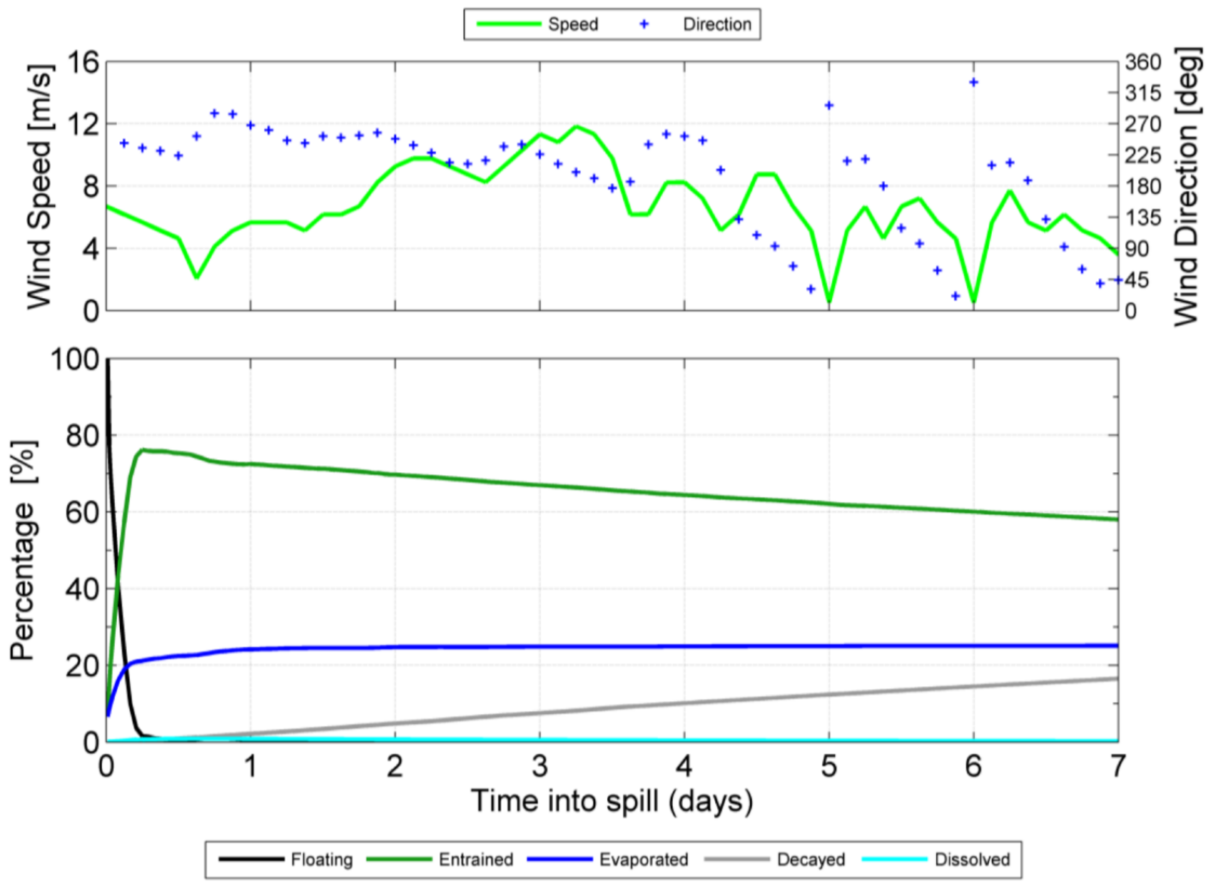

Figure 6-2: Proportional mass balance plot representing the weathering of marine diesel spilled onto the water surface as a one-off release (50 m^3 over one hour) and subject to variable wind at 27°C water temperature and 25°C air temperature.

Consequence Assessment

Potential Impacts Overview

Environment that May Be Affected

Surface Hydrocarbons: The probability contour figures for floating hydrocarbons indicate that concentrations equal to or greater than the 1 g/m^2 and 10 g/m^2 thresholds could potentially be found, in the form of slicks, up to 67 km and 48 km from the spill site, respectively. Floating hydrocarbons at concentrations equal to or greater than 10 g/m^2 is not forecast to contact any of the assessed shoreline receptors (**Table 6-19**).

Entrained Hydrocarbons: Entrained oil at concentrations equal to or greater than the 100 ppb threshold is predicted to be found up to around 619 km from the spill site. Contact by entrained hydrocarbons at concentrations equal to or greater than 100 ppb is predicted at Montebello AMP (20%) as well as a few other sensitive receptors with probabilities of equal to or less than 5% (**Table 6-19**). The maximum entrained oil concentration forecast for any receptor is predicted to be 267 ppb at Gascoyne MP.

Dissolved Hydrocarbons: Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 50 ppb threshold are predicted to be found up to 180 km from the spill site.

Accumulated Hydrocarbons: Accumulated hydrocarbons above threshold concentrations (≥100 g/m²) were not predicted by the modelling to occur at any location.

Taking into consideration the EMBA derived from hydrocarbon spill modelling for a marine diesel spill, the environment that may be affected will fall within the EMBA of the spill from a loss of well integrity outlined in **Section 6.7.2**.

Table 6-19: Probability of hydrocarbon spill contact above impact thresholds within the EMBA with key receptor locations and sensitivities for a 1000 m³ Instantaneous release of marine diesel

Environmental setting	Location/name	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions in Woodside's Risk Management Procedure																												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											
		Water Quality	*Sediment Quality*	*Marine Primary Producers*			*Other Communities/Habitats*								*Protected Species*									*Other Species*						Socio-cultural EMBA		Ecological EMBA			
		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 (including foraging and internesting areas and significant nesting beaches)*	*Sea snakes*	*Whale sharks*	*Sharks and rays*	*Sea birds and/or migratory shorebirds*	*Pelagic fish populations*	*Resident/demersal fish*	*Fisheries – commercial*	*Fisheries – traditional*	*Tourism and recreation*	*Protected areas/heritage – European and Indigenous/shipwrecks*	*Offshore oil & 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)*
Offshore	Montebello AMP	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		1	-	-	20	2	-
	Gascoyne AMP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	-	-	-	4	-	-
	Montebello Islands (including State Marine Park)	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		-	-	-	2	1	-
	Argo-Rowley Terrace AMP	✓						✓							✓	✓			✓			✓	✓	✓		✓			✓		-	-	-	4	-	-
Submerged Shoals	Rankin Bank	✓	✓	✓			✓	✓		✓						✓				✓		✓		✓	✓	✓		✓			1	-	-	-	1	-
	Rowley Shoals – Impervious Reef	✓	✓	✓	✓		✓	✓		✓	✓	✓			✓	✓			✓	✓		✓	✓	✓	✓	✓		✓			-	-	-	1	-	-

Islands	Pilbara Islands Southern Island Group	✓	✓		✓				✓			✓		✓		✓	✓		✓	✓		✓	✓	✓	✓	✓			✓	✓	1	-	-	5	-	-
	Muiron Islands (including MMA-WHA)	✓	✓		✓		✓		✓			✓		✓		✓	✓		✓	✓		✓	✓	✓	✓	✓			✓	✓	-	-	-	4	-	-
Mainland (nearshore waters)	Ningaloo Coast	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		-	1	-	2	-	-
	WA coast	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓		-	1	-	5	-	-

Summary of Potential Impacts to Protected Species, Other Habitats and Communities, Water Quality and Socio-economic Values
Modelling of a 1000 m³ release of marine diesel spill due to vessel collision predicts that no receptors will be contacted by accumulated shoreline oil concentrations equal to or greater than 100 g/m².   The Montebello AMP is predicted to contact entrained hydrocarbons >100 ppb (20%), as is the Gascoyne AMP (4%), Argo-Rowley Terrace AMP (2%) and the Montebello Islands (2%). The submerged Rowley Shoals, Pilbara and Muiron Islands Groups, and the Ningaloo and WA coastlines are also predicted to contacted entrained hydrocarbons above this threshold (≤5%).   Whilst surface hydrocarbons >10 g/m² will not occur at any receptor, there is a very low possibility that surface hydrocarbons >1 g/m² will occur at Montebello AMP, Rankin Bank, and the Pilbara Islands Southern Island Group (1% probability, each)   There is a low possibility of dissolved hydrocarbons ≥50 ppb will occur at Montebello AMP (2%), Montebello Islands (1%), and Rankin Bank (1%).   The potential impacts of spilled hydrocarbons to species (protected and otherwise), marine primary producers, other habitats and communities, water quality, marine sediment quality, air quality, protected areas and socio-economic values are described in **Section 6.7.2**. The loss of well integrity EMBA is larger spatially than the marine diesel EMBA; therefore, the potential impacts of entrained hydrocarbons provided in **Section 6.7.2**, and the scale of impact described, provides a conservative assessment for potential impacts of a 1000 m³ release of marine diesel. Impacts specific to a spill of marine diesel are summarised below. It is noted that the toxic components in marine diesel include alkylated naphthalenes which can be rapidly accumulated by marine biota including invertebrates such as marine oysters, clams, shrimp, as well as a range of vertebrates, such as finfish. Marine diesel also contains additives that contribute to its toxicity.   Given the localised area of the potential EMBA and the rapid dispersion, dilution and weathering of a marine diesel spill, it is expected that any potential impacts will be low magnitude and temporary in nature.   ***Protected Species***   As identified in **Section 4.5.2**, protected species including migrating pygmy blue whales and humpback whales may be encountered near the Operational Area, and therefore could be impacted in close proximity to the marine diesel spill location, where the volatile, water soluble and most toxic components of the diesel may be present. However, the window for exposure to hydrocarbons with the potential for any toxicity effects in these waters would be limited to a few days following the spill. Potential impacts may include behavioural impacts (e.g. avoidance of impacted areas), sub-lethal biological effects (e.g. skin irritation, irritation from ingestion or inhalation, reproductive failure) and, in rare circumstances, organ or neurological damage leading to death. Given the absence of critical habitats or aggregation areas, cetaceans in the area are expected to be transient, and impacts are expected to be limited to individuals or small groups of animals. Impact on the overall population viability of cetaceans are not predicted.   The EMBA overlaps with habitat critical to the survival of flatback turtles for internesting and BIAs identified in **Section 4.5.2.2**, particularly the internesting BIAs for flatback turtles which extend for ~80 km from known nesting locations. The Operational Area also overlaps with an internesting BIA for flatback turtles and is approximately 36 km from designated habitat critical to the survival of flatback turtles for internesting at the Montebello Islands (with peak nesting in December and January). However, it is noted that the BIA and habitat critical to the survival of flatback turtles are considered very conservative as they are based on the maximum range of internesting females and many turtles are more likely to remain near their nesting beaches. In the event of a worst case vessel spill of MDO, there is a potential that surface and entrained hydrocarbons exceeding impact threshold concentrations (10 g/m² and 100 ppb respectively) will be present in offshore waters extending up to 48 km and 619 km respectively, from the release site. Toxicity of hydrocarbons will be significantly reduced by weathering at over such distances, with the volatile and water soluble (often the most toxic) components expected to have dissipated beyond the vicinity of the spill site. Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 50 ppb threshold are predicted to be limited to the vicinity of the spill site. Low concentrations are only capable of causing sublethal impacts to the most sensitive marine organisms and no lethal or sub-lethal impacts to marine turtles are expected in the BIAs. The potential for lethal and sub-lethal impacts to marine turtles is limited to small numbers of transient individuals that may be present in offshore waters near the release location.   Seabirds may also be exposed to marine diesel on the sea surface or upper water column, if resting or foraging in waters near to the spill. Impacts may include mortality due to oiling of feathers or the ingestion of hydrocarbons. However, due to the limited spatial extent of a marine diesel spill and limited window for exposure, population level impacts are not expected.   Other protected species that may occasionally transit through the area and may potentially be exposed to a marine diesel spill, include shark and ray species such as whale sharks and manta rays. The EMBA overlaps the whale shark foraging BIA along the North-west shelf, but does not overlap the foraging (high density prey) BIA along the Ningaloo coast. Should sharks or rays be present in offshore waters near the Operational Area during the spill, direct impacts may occur if foraging within surface slicks or in the upper 20 to 30 m of the water column containing entrained hydrocarbons and dissolved aromatics. Contamination of their food supply and the subsequent ingestion of this prey may also result in long term impacts as a result of bioaccumulation. Impacts are again predicted to be limited to a small

number of animals given the low numbers of animals that may transit through the area during the short period when spilled hydrocarbons are present.

Given the limited number of animals that may be impacted and the rapid dispersion of marine diesel, it is considered that any potential impacts will be minor.

Other Habitats, Species and Communities

Within the EMBA for a marine diesel spill resulting from a vessel collision, there is the potential for plankton communities to potentially be impacted where entrained or dissolved hydrocarbon threshold concentrations are exceeded. A range of lethal and sublethal impacts may occur to plankton exposed to entrained or dissolved hydrocarbons within the EMBA. Communities are expected to recover quickly (weeks/months) due to high population turnover (ITOPF, 2011a). It is therefore considered that any potential impacts would be low magnitude and temporary in nature.

Pelagic fish populations in the open water offshore environment of the EMBA are highly mobile and have the ability to move away from a marine diesel spill. The spill-affected area would be confined to the surface layer and upper 20 to 30 m of the water column. It is therefore unlikely that fish populations would be exposed to widespread hydrocarbon contamination. Pelagic fish populations are distributed over a wide geographical area so impacts on populations or species level are considered to be negligible. Combined with these factors and the rapid dispersion of marine diesel, it is considered that any potential impacts will be minor.

Other communities (e.g. demersal fish, benthic infauna and epifauna) and key sensitivities (e.g. KEFs identified in **Section 4.5.3)** occur within the EMBA, however they will not be directly exposed or impacted by a marine diesel spill as hydrocarbons are confined to the upper layers of the water column.

Water Quality

It is likely that water quality will be reduced at the release location of the spill; however, such impacts to water quality would be temporary and localised in nature due to the rapid dispersion and weathering of marine diesel. The potential impact is therefore expected to be low.

Protected Areas

Surface, entrained and dissolved hydrocarbons at or exceeding impact thresholds have a low probability of contacting the Montebello AMP, Gascoyne AMP, and the Argo-Rowley Terrace AMP. Surface and entrained hydrocarbons are mostly only predicted within the deep open waters of these protected areas, with no contact to seabed habitats or to shorelines above the ecological impact threshold values. Potential impacts to water quality and the natural values (e.g. mobile protected species) in these areas would be temporary and localised in nature due to the rapid dispersion and weathering of the marine diesel, as described above. Dissolved hydrocarbons (at or exceeding 50 ppb) are predicted to reach the Montebello AMP and the Montebello Islands State Marine Park.

Socio-economic

A marine diesel spill is considered unlikely to cause significant direct impacts on the target species fished by Commonwealth and State fisheries (see **Section 4.6.2**) which overlap with the EMBA. The fisheries that operate within the EMBA predominantly target demersal fish species (demersal finfish and crustaceans) that inhabit waters in the range of >60–200 m depth, or pelagic species which are highly mobile. Therefore, a marine diesel spill is expected to only result in negligible impacts, considering that hydrocarbons are confined to the upper layers of the water column. Visible surface hydrocarbons at or exceeding 1 g/m^2 may also occur up to 67 km from the release site, which may result in fouling of fishing gear and a perception of impacts to fish stocks by fisheries stakeholders and the public. There is the potential that a fishing exclusion zone would be applied in the area of the spill, which would put a temporary ban on fishing activities and therefore potentially lead to subsequent economic impacts on commercial fishing operators if they were planning to fish within the area of the spill. Such measures would likely be in place for less than a week and would not result in widespread or long term impacts to fishing activities.

Summary of Potential Impacts to Environmental Values

In the unlikely event of an unplanned hydrocarbon release to the marine environment due to vessel collision, combined with the adopted controls, it is considered that any potential impact to water quality would be minor, localised and temporary in nature in comparison to background levels and/or international standards, with localised and temporary impacts to habitats, populations and shipping/fishing concerns.

The highest environmental consequence identified for the assessment of an unplanned hydrocarbon release to the marine environment due to vessel collision, as classified in **Table 2-3,** is defined as D, which equates to minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystems), physical or biological attributes.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[20]	***Benefit in Impact/ Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 30 (prevention of collisions) 2016, including: • adherence to steering and sailing rules including maintaining lookouts (e.g. visual, hearing, radar, etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar) • adherence to navigation light display requirements, including visibility, light position/shape appropriate to activity • adherence to navigation noise signals as required.	F: Yes. 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 **C 9.1**
Marine Order 21 (safety and emergency arrangements) 2016, including: • adherence to minimum safe manning levels • maintenance of navigation equipment in efficient working order (compass/radar) • navigational systems and equipment required are those specified in Regulation 19 of Chapter V of *Safety of Life at Sea* • Automatic Identification System (AIS) that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of interference with other marine users and thus the likelihood of a collision.	Controls based on legislative requirements – must be adopted.	Yes **C 9.2**
Establishment of a 500 m safety exclusion zone around WIV and communicated to marine users.	F: Yes. 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 **C 1.2**
Arrangements supporting the activities in the OPEP will be tested to ensure the OPEP can be implemented as planned.	F: Yes. CS: Moderate costs associated with exercises. Standard practice.	No change to impact or risk however ensures OPEP can be implemented in the event of a hydrocarbon spill thereby potentially reducing the consequence.	Control based on regulatory requirement – must be adopted.	Yes **C 8.4**

[20] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[20]***	***Benefit in Impact/ Risk Reduction***	***Proportionality***	***Control Adopted***
Good Practice				
When a support vessel is designated for standby it will undertake actions to prevent unplanned interactions, such as: • Maintain a 24 hour radio watch on designated radio channel(s). • Perform continuous surveillance and warn the WIV of any approaching vessels reaching 500 m safety exclusion zone. Surveillance shall be conducted by a combination of: visual lookout radar watch other electronic systems available including AIS monitoring any additional/agreed radio communications channels all other means available. • While complying with Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS), approach any vessel attempting to transit through the 500 m safety exclusion zone and contact vessel by all available means. • Monitor and advise the WIV if: WIV navigation signals are defective visibility becomes restricted. • Advise if any buoys in the area are not holding position or are not working as expected.	F: Yes. CS: Minimal cost – support vessels available routinely in Operational Area during Petroleum Activities Program. Standard practice.	Provides a reduction in likelihood of a collision with a third party vessel.	Benefits outweigh cost/sacrifice.	Yes **C 9.3**
AHO notified of activities and movements no less than four working weeks prior to scheduled activity commencement date of well intervention activities.	F: Yes. CS: Minimal cost. Standard practice.	Notification to AHO will enable them to generate navigation warnings (Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) (including AUSCOAST warnings where relevant)).	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes **C 1.1**
Notify AMSA JRCC upon commencement and completion of well intervention activities.	F: Yes. CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware,	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes **C 1.5**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[20]	***Benefit in Impact/ Risk Reduction***	***Proportionality***	***Control Adopted***
		thereby reducing the likelihood of a collision with a third party vessel.		
Notify AHO and AMSA JRCC of any extended delay in the timing of the Petroleum Activities Program.	F: Yes CS: Minimal cost. 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. Control is also Standard Practice.	Yes **C 1.6**
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. 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				
No additional controls identified.				
Risk Based Analysis				
A quantitative spill risk assessment was performed (see detail above).				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[20]***	***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 2.6.1**), Woodside considers the adopted controls appropriate to manage the impacts and risks of an unplanned loss of hydrocarbon as a result of vessel collision. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				
Demonstration of Acceptability				
Acceptability Statement The impact assessment has determined that an accidental hydrocarbon release as a result of a vessel collision represents a Minor current risk rating and may result in minor, short-term impact (1-2 years) on species, habitat (but not affecting ecosystems function), physical or biological attributes and communities. BIAs within the Operational Area include flatback turtle internesting, whale shark foraging, and wedge-tailed shearwater breeding and foraging BIAs. 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 stakeholder consultation. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2,** this is considered an acceptable level of risk.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 10 No release of hydrocarbons to the marine environment due to a vessel collision during the Petroleum activities Program.	**C 9.1** Marine Order 30 (prevention of collisions) 2016, including: • adherence to steering and sailing rules including maintaining lookouts (e.g. visual, hearing, radar, etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar) • adherence to navigation light display requirements, including visibility, light position/shape appropriate to activity • adherence to navigation noise signals as required.	**PS 9.1.1** Support vessels and WIV compliant with Marine Order 30 (which requires vessels to be visible at all times) to prevent unplanned interaction with marine users.	**MC 9.1.1** Marine Assurance inspection records demonstrate compliance with standard maritime safety procedures (Marine Orders 21 and 30).
	C 9.2 Marine Order 21 (safety and emergency arrangements) 2016, including: • adherence to minimum safe manning levels • maintenance of navigation equipment in efficient working order (compass/radar)	**PS 9.1.2** Support vessels and WIV compliant with Marine Order 21 to prevent unplanned interaction with marine users.	

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	• navigational systems and equipment required are those specified in Regulation 19 of Chapter V of *Safety of Life at Sea* • AIS that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data.		
	C 1.2 Establishment of a 500 m safety zone around WIV/support vessels and communicated to marine users.	**PS 1.2.1** No adverse interactions between vessels and WIV.	**MC 1.2.1** Records demonstrate breaches by unauthorised vessels within the safety exclusion zone are recorded.
			MC 1.2.2 Consultation records demonstrate that AHO has been notified before commencing the activity to allow generation of navigation warnings (MSIN and NTM (including AUSCOAST warnings where relevant)), which communicate safety exclusion zones to marine users.
	C 8.4 Arrangements supporting the activities in the OPEP (per Table 7-4) will be tested to ensure the OPEP can be implemented as planned.	**PS 8.4.1** Exercises/tests will be conducted in alignment with the frequency identified in Table 7-6.	**C 8.4.1** Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 8.4.2 Testing of arrangement records confirm that emergency response capability has been maintained.	**C 8.4.2** Emergency Management dashboard confirms that minimum level of personnel trained for core OPEP roles are available.
	C 9.3 When a support vessel is designated for standby it will undertake actions to prevent unplanned interactions, such as: • Maintain a 24 hour radio watch on designated radio channel(s). • Perform continuous surveillance and warn the	**PS 9.3.1** Define role of support vessels in maintaining safety exclusion 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 9.3.1** Records of non-conformance against controls maintained.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	WIV of any approaching vessels reaching the 500 m safety exclusion zone. Surveillance shall be conducted by a combination of: visual lookout radar watch other electronic systems available including AIS monitoring any additional/agreed radio communications channels all other means available. • While complying with COLREGS, approach any vessel attempting to transit through the 500 m zone and contact vessel by all available means. • Monitor and advise the WIV if: WIV navigation signals are defective visibility becomes restricted. • Advise if any buoys in the area are not holding position or are not working as expected.		
	C 1.1 see **Section 6.6.1**	**PS 1.1** see **Section 6.6.1**	**MC 1.1** see **Section 6.6.1**
	C 1.3 see **Section 6.6.1**	**PS 1.3** see **Section 6.6.1**	**MC 1.3** see **Section 6.6.1**
	C 1.4 see **Section 6.6.1**	**PS 1.4** see **Section 6.6.1**	**MC 1.4.1** see **Section 6.6.1**
Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are presented in **APPENDIX D.**			

6.7.4 Unplanned Discharges: Deck and Subsea Spills

Context		
Project Fluids – **Section 3.7** Project Vessels – **Section 3.8**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental discharge of hydrocarbons/ chemicals from WIV and project vessels deck activities and equipment (e.g. cranes) and from subsea ROV hydraulic leaks within the Operational Area		X			X		A	F	2		L	LCS GP PJ	Broadly acceptable	EPO 11

Description of Source of Risk

Unplanned hydrocarbon and chemical spills

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 Operational Area, on the helipad of the WIV and support vessels.

Minor leaks during wire line activities (i.e. well intervention 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 m3)
- loss of containment – fluids – surface holding tanks
- 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 <10 L.

Subsea spills can result from a loss of containment of fluids from subsea equipment including the WOCS/WORS 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). These include the diamond wire cutter, bolt tensioning equipment, ROV tooling etc.

Bulk Fluids - Transfers

A support vessel may bulk transfer brine/MEG to the WIV, 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 fluids to either the bunded deck or into the marine environment. The most likely spill volume of brine/MEG 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 brine/MEG 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. fluids pumped through a failed transfer hose for a period of about five minutes).

Drilling Fluids - Activation of the Emergency Disconnect Sequence

The EDS is an emergency system that provides a rapid means of shutting in the well and disconnecting the WIV from the Lower Disconnect package of the WOCS/WORS. The EDS could be manually activated due to an identified threat to the safety of the WIV, including loss of WIV station keeping, potential collision by a third-party vessel or a loss of well control. During operations, activating the EDS could result in a subsurface release of drill water, brine/MEG and gas based on the contents of the WOCS/WORS at the time of the EDS. The volume of material released would be up to 1 m^3 (i.e. the annulus volume between the LRP and EDS would be lost).

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.

Consequence Assessment

Accidental spills of hydrocarbons or chemicals from the WIV and support vessels, bulk transfer hose, or loss of WOCS/WORS contents due to EDS, will decrease the water quality in the immediate area of the spill; however, the impacts are expected to be temporary and very localised due to dispersion and dilution in the open ocean environment.

The potential biological and ecological impacts associated with hydrocarbon spills are presented in **Sections 6.7.2** to **6.7.3**. A minor loss of hydrocarbons from deck and subsea spills will be much reduced in terms of spatial and temporal scales from impacts described in **Section 6.7.2** to **6.7.3**. Given the small area of the potential spill and the dilution and weathering of any spill, the likelihood of ecological impacts to marine fauna (including protected species), other communities and habitats will be limited to no lasting effect and restricted to individual animals, and temporary, localised contamination of water.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that minor hydrocarbon/chemical spills to the marine environment will not result in a potential impact to water quality greater than localised contamination above background levels with no lasting effect, quality standards or known effect concentrations and will not result in a potential impact greater than localised disruption to a small proportion of biological populations with no impact on protected species.

Demonstration of ALARP

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)[21]*	*Benefit in Impact/Risk Reduction*	*Proportionality*	*Control Adopted*
Legislation, Codes and Standards				
Marine Order 91 (marine pollution prevention – oil) 2014, requires Ship Oil Pollution Emergency Plan (SOPEP)/Spill Monitoring Programme Execution Plan (SMPEP) (as appropriate to vessel class).	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of an unplanned release. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 10.1**
Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of contaminated deck drainage water being discharged to the marine environment.	Controls based on legislative requirements – must be adopted.	Yes **C 10.2**

[21] Qualitative measure

Good Practice				
Where there is potential for loss of primary containment of oil and chemicals on the WIV, deck drainage will be collected via a closed drainage system. E.g. drill floor.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of contaminated deck drainage water being discharged to the marine environment.	Benefits outweigh cost/sacrifice.	Yes **C 4.3**
Spill kits positioned in high risk locations around the WIV and support vessels (near potential spill points such as transfer stations).	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of a deck spill from entering the marine environment. The consequence is unchanged.	Benefits outweigh cost/sacrifice.	Yes **C 10.3**
Project vessels have self-containing hydraulic oil drip tray management system.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of a deck spill from entering the marine environment. The consequence is unchanged.	Benefits outweigh cost/sacrifice.	Yes **C 10.4**
Fluids and additives intended or likely to be discharged to the marine environment will have an environmental assessment completed before use.	F: Yes. 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 **C 5.1**
• Contractor procedure for managing bulk fluids transfers onto, around and off the WIV, which requires: • emergency shutdown systems for stopping losses of containment (e.g. burst hoses) • transfer hoses to have flotation devised to allow detection of a leak • the valve line-up to be checked prior to commencing transfers	F: Yes. 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 **C 10.5**

• constant monitoring of the transfer process • direct radio communications • completed PTW and JSA showing contractor procedures are implemented • recording and verification of volumes moved to identify any losses				
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
Below-deck storage of all hydrocarbons and chemicals.	F: Not feasible. 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. 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 the vessel.	F: Yes. Increases the risks associated with transportation and lifting operations. CS: Project delays if required chemicals not on board. Increases the risks associated with transportation and lifting operations.	No reduction in likelihood or consequence since chemicals will still be required to enable activities to occur.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
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 2.6.1**), Woodside considers the adopted controls appropriate to manage the impacts and risks of the potential unplanned accidental deck and subsea spills described above. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				
Demonstration of Acceptability				
Acceptability Statement The risk assessment has determined that an unplanned minor discharge of hydrocarbons as a result of minor deck and subsea spills represents a low risk that is unlikely to result in potential impact greater than localised and temporary disruption but not impacting on ecosystem function. BIAs within the Operational Area include flatback turtle				

internesting, whale shark foraging, and wedge-tailed shearwater breeding BIA. However, these species are not expected to be impacted. The adopted controls are consistent with industry legislation, codes and standards, good practice and professional judgement and meet the expectations of Australian Marine Orders. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of risk.			
Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 11 No unplanned spills to the marine environment from deck activities greater than a consequence level of F[22] during the Petroleum Activities Program.	**C 10.1** Marine Order 91 (Marine pollution prevention – oil) 2014, requires SOPEP/SMPEP (as appropriate to vessel class).	**PS 10.1.1** Appropriate initial responses prearranged and exercised for response to a hydrocarbon spill, as appropriate to vessel class.	**MC 10.1.1** Marine Assurance inspection records demonstrate compliance with Marine Order 91.
	C 10.2 Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/ moved temporarily.	**PS 10.2.1** Failure of primary containment in storage areas does not result in loss to the marine environment.	**MC 10.2.1** Records confirms all liquid chemicals and fuel are stored in bunded/ secondarily contained areas when not being handled/moved temporarily.
	C 4.3 See **Section 6.6.4**	**PS 4.3.1** See **Section 6.6.4**	**MC 4.3.1** See **Section 6.6.4**
	C 10.3 Spill kits positioned in high risk locations around the rig (near potential spill points such as transfer stations).	**PS 10.3.1** Spill kits to be available for use to clean up deck spills.	**MC 10.3.1** Records confirms spill kits are present, maintained and suitably stocked.
	C 10.4 Project vessels have self-containing hydraulic oil drip tray management system.	**PS 10.4.1** Contain any on-deck spills of hydraulic oil.	**MC 10.4.1** Records demonstrate Project vessels are equipped with a self-containing hydraulic oil drip tray management system.
	C 5.1 See **Section 6.6.5**	**PS 5.1.1** See **Section 6.6.5**	**MC 5.1.1** See **Section 6.6.5**

[22] Defined as 'No lasting effect (<1 month). Localised impact not significant to environmental receptor'.

	C 10.5 Contractor procedure for managing bulk fluids transfers onto, around and off the WIV, which requires: • emergency shutdown systems for stopping losses of containment (e.g. burst hoses) • transfer hoses to have flotation devised to allow detection of a leak • the valve line-up to be checked prior to commencing transfers • constant monitoring of the transfer process • direct radio communications • completed PTW and JSA showing contractor procedures are implemented • recording and verification of volumes moved to identify any losses	**PS 10.5.1** Compliance with contractor procedures to limit accidental loss to the marine environment.	**MC 10.5.1** Records demonstrate drilling fluid transfers are performed in accordance with the applicable contractor procedures.
Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **APPENDIX D.**			

6.7.5 Unplanned Discharges: Release of Solid Hazardous and Non-hazardous Wastes

Context		
Project Vessels and Support Activities– **Section 3.8**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental loss of hazardous or non-hazardous wastes to the marine environment (excludes sewage, grey water, putrescible waste and bilge water)		X	X		X	X		A	F	2	L	LCS GP PJ	Broadly Acceptable	EPO 12

Description of Source of Risk

The WIV 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 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.

Consequence Assessment

Potential Impacts to Water Quality, Other Habitats and Communities, and Protected Species

The potential impacts of solid wastes accidentally discharged to the marine environment include direct pollution and contamination of the environment and secondary impacts relating to potential contact of marine fauna with wastes, resulting in entanglement or ingestion and leading to injury and death of individual animals. 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 Operational Area, the types, size and frequency of wastes that could occur, and species present.

Water Quality

<u>Change in Water Quality</u>

Hazardous solid wastes such as paint cans, oily rags, etc., can cause localised contamination of the water through a release of toxins and chemicals. Given the likely small volumes of any unplanned solid waste discharge, and the occasional nature of the event, these would result in temporary and highly localised changes to the water quality

Seabirds and Migratory Shorebirds, Fish, Marine Reptiles and Marine Mammals

<u>Injury/Mortality to Fauna</u>

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

(Commonwealth of Australia, 2018). The Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (Commonwealth of Australia, 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; Commonwealth of Australia, 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 (Commonwealth of Australia, 2018) management controls will reduce the risk of unplanned discharge of solid waste.

The temporary or permanent loss of waste materials into the marine environment will have no lasting effect on any species or water quality, based on the types, size and frequency of wastes that could occur.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that the accidental discharge of solid waste described will result in localised impacts not significant to environmental receptors, with no lasting effect (i.e. Environment Impact – F).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[23]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Project vessels compliant with Marine Orders for safe vessel operations: • Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014 • Marine Order 95 (Pollution prevention – Garbage).	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of an unplanned release. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 11.1**
Good Practice				

[23] Qualitative measure

Drilling and Completions waste arrangements, which require: • dedicated space for waste segregation bins and skips to be provided on the WIV • records of all waste to be disposed, treated or recycled • waste streams to be handled and managed according to their hazard and recyclability class • all non-putrescible waste (excludes all food, greywater or sewage waste) to be transported from the WIV and disposed onshore.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of an unplanned release. The consequence is unchanged.	Benefit outweighs cost/sacrifice.	Yes **C 11.2**
Project vessel waste arrangements, which require: • dedicated waste segregation bins • records of all waste to be disposed, treated or recycled • waste streams to be handled and managed according to their hazard and recyclability class.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of an unplanned release. The consequence is unchanged.	Benefit outweighs cost/sacrifice.	Yes **C 11.3**
• If safe and practicable to do so, vessel, ROV, or crane will be used to attempt recovery of material24	F: Yes. CS: Minimal cost. Standard practice.	Potentially reduces consequence by recovering object/waste container from the environment.	Benefit outweighs cost/sacrifice.	Yes **C 11.4**

[24] For this control /performance standard, ‘material’ is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of >F

environmentally hazardous or non-hazardous solid object/waste lost overboard. This activity will consider: • risk to personnel to retrieve object • whether the location of the object is in recoverable water depths • object's proximity to subsea infrastructure • ability to recover the object (i.e. nature of object, lifting equipment or, ROV availability and suitable weather)				

Professional Judgement – Eliminate

No additional controls identified.

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 2.6.1**), Woodside considers the adopted controls appropriate to manage the risks and consequences of accidental discharges of waste. 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 Statement

The impact assessment has determined that unplanned discharges from a release of solid hazardous and non-hazardous wastes represent a low current risk rating and may result in localised impacts with no lasting effect (<1 month) to water quality, habitats (but not ecosystems) and species. BIAs within the Operational Area include flatback turtle interesting buffer, whale shark foraging, and wedge-tailed shearwater breeding BIA. 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 expectations of Australian Marine Orders. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of risk.

Environmental Performance Outcomes, Standards and Measurement Criteria

Outcomes	***Controls***	***Standards***	***Measurement Criteria***

EPO 12 No unplanned release of solid hazardous or non-hazardous waste to the marine environment greater than a consequence level of F[25] during the Petroleum Activities Program.	**C 11.1** Project vessels compliant with Marine Orders for safe vessel operations: • Marine Order 94 (Marine pollution prevention –packaged harmful substances) 2014 • Marine Order 95 (Pollution prevention – Garbage).	**PS 11.1.1** WIV and project vessels compliant with Marine Orders 94 and 95.	**MC 11.1.1** Records demonstrate compliance with Marine Orders 94 and 95.
	C 11.2 Drilling and Completions waste arrangements will be applied, which require: • dedicated space for waste segregation bins and skips to be provided on the WIV • records of all waste to be disposed, treated or recycled • waste streams to be handled and managed according to their hazard and recyclability class • all non-putrescible waste (excludes all food, greywater or sewage waste) to be transported from the WIV and disposed onshore.	**PS 11.2.1** Hazardous and non-hazardous waste will be managed in accordance with the Drilling and Completions waste arrangements.	**MC 11.2.1** Records demonstrate compliance against Drilling and Completions waste arrangements.
	C 11.3 Support vessel waste arrangements will be applied, which require: • dedicated waste segregation bins • records of all waste to be disposed, treated or recycled • waste streams to be handled and managed according to their hazard and recyclability class.	**PS 11.3.1** Hazardous and non-hazardous waste managed in accordance with the support vessels' waste arrangements	**MC 11.3.1** Records demonstrate compliance against support vessels' waste arrangements.
	C 11.4 If safe and practicable to do so, vessel, ROV, or crane will be used to attempt recovery of solid	**PS 11.4.1** Material solid waste or object/waste dropped to the marine environment will be recovered where	**MC 11.4.1** Records detail the recovery attempt consideration and status of any object/waste lost to the marine environment.

[25] Defined as 'No lasting effect (less than one month). Localised impact not significant to areas or items of cultural significance)'.

	object/waste lost overboard.	safe and practicable to do so, considering: • risk to personnel to retrieve object • whether the location of the object is in recoverable water depths • object's proximity to subsea infrastructure • ability to recover the object (i.e. nature of object, lifting equipment, ROV availability and suitable weather).	

6.7.6 Physical Presence Vessel Collision with Marine Fauna

Context		
Project Vessels and Support Activities– **Section 3.8**	Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary

Source of Risk	Environmental Value Potentially Impacted							Evaluation						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental collision between project vessels/WIV and protected marine fauna within the Operational Area						X		A	E	1	L	LCS GP PJ	Broadly Acceptable	EPO 13

Description of Source of Risk

The project vessels operating in and around the Operational Area may present a potential hazard to cetaceans (e.g. humpback whales, fin whales) and other protected marine fauna, such as marine turtles and whale sharks. 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) and mortality.

The factors that contribute to the frequency and severity of impacts due to collisions vary greatly due to vessel type, vessel operation (specific activity, speed), physical environment (e.g. water depth), the type of animal potentially present and their behaviours.

Vessels used during the Petroleum Activities Program may include subsea support vessels, with multiple vessels likely to be used to support WIV. Vessels would typically be stationary or slow moving while supporting the Petroleum Activities Program. Support vessels are used to transport equipment and materials between the WIV and port (e.g. Dampier, Onslow, Exmouth). If required, one of the vessels may be present at the WIV to perform standby duties, and others will make regular trips between the Operational Area to port for routine, non-routine and emergency operations. Support vessels do not anchor within the Operational Area during the activities due to water depth; therefore, vessels will utilise DP.

Consequence Assessment

Vessel collisions with marine fauna have potential to occur within the Operational Area. Vessel disturbance is a key threat to a number of migratory and threatened species identified as occurring within the Operational Area including cetaceans, marine turtles and whale sharks. Three species have BIAs that intercept the Operational Area:

- flatback turtle internesting buffer BIA;
- whale shark foraging BIA; and
- wedge-tailed shearwater breeding BIA.

Refer to **Section 4.5.2** for more information about these species and details of seasonal timings.

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. According to the data of Vanderlaan and Taggart (2007), it is estimated that the risk 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 US National Ocean and Atmospheric Administration database (Jensen and Silber 2004) there 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 placed amongst whales.

Project vessels within the Operational Area are likely to be travelling <8 knots, (and will often be stationary), unless operating in an emergency. 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.

Cetaceans

The nearest recognised BIAs for cetaceans (considered to be at risk due to relatively slow movement and proportion of time spent at or near the sea surface) is the humpback whale migration BIA, which lies approximately 25 km south-east of the Operational Area (refer to **Section 4.5.2.3**). The pygmy blue whale migration BIA also lies beyond the Operational Area (approximately 43 km north-west). However, migrating pygmy blue whales are not necessarily confined to the designated migratory corridor (Thums et al., 2022). Therefore, individuals may transit through the Operational Area and increased numbers may occur during whale migration periods (**Section 4.5.2.3**). Adverse interactions between vessels and humpback or pygmy blue whales are considered to be unlikely due to the slow speeds of project vessels within the Operational Area, and the distance of the Operational Area from these known BIAs.

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. Given the duration of activities within the Operational Area and the slow speeds at which project vessels operate, collisions with cetaceans such as pygmy blue and humpback whales are considered very unlikely.

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.

Whale sharks

Whale sharks are at risk from vessel strikes when feeding at the surface or in shallow waters (where there is limited option to dive). Whale sharks may traverse offshore North West Shelf waters including the Operational Area during their migrations to and from Ningaloo Reef. However, it is expected that whale shark presence within the Operational Area would not comprise high numbers and their presence would be transitory and of a short duration. There are no constraints preventing whale sharks from moving away from vessels (e.g. shallow water or shorelines).

Marine turtles

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 distance of the Operational Area from the nearest nesting beaches (Montebello Islands are approximately 75 km away), it is expected that the presence of marine turtles, including flatback turtles, would be very unlikely and only comprise individuals transiting the open, offshore waters for short periods of time. It is acknowledged, however, that there are significant nesting sites along the WA mainland coast and islands of the region and that turtles may occur within the Operational Area in low numbers. There is an internesting BIA for the flatback turtle which overlaps the Operational Area, which is associated with the Montebello Islands (see **Section 4.5.2.2**). The Montebello Islands themselves are located about 75 km south of the Operational Area and this internesting area is a spatially assigned buffer for marine turtles nesting at the Montebello Islands. Therefore, it is unlikely that flatback turtles nesting at the Montebello Islands will be found to aggregate in significant numbers more than 50 km away and within the Operational Area. Notably, the typical response from turtles on the surface to the presence of vessels is to dive (a potential “startle” response), which decreases the risk of collisions (Hazel et al. 2007). As with cetaceans, the risk of collisions between turtles and vessels increases with vessel speed (Hazel et al. 2007). Given the low speeds of vessels undertaking the Petroleum Activities Program, along with the expected low numbers of turtles within the Operational Area, interactions between vessels and turtles are considered to be highly unlikely.

It is not deemed credible, that vessel movement associated with the Petroleum Activities Program could have a significant impact on marine fauna populations given (1) the low presence of transiting individuals, (2) avoidance behaviour commonly displayed by whales, whale sharks and marine turtles and (3) low operating speed of the activity support vessels (generally less than 8 knots or stationary, unless operating in an emergency). Activities are considered unlikely to result in a consequence greater than slight short-term disruption to individuals or a small proportion of the population and no impact on critical habitat or fauna activity.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls, it is considered that a collision, were it to occur, will not result in a potential impact greater than slight, short-term impact on species (i.e. Environment Impact – E).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[26]***	***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[27]: • Project vessels will not travel greater than six knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. • Project vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean or turtle shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots. • Project vessels will not travel greater than eight knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls will reduce the likelihood of a collision between a cetacean, whale shark or turtle occurring. The consequence of a collision is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 3.1**
Good Practice				
• Variation of the timing of the Petroleum Activities Program to avoid migration and foraging periods.	F: No. Timing of activities is linked to WIV schedule. Timing of all activities is currently not determined and, due to WIV availability and operational requirements, performing activities during migration seasons may not be able to be avoided. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No

[26] Qualitative measure

[27] 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)[26]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
The use of dedicated MFOs on support vessels for the duration of each activity to watch for whales and provide direction about 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 perform specific cetacean observation training. CS: Additional cost of MFOs considered unnecessary.	Given that support 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
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 2.6.1**), 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.				
Demonstration of Acceptability				
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 may result in slight, short-term impacts (<1 year) to species. Relevant BIAs overlapping the Operational Area include flatback turtle internesting and whale shark foraging BIAs. 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 6.8**). 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. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of risk.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 13 No vessel strikes with protected marine fauna (whales, whale sharks, turtles) during the Petroleum Activities Program.	**C 3.1** EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[28]: • Project vessels will not travel greater than six knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. • Project vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). • If the cetacean or turtle shows signs of being disturbed, project vessels will immediately withdraw from the caution zone at a constant speed of less than six knots. • Project vessels will not travel greater than eight knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	**PS 3.1.1** Vessels will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to manage the risk of fauna collision.	**MC 3.1.1** Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans and application of these regulations to whale sharks and marine turtles. **MC 3.1.2** Records demonstrate reporting cetacean, whale shark and marine turtle ship strike incidents to the National Ship Strike Database.

[28]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.

6.7.7 Physical Presence: Dropped Object Resulting in Seabed Disturbance

Context		
Project Vessels and Support Activities – **Section 3.8** Subsea Intervention Activities – **Section 3.6**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary

Source of Risk	*Environmental Value Potentially Impacted*							*Evaluation*						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Dropped objects resulting in the disturbance of benthic habitat		X			X			A	F	2	L	LCS GP PJ	Broadly Acceptable	EPO 14

Description of Source of Risk

There is the potential for objects to be dropped overboard from the WIV 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) and hardware fixtures (e.g. riser hose clamp); 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 Operational Area.

Consequence Assessment

Potential Impacts to Benthic Communities

In the unlikely event of loss of an object being dropped into the marine environment, 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.

The temporary or permanent loss of dropped objects into the marine environment is likely to result in a localised impact only, as the benthic communities associated with the Operational Area are of low sensitivity and are broadly represented throughout the NWMR. As described in **Section 4.5.3**, the Ancient Coastline at 125 m Depth Contour KEF is located within the Operational Area. The habitat types associated with the hard substrate that characterises the Ancient Coastline at 125 m Depth Contour KEF are not considered to be unique by Falkner et al. (2009) in their review of KEFs in the NWMR. Furthermore, benthic habitats in the Operational Area are expected to consist of bare unconsolidated sediments dominated by silt and clay fractions (**Section 4.5.3**). Given the nature and scale of risks and consequences from dropped objects, no lasting effect is expected to seabed sensitivities associated with the Operational Area. 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.

Summary of Potential Impacts to Environmental Value(s)

Given the adopted controls and the predicted small footprint of a dropped object, it is considered that a dropped object will result in only localised impacts to a small area of the seabed and a small proportion of the benthic population; however, no significant impact to environmental receptors, and with no lasting effect (i.e. Environment Impact – F).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[29]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				
The WIV and project vessels' work procedures for lifts, bulk transfers and cargo loading, which require: • The security of loads shall be checked before commencing lifts. • Loads shall be covered if there is a risk of loss of loose materials. • 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. CS: Minimal cost. Standard practice.	By implementing WIV and project vessels' work procedures for lifts, bulk transfers and cargo loading, the likelihood of a dropped object event is reduced. Since the object may be recovered, a reduction in consequence is possible.	Benefits outweigh cost/sacrifice.	Yes **C 12.1**
WIV and project vessel inductions include control measures and training for crew in dropped object prevention.	F: Yes. CS: Minimal cost. Standard practice.	By ensuring crew are appropriately trained in dropped object prevention, the likelihood of a dropped object event is reduced. Since the object may be recovered, a reduction in consequence is possible.	Benefits outweigh cost/sacrifice.	Yes **C 12.2**
If safe and practicable to do so, vessel, ROV, or crane will be used to attempt recovery of material environmentally hazardous or non-hazardous solid object/waste lost overboard. • This activity will consider: • risk to personnel to retrieve object • whether the location of the object is in recoverable water depths	F: Yes. CS: Minimal cost. Standard practice.	Potentially reduces consequence by recovering object/waste container from the environment.	Benefit outweighs cost/sacrifice.	Yes **C 11.4**

[29] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[29]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• object's proximity to subsea infrastructure				
Professional Judgement – Eliminate				
No additional controls identified.				
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 2.6.1**), Woodside considers the adopted controls appropriate to manage the risks and consequences of seabed disturbance from dropped objects. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without disproportionate sacrifice, the risks and consequences are considered ALARP.				

Demonstration of Acceptability			
Acceptability Statement The impact assessment has determined that a dropped object resulting in seabed disturbance represents a low current risk rating and may result in localised impacts with no lasting effect (<1 month) to environmental receptors. The adopted controls are considered consistent with industry good practice and professional judgement. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of risk.			
Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 14 No incidents of dropped objects to the marine environment greater than a	**C 12.1** The WIV and project vessels' work procedures for lifts, bulk transfers and cargo loading, which require: • the security of loads to be checked before commencing lifts • loads to be covered if there is a risk of losing loose materials • lifting operations to be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state.	**PS 12.1.1** All lifts conducted in accordance with applicable WIV/ project vessels' work procedures to limit potential for dropped objects.	**MC 12.1.1** Records show lifts conducted in accordance with the applicable WIV/ project vessels' work procedures.
	C 12.2 WIV and project vessel inductions include control measures and training for	**PS 12.2.1** WIV and project vessels crews aware of	**MC 12.2.1** Records show dropped object prevention training

consequence level of F[30] during the Petroleum Activities Program.	crew in dropped object prevention.	requirements for dropped object prevention.	is provided to the WIV/ project vessels.
	C 11.4 See **Section 6.7.5**	**PS 11.4.1** See **Section 6.7.5**	**MC 11.4.1** See **Section 6.7.5**

[30] Defined as 'No lasting effect (less than one month). Localised impact not significant to areas or items of cultural significance)'.

6.7.8 Physical Presence: Accidental Introduction and Establishment of Invasive Marine Species

Context		
Project Vessels– **Section 3.8**	Physical Environment – **Section 4.4** Biological Environment – **Section 4.5**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary														
Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Introduction of invasive marine species within the Operational Area.					X	X	X	A	E	0	L	LCS	Broadly Acceptable	EPO 14

Description of Source of Risk
During the Petroleum Activities Program, vessels will be transiting to and from the Operational Area, potentially including traffic mobilising from beyond Australian waters. Vessels may mobilise from the nearest Australian port or staging area (e.g. Dampier, Onslow, Exmouth, King Bay Supply Base) or directly from international waters to the Operational Area, in accordance with biosecurity and marine assurance requirements. These project vessels may include the WIV and general support vessels (**Section 3.8**). 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 Operational Area 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. There is also potential for introduction of IMS through vessel interactions nearby (approximately 12 km) to fixed infrastructure/GWA platform. The WIV may mobilise from outside of Australian waters. The support vessels are typically sourced from Australia and are not considered high risk for IMS introduction. All project vessels are subject to the Woodside Marine Offshore Vessel Assurance procedure (**Section 7.5.2.2**), and the Australian Ballast Water Management Requirements.
Consequence Assessment
Potential Impacts to Ecosystems/Habitats, Species and Socio-economic Values

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 (Williamson and Fitter, 1996; Paulay et al., 2002; Geiling, 2014).

While project vessels have the potential to introduce IMS into the Operational Area, the deep offshore open waters of the Operational Area (~ 113 m deep) are not conducive to the settlement and establishment of IMS. Furthermore, the Operational Area are away from shorelines and/or critical habitat. The likelihood of IMS being introduced and establishing viable populations within the Operational Area or immediate surrounds is considered highly unlikely and considered manageable given the ballast water and biofouling controls that will be implemented.

Summary of Potential Impacts to Environmental Value(s)

In support of Woodside's assessment of the impacts and risks of IMS introduction associated with the petroleum activity program, risk and impact evaluations of the different aspects of marine pest translocation associated with the activity are undertaken. The results of this assessment are presented in **Table 6-20**. As a result of this assessment Woodside has presented the highest potential consequence as a E (Environment) and likelihood as Highly Unlikely (1), resulting in an overall Low risk following the implementation of identified controls.

Table 6-20: Evaluation of risks and impacts from IMS translocation

IMS Introduction Aspect	**Credibility Introduction**	**Consequence of Introduction**	**Likelihood**
Transfer of IMS from infected vessel to Operational Area and establishment on the seafloor or subsea infrastructure.	**Not Credible** The deep offshore open waters of the Operational Area, away from shorelines and/or critical habitat, approximately 226 km from a shore and in waters 113 m deep are not conducive to the settlement and establishment of IMS.		
Transfer of IMS from infected vessel to and subsequent establishment on the GWA Platform.	**Credible** There is potential for the transfer of marine pests to occur.	If IMS were to establish this would potentially result in fouling of intakes (depending on the pest introduced), and would likely result in the quarantine of the GWA facility until eradication could occur (through cleaning and treatment of infected areas), which	**Remote (0)** Interactions between the GWA facility and project vessels will be limited during the petroleum activity program, given TPA03 is located 13 km from the facility. Spread of marine pests via ballast water or spawning in these open

		would be costly to undertake. **Slight (E) - Reputation and Brand** 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. **Slight (E) - Environment** Environmental consequence of introduction of IMS to the GWA platform is considered Slight (E), localised and would relate to habitat directly on the GWA facility.	ocean environments is considered Remote (0).
Transfer of IMS from infected vessel to and subsequent establishment on GWA Platform, then transfer of IMS to a secondary vessel from the GWA facility.	**Not Credible** Risk is considered so remote that it is not credible for the purposes of the Petroleum Activity Program. The transfer of a marine pest from an injected activity vessel to the GWA facility was already considered highly unlikely given the offshore open ocean environment. For marine pests to then establish into a mature spawning population on GWA and then transfer to another support vessel is not considered credible (i.e. beyond the Woodside risk matrix). The GWA facility is located in an offshore, open ocean, deep environment. Support vessels only spend short periods of time alongside GWA (i.e. during backloading or bunkering activities). There is also no direct contact (i.e. they are not tied up alongside) during these activities. It is also noted that Woodside has been conducting marine vessel movements between the GWA facility and WA ports (such as Dampier), for a long period of time and no IMS has been detected in these ports (DoF 2017).		

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[31]	***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 outlined in the Australian Ballast Water Management Requirements.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of transferring marine pests between the WIV and project 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 **C 12.1**
Good Practice				
Woodside's IMS risk assessment process[32] will be applied to the WIV, project vessels and relevant immersible equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors: For vessels/ WIV: • vessel/WIV/ type • recent IMS inspection and cleaning history, including for internal niches • out-of-water period before mobilisation • age and suitability of antifouling coating at mobilisation date • internal treatment systems and history • origin and proposed area of operation • number of stationary/slow speed periods >7 days • region of stationary or slow periods • type of activity – contact with seafloor. For immersible equipment: • region of deployment since last thorough	F: Yes. 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 pests between project vessels within the Operational Area is reduced. No change in consequence would occur.	Benefits outweigh cost/sacrifice.	Yes **C 12.2**

[31] Qualitative measure

[32] 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).

clean, particularly coastal locations • duration of deployments • duration of time out of water since last deployment • transport conditions during mobilisation • post-retrieval maintenance regime. • Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk (such as treating internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.				
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. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Eliminate use of vessels including the WIV and support vessels.	F: No. Given that vessels must be used to complete the Petroleum Activities Program, there is no feasible means to eliminate the source of risk. 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. While the project will attempt to source support vessels locally, availability is not guaranteed. There are limited project vessels	Sourcing vessels from within Australia will reduce the likelihood of IMS from outside Australian waters; however, it does not	Disproportionate. Sourcing vessels from Australian waters may result in a slight reduction in the likelihood of introducing IMS to the	No

	based in Australian waters and sourcing Australian-based vessels only will cause increases in cost due to pressures of vessel availability. CS: Significant cost and schedule impacts due to supply restrictions.	reduce the likelihood of introducing species native to Australia but alien to the Operational Area. It also does not prevent the translocation of IMS that have established elsewhere in Australia. Therefore, the consequence is unchanged.	Operational Area but it does not completely eliminate the risk. Furthermore, the potential cost of implementing this control could be high, given the potential supply issues associated with only locally sourcing vessels.	
IMS inspection of all vessels.	F: Yes. CS: Significant cost and schedule impacts. In addition, Woodside's IMS risk assessment process is seen to be more cost-effective as this control allows Woodside to manage the introduction of IMS through biofouling, while targeting its efforts and resources to areas of greatest concern.	Inspection of all vessels for IMS would reduce the likelihood of IMS being introduced to the Operational Area. 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 that are proposed to be implemented achieve an ALARP position.	No

Professional Judgement – Engineered Solution

None 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 2.6.1**), Woodside considers that the adopted controls are 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 disproportionate cost, the risks and consequences are considered ALARP.

Demonstration of Acceptability

Acceptability Statement

The impact assessment has determined that the accidental introduction and establishment of IMS represents a low current risk rating and may result in slight, short-term impacts (<1 year) on habitat (but not affecting ecosystems function) or biological attributes. BIAs within the Operational Area include flatback turtle interesting buffer, whale shark foraging, and wedge-tailed shearwater breeding BIA. However, these species are not expected to be impacted.

The adopted controls are considered consistent with industry legislation, codes and standards. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.7.2**, this is considered an acceptable level of risk.

Environmental Performance Outcomes, Standards and Measurement Criteria

Outcomes	***Controls***	***Standards***	***Measurement Criteria***

EPO 14 No introduction and establishment of IMS into the Operational Area as a result of the Petroleum Activities Program.	**C 12.1** 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.	**PS 12.1.1** Project vessels manage ballast water in accordance with Australian Ballast Water Management Requirements.	**MC 12.1.1** Ballast Water Records System maintained by vessels which verifies compliance against Australian Ballast Water Management Requirements.
	C 12.2 Woodside's IMS risk assessment process[33] will be applied to project vessels and relevant immersible equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors:	**PS 12.2.1** Before entering the Operational Area, project vessels, WIV and relevant immersible equipment are determined to be low risk[34] of introducing IMS of concern, and maintain this low risk status to mobilisation.	**MC 12.2.1** Records of IMS risk assessments maintained for all project vessels and relevant immersible equipment entering the operational area or IMS management area to undertake the Petroleum Activities Program.
	For vessels/WIV: • vessel/WIV type • recent IMS inspection and cleaning history, including for internal niches • out-of-water period before mobilisation • age and suitability of antifouling coating at mobilisation date • internal treatment systems and history • origin and proposed area of operation • number of stationary/slow speed periods >7 days • region of stationary or slow periods • type of activity – contact with seafloor. For immersible equipment: • region of deployment since last thorough clean, particularly coastal locations • duration of deployments • duration of time out of water since last deployment	**PS 12.2.2** 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 12.2.2** Records confirm that the IMS risk assessments undertaken by an Environment Adviser or IMS inspector (as relevant).

[33] 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).

[34] Low risk of introducing IMS of concern is defined as either no additional management measures required or, management measures have been applied to reduce the risk.

	• transport conditions during mobilisation • post-retrieval maintenance regime. Based on the outcomes of each IMS risk assessment, management measures commensurate with the risk (such as treating internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.		

6.8 Recovery Plan and Threat Abatement Plan Assessment

As described in **Section 1.10**, 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 2015–2025 (Commonwealth of Australia, 2015a).
- Recovery Plan for the Grey Nurse Shark (Carcharias taurus) 2014 (Commonwealth of Australia, 2014).
- Sawfishes and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015b).
- Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (Commonwealth of Australia, 2018).

Table 6-21 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 not inconsistent with that action. The results of this assessment against relevant actions are presented in **Table 6-22** to **Table 6-26**.

The assessment of potential impacts and risks to pygmy blue whales from underwater noise emissions in **Section 6.6.3** 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 6-23 has been undertaken in the context of the definitions included in the guidance note.

Table 6-21: 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			
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			

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
B1. Determine trends in index beaches	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			
1. The conservation status of blue whale populations is assessed using efficient and robust methodology	Y		
2. The spatial and temporal distribution, identification of biologically important areas, and population structure of blue whales in Australian waters is described	Y	Y	Y
3. Current levels of legal and management protection for blue whales are maintained or improved and an appropriate adaptive management regime is in place	Y		
4. 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		
B.2: Investigating population structure	Y		
B.3: Describing spatial and temporal distribution and defining biologically important habitat	Y	Y	Y

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	*Titleholder*	*Petroleum Activities Program*
Grey Nurse Shark Recovery Plan			
Overarching Objective			
To assist the recovery of the grey nurse shark in the wild, throughout its range in Australian waters, with a view to: • improving the population status, leading to future removal of the grey nurse shark from the threatened species list of the EPBC Act • ensuring that anthropogenic activities do not hinder the recovery of the grey nurse shark in the near future, or impact on the conservation status of the species in the future	Y	Y	Y
Specific Objectives			
1. Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters	Y		
2. Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
3. Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
4. Where practicable, minimise the impact of shark control activities on the grey nurse shark	Y		
5. Investigate and manage the impact of ecotourism on the grey nurse shark	Y		
6. Manage the impact of aquarium collection on the grey nurse shark	Y		
7. Improve understanding of the threat of pollution and disease to the grey nurse shark	Y	Y	Y
8. Continue to identify and protect habitat critical to the survival of the grey nurse shark and reduce the impact of threatening processes within these areas	Y	Y	
9. Continue to develop and implement research programs to support the conservation of the grey nurse shark	Y	Y	
10. Promote community education and awareness in relation to grey nurse shark conservation and management	Y		
Sawfish and River Sharks Recovery Plan			
Primary Objective			
To assist the recovery of sawfish and river sharks in Australian waters with a view to:	Y	Y	Y

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
improving the population status leading to the removal of the sawfish and river shark species from the threatened species list of the EPBC Act ensuring that anthropogenic activities do not hinder recovery in the near future, or impact on the conservation status of the species in the future			
Specific Objectives			
1. Reduce and, where possible, eliminate adverse impacts of commercial fishing on sawfish and river shark species	Y		
2. Reduce and, where possible, eliminate adverse impacts of recreational fishing on sawfish and river shark species	Y		
3. Reduce and, where possible, eliminate adverse impacts of Indigenous fishing on sawfish and river shark species	Y		
4. Reduce and, where possible, eliminate the impact of illegal, unregulated and unreported fishing on sawfish and river shark species	Y		
5. Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species	Y	Y	Y
6. Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species noting the linkages with the Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life	Y	Y	Y
7. Reduce and, where possible, eliminate any adverse impacts of collection for public aquaria on sawfish and river shark species	Y		
8. Improve the information base to allow the development of a quantitative framework to assess the recovery of, and inform management options for, sawfish and river shark species	Y		
9. Develop research programs to assist conservation of sawfish and river shark species	Y	Y	
10. Improve community understanding and awareness in relation to sawfish and river shark conservation and management	Y		
Marine Debris Threat Abatement Plan			
Objectives			
1. Contribute to long-term prevention of the incidence of marine debris	Y	Y	
2. Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations	Y	Y	Y

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
3. Remove existing marine debris	Y		
4. Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris	Y		
5. 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 6-22: 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) Priority actions at stock level: G-NWS – Understand the threat posed to this stock by marine debris LH-WA – Determine the extent to which marine debris is impacting loggerhead turtles F-Pil & H-WA – no relevant actions	Refer **Section 6.7.5** **Not inconsistent assessment:** The assessment of the accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to marine turtles. Controls have been implemented to reduce the likelihood of accidental release of solid wastes for the duration of the petroleum activities program.	N/A
	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 Priority actions at stock level: G-NWS – Ensure that spill risk strategies and response programs include management for turtles and their habitats 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 H-WA – no relevant actions	Refer **Sections 6.7.2, 6.7.3, 6.7.4, 6.7.5** and **Appendix D** **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 7.9** Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D**
	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 Priority actions at stock level: G-NWS – as above LH-WA – no relevant actions	Refer **Section 6.6.7** **Not inconsistent assessment:** The assessment of light emissions has considered the potential impacts to green, flatback and hawksbill 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	N/A

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
		F-Pil & H-WA – Manage artificial light from onshore and offshore sources to ensure biologically important behaviours of nesting adults and emerging/dispersing hatchlings can continue	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.	
	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 Priority actions at stock level: G-NWS – Continue long-term monitoring of index beaches LH-WA – Continue long-term monitoring of nesting and foraging populations F-Pil & H-WA – no relevant actions	**Not inconsistent assessment:** Woodside contributes to Action Area B1 via its support of the Ningaloo Turtle Program[35].	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 Priority actions at stock level: 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 biology and extrapolate findings from the North West Shelf stock to other stocks LH-WA – no relevant actions F-Pil – no relevant actions H-WA – investigate mixed stock genetics at foraging grounds	Refer **Section 6.6.3** Not inconsistent assessment: The assessment of acoustic emissions has considered the potential impacts to marine turtles. WIV and project vessel acoustic emissions could cause localised and short-term 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.	N/A
Assessment Summary 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.				

35 http://www.ningalooturtles.org.au/media_reports.html

Table 6-23: Assessment against relevant actions of the 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 **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 6.6.3** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to pygmy blue whales. Acoustic emissions from project vessels and WIV will not cause injury to any pygmy blue whale. There are no known or possible foraging areas for pygmy blue whales within or adjacent to the Operational Area. If the Petroleum Activities Program within the Operational Area overlaps with an individual northbound or southbound migration, they may deviate slightly from the migratory route, but will continue on their migration.	N/A

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
	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 6.7.6** **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 within the Operational Area overlaps with an individual northbound or southbound migration, they may deviate slightly from the migratory route, but will continue on their migration. Vessel collisions with pygmy blue whales are highly unlikely to occur, given the very slow vessel speeds.	**EPO 19** **C 19.1** **PS 19.1.1 & 19.1.2**
	Action Area B.3: Describing spatial and temporal distribution and defining biologically important habitat	**Action 2**: Identify migratory pathways between breeding and feeding grounds **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[36]).	N/A

Assessment Summary

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.

[36] 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

Table 6-24: Assessment against relevant actions of the Grey Nurse Shark Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Grey Nurse Shark Recovery Plan	**Objective 7**: Improve understanding of the threat of pollution and disease to the grey nurse shark	**Action 7.1**: Review and assess the potential threat of introduced species, pathogens and pollutants	Refer **Sections 6.6.4, 6.6.5, 6.7.4 6.7.5, 6.7.8** **Not inconsistent assessment**: This EP includes an assessment of the impacts from accidental release of solid wastes as well as planned discharges of drilling waste on marine species.	N/A
			Refer **Sections 6.6.4, 6.6.5, 6.6.6, 6.7.2, 6.7.3, 6.7.4, 6.7.5, 6.7.6, 6.7.7** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to grey nurse sharks.	**Section 7.9** Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **APPENDIX D**
Assessment Summary The Grey Nurse Shark 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 6-25: Assessment against relevant actions of the Sawfish and River Shark Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Sawfish and River Shark Recovery Plan	**Objective 5**: Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species	**Action 5c**: Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks	Refer **Sections 6.6.4, 6.6.5, 6.6.6, 6.7.2, 6.7.3, 6.7.4, 6.7.5, 6.7.6** **Not inconsistent assessment**: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to sawfish and river shark.	Refer **Section 7.9** Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **APPENDIX D**
	Objective 6: Reduce and, where possible, eliminate any adverse impacts of marine debris on sawfish and river shark species	**Action 6a**: Assess the impacts of marine debris including ghost nets, fishing gear and plastics on sawfish and river shark species	Refer **Section 6.7.5** **Not inconsistent assessment**: The assessment of the accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to sawfish. Controls have been implemented to reduce the likelihood of accidental release of solid wastes for the duration of the petroleum activities program.	N/A
Assessment Summary The Sawfish and River Shark 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 6-26: Assessment against relevant actions of the Marine Debris Threat Abatement Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Marine Debris TAP	**Objective 2**: Understand the scale of marine plastic and microplastic impact on key species, ecological communities and locations	**Action 2.04**: Build understanding related to plastic and microplastic pollution	Refer **Section 6.7.5** **Not inconsistent assessment:** The assessment of the accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to the marine environment. Controls have been implemented to reduce the likelihood of accidental release of solid wastes for the duration of the petroleum activities program.	N/A
Assessment Summary 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.				

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 that 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 that the Petroleum Activities Program is managed in accordance with this Implementation Strategy and the WMS (see **Section 2.3**).

7.2 Systems, Practice, and Procedures

All operational activities are planned and performed in accordance with relevant legislation and standards, management measures 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 change during the statutory duration of this EP and is managed through a changes register and update process.

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 7-1**. Roles and responsibilities for oil spill preparation and response are outlined in **APPENDIX D** and the *Woodside Oil Pollution Emergency Arrangements (Australia)*.

Table 7-1: Roles and responsibilities

Title (role)	Environmental Responsibilities
Office-based Personnel	
Woodside Well Delivery Manager	• Monitor and manage the activity so it is performed as per the relevant standards and commitments in this EP and approval conditions. • Notify the Woodside Environment Adviser in a timely manner of any scope changes. • Liaise with regulatory authorities as required. • Review this EP as necessary and manage change requests. • Provide sufficient resources to implement the well intervention-related management measures (i.e. controls, EPOs, PSs and MC) in this EP. • Ensure WIV and support vessel personnel are given an HSE Induction as per Section 7.4.2 of this EP at the start of the intervention program. • Verify that contractors meet environmental related contractual obligations. • Confirm controls and performance standards in this EP are actioned, as required, before well intervention commences. • Ensure the WIV start-up meets the requirements of the Drilling and Managing Rig Operations Process. • Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's HSE Reporting and Investigation Procedure. • Monitor and close out corrective actions identified during environmental monitoring or audits.

Title (role)	Environmental Responsibilities
Woodside Senior Operations Engineer	• Ensure the well intervention program meets the requirements detailed in this EP. • Ensure changes to the well intervention program are communicated to the Woodside Environmental Adviser. • Ensure 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 implemented. • Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's HSE Reporting and Investigation Procedure. • Monitor and close out corrective actions identified during environmental monitoring or audits.
Woodside Drillingand Subsea Engineers	• Ensure changes to the well intervention program are communicated to the Woodside Environmental Adviser. • Ensure well intervention fluid chemical components and other fluids that may be used downhole have been reviewed by the Environmental Adviser.
Woodside Environmental Adviser	• Verify relevant Environmental Approvals for the activities exist before commencing activity. • Track compliance with performance outcomes and performance standards as per the requirements of this EP. • Prepare environmental component of relevant Induction Package. • Assist with the review, investigation and reporting of environmental incidents. • Ensure environmental monitoring and inspections/audits are performed as per the requirements of this EP. • Liaise with relevant regulatory authorities as required. • Assist in preparing required external regulatory reports, in line with environmental approval requirements and Woodside incident reporting procedures. • Monitor and close out corrective actions (Campaign Action Register) identified during environmental monitoring or audits. • Provide advice to relevant Woodside personnel and contractors to help them understand their environment responsibilities. • Liaise with 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 Stakeholder Consultation Plan for the Petroleum Activities Program. • Report on stakeholder consultation. • Continuously liaise and provide notification as required as outlined in the EP.
Woodside Marine Assurance Superintendent	• Conduct 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.

Title (role)	Environmental Responsibilities
Woodside Corporate Incident Coordination Centre (CICC) Duty Manager	On receiving notification of an incident, the Woodside CICC Duty Manager shall: • Establish and take control of the Incident Management Team and establish an appropriate command structure for the incident. • Assess the situation, identify risks and actions to minimise the risk. • Communicate impact, risk and progress to the Crisis Management Team and stakeholders. • Develop the Incident Action Plan (IAP) including objectives for action. • Approve, implement and manage the IAP. • Communicate within and beyond the incident management structure. • Manage and review safety of responders. • Address the broader public safety considerations. • Conclude and review activities.
WIV -based Personnel	
WIV Offshore Installation Manager (OIM)	• Ensure the WIV's management system and procedures are implemented. • Ensure personnel starting work on the WIV receive an environmental induction that meets the requirements specified in this EP. • Ensure personnel are competent to perform the work they have been assigned. • Verify that emergency drills are conducted as per the WIV's schedule. • Ensure the WIV's Emergency Response Team has been given sufficient training to implement the WIV's SOPEP. • Ensure any environmental incidents or breaches of outcomes or standards are reported immediately to the Well Site Manager. • Ensure corrective actions for incidents or breaches are developed, communicated to the Well Site Manager, and tracked to close-out in a timely manner.
Woodside Well Site Manager	• Ensure the well intervention program is performed as detailed in this EP. • Ensure the management measures (i.e. controls, EPOs, PSs and MC) detailed in this EP (relevant to offshore activities) are implemented on the WIV (other controls will be implemented onshore). • Ensure environmental incidents or breaches of outcomes or standards are reported as per the Woodside Corporate Event Notification Matrix. Ensure corrective actions for incidents and breaches are developed, tracked and closed out in a timely manner. • Ensure actions in the Well Delivery HSE Improvement Plan are performed. • Ensure periodic environmental inspections/reviews are completed. Ensure 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 WIV, and help collect and record evidence of implementation (other controls are implemented and evidence collected onshore). • Support the Well Site Manager to ensure the EPOs are met and the PSs detailed in this EP are implemented on the WIV. • Confirm actions in the Well Delivery HSE Improvement Plan are performed. • 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. • Ensure periodic environmental inspections/reviews are completed and corrective actions from inspections are developed, tracked and closed out in a timely manner. • Review contractors' procedures, input into Toolbox talks and JSAs. • Provide day-to-day environmental support for activities in consultation with the Woodside Environment Adviser.
Drilling Logistics Coordinator	• Ensure waste is managed on the WIV and sent to shore as per the Drilling and Completions Waste Management Plan (WMP).

Title (role)	Environmental Responsibilities
Vessel-based Personnel	
Vessels Master	• Ensure the vessel management system and procedures are implemented. • Ensure personnel commencing work on the vessel receive an environmental induction that meets the relevant requirements specified in this EP. • Ensure personnel are competent to perform the work they have been assigned. • Verify SOPEP drills are conducted as per the vessel's schedule. • Ensure the vessel Emergency Response Team has been given sufficient training to implement the SOPEP. • Ensure any environmental incidents or breaches of relevant EPOs or PSs detailed in this EP are reported immediately to the Woodside Well Site Manager. • Ensure corrective actions for incidents or breaches are developed, communicated to the Well Site Manager, and tracked to close-out in a timely manner. Ensure close-out of actions is communicated to the Well Site Manager.
Vessel Logistics Coordinators	• Ensure waste is managed on the relevant support vessels and sent to shore as per the relevant WMP.
Vessel HSE Advisers	Refer to Woodside HSE Offshore Adviser responsibilities detailed above under WIV-based personnel.
Contractor Project Manager	• Confirm activities are performed in accordance with this EP, as detailed in the Woodside approved Contractor Environmental Management Plan. • Ensure personnel commencing work on the project receive a relevant environmental induction that meets the requirements specified in this EP. • Ensure personnel are competent to perform the work they have been assigned. • 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.

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.

7.4 Training and Competency

7.4.1 Overview

Woodside, as part of its contracting process, assesses a proposed contractor's environmental management systems to determine the level of compliance with the standard AS NZ ISO 14001. This assessment is performed 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 training is required for all personnel, detailing awareness and compliance with the contractor's environmental policy and environmental management system.

7.4.2 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.
- Regulations relevant to the activity.
- Woodside's Environmental Management System – Health Safety, Environment and Quality 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 measurement criteria.
- Incident reporting.

7.4.3 Activities Program Specific Environmental Awareness

Before commencing the subsea campaigns associated with the Petroleum Activities Program, a pre-activity meeting will be held on-board WIV and support 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 to the support vessel personnel. Attendance lists are recorded and retained.

During operations, regular HSE meetings will be held on the WIV and support vessels. During these meetings, recent environmental incidents are reviewed and awareness material presented.

7.4.4 Management of Training Requirements

All personnel on the WIV 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.

7.5 Monitoring, Auditing, Management of Non-Conformance and Review

7.5.1 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.

7.5.1.1 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 personnel to record and submit 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 Well Delivery function scorecard for KPIs.
- Internal auditing and assurance program as described in **Section 7.5.2**.

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 7.5.2**.

7.5.1.2 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.

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.

7.5.2 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.

7.5.2.1 WIV Activities

The following internal audits, inspections and reviews will be performed to review the environmental performance of the activities:

- Survey environment of equipment for a newly contracted WIV against Woodside's Specification for MODU Deployed Subsea Installation or Workover Equipment and Services. This standard covers functional and technical requirements for Woodside contracted WIV's and their associated equipment. An environment equipment survey scope typically includes environmental discharge control (including drainage management), and loss of containment management.

- Complete a minimum of one environmental inspection during the Petroleum Activities Program (conducted by offshore Woodside personnel or a delegate) which may include verifying:
  - bunkering/transfers between support vessels and WIV /support vessels
  - environment containment including chemical storage, spill response equipment and housekeeping
  - general WIV environment risks including waste management, , and inspection of subsea and moonpool areas.

7.5.2.2 Marine Assurance

Woodside's marine assurance is managed by the Marine Assurance Team of the Logistics 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.

The process is mandatory for all vessels (other than tankers and floating production storage and offloading vessels) hired for Woodside operations, 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:

- Offshore Vessel Safety Management System assessment (OVMSA)
- DP system verification
- vessel inspections
- OVID or condition and suitability assessment
- 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
- IMXA 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 have been made to complete this (e.g. short term vessel hire), the Marine Assurance Specialist Offshore may approve the use of an alternate means of inspection, known as a risk assessment.

7.5.2.3 Risk Assessment

Woodside conducts a risk assessment of vessels where either an OVMSA Verification Review and/or an OVID 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 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.

7.5.3 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 2.6.3**). Detailed investigations are completed for all categories A, B, C and high potential environmental incidents.

7.5.4 Review

7.5.4.1 Management Review

Within the HSE 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. Well Delivery and Developments/Projects), managers review environmental performance regularly, including through quarterly HSE review meetings.

Woodside's Environment Team will perform six-monthly reviews of the effectiveness of the implementation strategy and associated tools. This will involve reviewing the:

- Well Intervention environment KPIs
- Tools and systems to monitor environmental performance (detailed in **Section 7.5.1**)
- Lessons learned about implementation tools and throughout each campaign.
- Reviews of oil spill arrangements and testing are performed in accordance with **Section 7.9**.

7.5.4.2 Learning and Knowledge Sharing

Learning and knowledge sharing occurs via a number of different methods, which may include:

- Event investigations.
- Event bulletins.
- After action review, including review of environmental incidents as relevant.
- Ongoing communication with WIV operators.
- Formal and informal industry benchmarking.
- Cross asset learnings.
- Engineering and technical authorities discipline communications and sharing.

7.6 Management of Change and Revision

7.6.1 Environmental Plan Management of Change

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, DCCEEW 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 external stakeholders (**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 2.6**) 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.

7.6.2 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 7.6.1**). 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.

7.7 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.

7.8 Reporting

To meet the EPOs and standards outlined in this EP, Woodside reports at a number of levels, as outlined in the next sections.

7.8.1 Routine Reporting (Internal)

7.8.1.1 Daily Progress Reports and Meetings

Daily reports for well intervention activities are prepared and issued to key support personnel and stakeholders, by relevant managers responsible for the well. The report provides performance information about well intervention 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.

7.8.1.2 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.

7.8.1.3 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.

7.8.2 Routine Reporting (External)

7.8.2.1 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.

7.8.2.2 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 7-2**.

Table 7-2: Routine external reporting requirements

Report	Recipient	Frequency	Content
Monthly Recordable Incident Reports	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.

7.8.2.3 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.

7.8.3 Incident Reporting (Internal)

The process for reporting environmental incidents is described in **Sections 7.8.3** and **7.8.4** 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.

7.8.4 Incident Reporting (External) – Reportable and Recordable

7.8.4.1 Reportable Incidents

7.8.4.1.1 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 Figure 2-6**).
- 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 **Figure 2-6**).
- The environmental risk assessment (**Section 6**) for the Petroleum Activities Program identifies those risks with a potential consequence level of C+ for environment. The incidents that have the potential to cause this level of impact include hydrocarbon loss of containment events to the marine environment resulting from a loss of well integrity.

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.

7.8.4.1.2 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 DCCEEW notified if MNES are to be affected by the oil spill incident.

7.8.4.2 Recordable Incidents

7.8.4.2.1 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'.

7.8.4.2.2 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 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.

7.8.4.3 Other External Incident Reporting Requirements

In addition to the notification and reporting of environmental incidents defined under the Environment Regulations and Woodside requirements, **Table 7-3** describes the incident reporting requirements that also apply in the Operational Area.

Table 7-3: 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* 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: Free call: 1800 641 792 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: 1800 641 792 or +61 2 6230 6811 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	DCCEEW	Reported verbally, ASAP	Director of National Parks	Phone: 02 6274 2220
Activity causes unintentional death of or injury to fauna species listed as Threatened or Migratory under the EPBC Act	Vessel Master	DCCEEW	Within seven days of becoming aware	Secretary of the DCCEEW	Phone: 1800 803 772 Email: protected.species@environment.gov.au

The pollution activities should also be reported to AMSA via RCC Australia by the Vessel Master are:

- Any 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 TPA03 Well Intervention First Strike Plan (**APPENDIX H**).
- 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 safety cases.

7.9 Emergency Preparedness and Response

7.9.1 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 7-4**.

Table 7-4: 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**)
Describes the OPEP	Regulation 14(8)	EP: Woodside's oil pollution emergency plan has the following components: • Woodside Oil Pollution Emergency Arrangements (Australia) • Oil Pollution First Strike Plan (APPENDIX H) • Oil Spill Preparedness and Response Mitigation Assessment (APPENDIX D) • In accordance with Regulation 31 of the Environmental Regulations the Woodside Oil Pollution Emergency Arrangements (Australia) was provided with the Julimar Phase 2 Drilling and Subsea Installation EP, accepted by NOPSEMA on 8 November 2019.

Content	Environment Regulations Reference	Document/Section Reference
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**) 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 7.9.5** 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)

7.9.2 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 7-5: 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) • Oil Spill Response Skills Enhancement Course (OSREC – internal course) • Participation in L2 oil spill exercise (initial) Participation in L2 oil spill exercise (refresher)
Security & Emergency Manager Duty Manager	• ICLDP • OSREC • IMO2 or equivalent spill response specialist level with an oil spill response organisation (OSRO) • Participation in L2 oil spill exercise (initial) Participation in L2 oil spill exercise (refresher)
Operations, Planning, Logistics, Safety	• OSREC • ICC Fundamentals Course (internal course) • Participation in L2 oil spill exercise (initial) • Participation in L2 oil spill exercise (refresher)
Environment Coordinator	• ICC Fundamentals • OSREC • IMO2 or equivalent spill response specialist level with an OSRO • Participation in L2 oil spill exercise (initial) • 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.
- 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.
- Regarding training specific equivalency;
- 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).
- 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.
- 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.
- 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).

7.9.3 Emergency Response Preparation

The Corporate Incident Coordination Centre (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 (IMT) 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 well intervention activity, the ERP will be a bridging document to the contracted WIV'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 WIV and ensures roles and responsibilities between the contracted WIV 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 WIV the OIM will assume overall onsite command and act as the Incident Controller (IC). All persons aboard the WIV will be required to act under the IC's directions. The WIV/vessels will maintain communications with the onshore Well Delivery 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.
- 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 WIV and support vessels will have on-board equipment for responding to emergencies including medical equipment, fire-fighting equipment and oil spill response equipment.

7.9.4 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** of 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 provide immediate actions required to commence a response (**APPENDIX H**).

The WIV and support 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**.

7.9.5 Emergency and Spills Response

Woodside categorises incidents and emergencies in relation to response requirements as follows:

7.9.5.1 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.

7.9.5.2 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.

7.9.5.3 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 CICC may also be activated as required to manage the operational incident response.

7.9.6 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 7-6**. 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, testing of arrangements register and OPEP, where appropriate.

Table 7-6: Testing of response capability

Response Category	Scope	Response Testing Frequency	Response Testing Objective
Level 1 Response	Exercises are WIV/ vessel specific	At least one Level 1 First Strike drill must be conducted during an activity.	Comprehensive exercises test elements of the Oil Pollution First Strike Plan (**APPENDIX H**). Emergency drills are scheduled to test other aspects of the Emergency Response Plan.
Level 2 Response	Exercises are WIV specific	Level 2 Emergency Management exercises are relevant to activities with an operational duration of one month or greater. At least one Emergency Management exercise per vessel per campaign must be conducted within the first month of commencing the activity and then at every 6 month hire period thereafter, where applicable based on duration.	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.

7.9.7 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 **Table 7-5**, up to eight formal exercises are planned annually, across Woodside, to specifically test arrangements for responding to a hydrocarbon spill to the marine environment.

7.9.7.1 Testing of Arrangements Schedule

Woodside's Testing of Arrangements Schedule (**Figure 7-1**) 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.

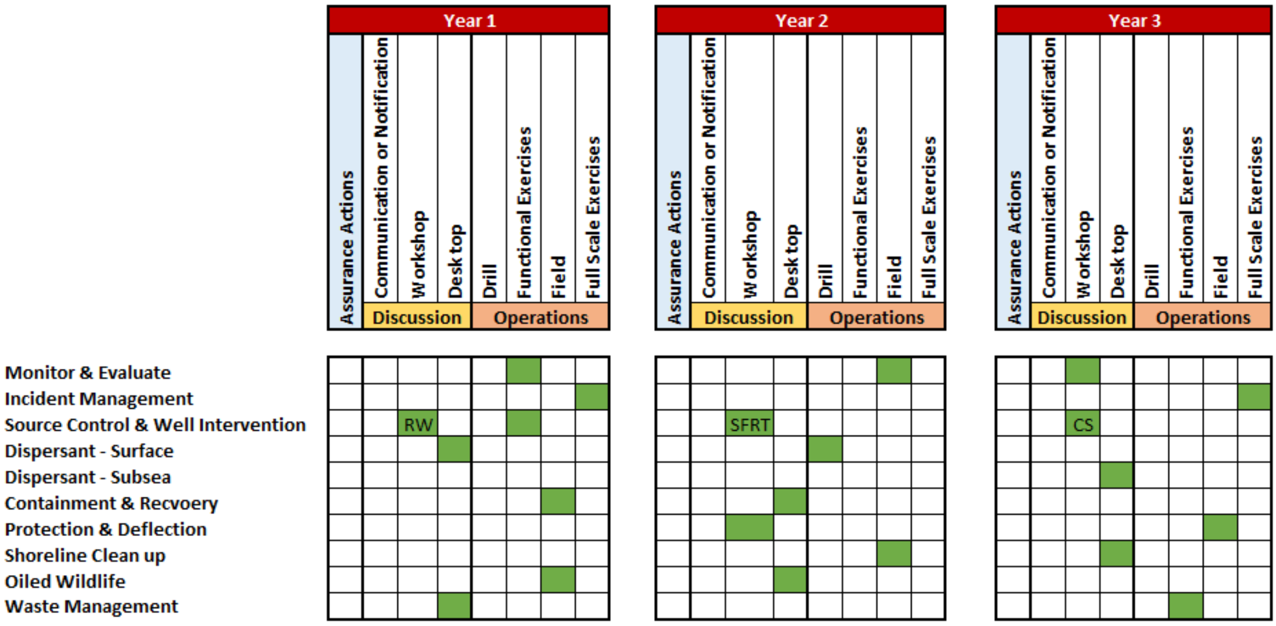

Figure 7-1: Indicative 3-yearly testing of arrangements schedule

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).

7.9.8 Cyclone and Dangerous Weather Preparation

As the timing of some activities associated with the Petroleum Activities Program are not yet determined, it is possible well intervention activities will overlap with the cyclone season (November to April, with most cyclones occurring between January and March). If undertaking activities within cyclone season, the WIV 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 WIV and support 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 LIST OF TERMS AND ACRONYMS

Acronym	Description
~	Approximately
<	Less/fewer than
>	Greater/more than
≤	Less than or equal to
≥	Greater than or equal to
°	Degrees
°C	Degrees Celsius
3D	Three-dimensional
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AIS	Automatic Identification System
ALARP	As low as reasonably practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
API	American Petroleum Institute
ASAP	As soon as possible
AS/NZS	Australian Standard/New Zealand Standard
ATSB	Australian Transport Safety Bureau
AusSAR	Australian Search and Rescue
bbl	Barrel
BIA	Biologically Important Area
BoM	Bureau of Meteorology
BOP	Blowout Preventer
CAES	Catch and Effort System
CCP	Cyclone Contingency Plan
CEFAS	United Kingdom Centre for Environment, Fisheries and Aquaculture Science
CHP	Commonwealth Heritage Place
CICC	Corporate Incident Communication Centre
cm	Centimetre
cm^3	Cubic centimetre
CMT	Crisis Management Team
CO_2	Carbon dioxide
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea
cP	Centipoise
CS	Cost Sacrifice

Acronym	Description
CV	Company Value
D&C	Drilling and Completions
DAA	Western Australian Department of Aboriginal Affairs
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water (now DCCEEW)
dB	Decibel
dB re 1 µPa	Decibels relative to one micropascal; the unit used to measure the intensity of an underwater sound
DEC	Department of Environment and Conservation
DHNRDT	Deepwater Horizon Natural Resource Damage Assessment Trustees
DMIRS	Western Australian Department of Mines, Industry Regulation and Safety
DMP	Western Australian Department of Mines and Petroleum (now Department of Mines, Industry Regulation and Safety)
DNP	Director of National Parks
DoEE	Commonwealth Department of the Environment and Energy (now DCCEEW)
DP	Dynamic positioning
DPIRD	Western Australian Department of Primary Industries and Regional Development
DSEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now DCCEEW)
EDS	Emergency Disconnect Sequence
EEZ	Exclusive Economic Zone
EMBA	Environment that may be affected
EMS	Environmental Management System
ENVID	Environment Identification (study)
EP	Environment Plan
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPO	Environmental Performance Objective
EPS	Environment Performance Standard
ERP	Emergency Response Plan
ESD	Ecologically Sustainable Development
F	Control feasibility
F-Pil	Flatback turtle – Pilbara stock
FPSO	Floating production, storage, and offtake
g	Gram
G-NWS	Green turtle – North West Shelf stock
GP	Good Practice
GWA	Goodwyn Alpha
H-WA	Hawksbill turtle – WA stock

Acronym	Description
HAZID	Hazard identification (study)
HOCNF	Harmonised offshore chemical notification format
HQ	Hazard Quotient
HSE	Health, Safety, and Environment
Hz	Hertz
IAP	Incident Action Plan
IAPP	International Air Pollution Prevention
IC	Incident Controller
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organisation
IMR	Inspection, maintenance and repair
IMS	Invasive Marine Species
IMT	Incident Management Team
IOGP	International Association of Oil and Gas Producers
IOPP	International Oil Pollution Prevention
IPIECA	International Petroleum Industry Environmental Conservation Association
IS	Implementation Strategy
ISO	International Organization for Standardization
ITOPF	International Tanker Owners Pollution Federation Ltd
IUCN	International Union for the Conservation of Nature
JRCC	Joint Rescue Coordination Centre
JSA	Job Safety Analysis
KEF	Key Ecological Feature
kg	Kilogram
kHz	Kilohertz
km	Kilometre
KPI	Key Performance Indicator
L	Litre
LBL	Long baseline
lbs	Pounds
LCS	Legislation, Codes and Standards
LF	Low-frequency
LH-WA	Logger Head turtle – WA stock
LNG	Liquefied Natural Gas
LP	Low Pressure
m	Metre
m^2	Square metre

Acronym	Description
m^3	Cubic metre
MARPOL	The International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978.
MC	Measurement Criteria
MDO	Marine diesel oil
MEG	Mono-ethylene glycol
MF	Mid-frequency
MFO	Marine Fauna Observer
mg	Milligram
MNES	Matters of National Environmental Significance
MPRA	Marine Parks and Reserves Authority
MSIN	Marine Safety Information Notification
N/A	Not Applicable
NERA	National Energy Resources Australia
NHP	National Heritage Place
NIMS	Non-indigenous Marine Species
NLPG	National Light Pollution Guidelines
nm	Nautical mile
NMFS	National Marine Fisheries Service (US)
NOAA	National Oceanic and Atmospheric Administration (US)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NORM	Naturally Occurring Radioactive Material
NRC	North Rankin Complex
NT	Northern Territory
NTM	Notices to mariners
NWMR	North-west Marine Region
NWS	North West Shelf
OCNS	Offshore Chemical Notification Scheme
OIM	Offshore Installation Manager
OIW	Oil in water
OPEP	Oil Pollution Emergency Plan
OPGGS	Commonwealth *Offshore Petroleum and Greenhouse Gas Storage Act 2006*
OSPAR	Oslo–Paris Convention for the Protection of the Marine Environment of the North East Atlantic
OSREC	Oil Spill Response Enhancement Course
OVID	Off-shore Vessel Inspection Database

Acronym	Description
OVMSA	Offshore Vessel Safety Management System Assessment
PAH	Polycyclic aromatic hydrocarbon
PENV	Pendoley Environmental
PO	Performance Outcome
PJ	Professional Judgement
PLF	Pilbara Line Fishery
PMST	Protected Matters Search Tool
ppb	Parts per billion
ppm	Parts per million
PS	Performance Standard
PSRA	Process Safety Risk Assessment Procedure
PTS	Permanent threshold shift
PTW	Permit to Work
RBA	Risk-based Analysis
rms	Root Mean Square
ROV	Remotely operated vehicle
SCE	Solids Control Equipment
SEL	Sound Exposure Level
SFRT	Subsea First Response Toolkit
SIMAP	Spill Impact Mapping and Analysis program
SIMOPS	Simultaneous Operations
SMPEP	Spill Monitoring Program Execution Plan
SOPEP	Ship Oil Pollution Emergency Plan
SPL	Sound Pressure Level
SSDI	Subsea Dispersant Injection
SSIV	Subsea Isolation Valve
SSPL	Subsea and Pipelines
SV	Societal Value
T	Tonne
TAP	Threat Action Plan
TEC	Threatened Ecological Community
TSS	Total suspended solids
TTS	Temporary threshold shift
UK	United Kingdom
US	United States
USBL	Ultra-short baseline
VOC	Volatile Organic Compound

Acronym	Description
WA	Western Australia
WCC	Woodside Communication Centre
WEL	Woodside Energy Limited
WHP	World Heritage Place
WMP	Waste Management Plan
WMS	Woodside Management System
WOCS/WORS	Work-over Control System/ Work-over Riser System
WOMP	Well Operations Management Plan

APPENDIX A WOODSIDE HEALTH, SAFETY, ENVIRONMENT AND QUALITY AND RISK MANAGEMENT POLICIES

WOODSIDE POLICY

Woodside

Health, Safety and Environment Policy

OBJECTIVES

Strong health, safety and environment (HSE) performance is essential for the success and growth of our business. Our aim is to be recognised as an industry leader in HSE through managing our activities in a sustainable manner with respect to our workforce, our communities and the environment.

At Woodside we believe that process and personal safety related incidents, and occupational illnesses, are preventable. We are committed to managing our activities to minimise adverse health, safety or environmental impacts.

PRINCIPLES

Woodside will achieve this by:

- implementing a systematic approach to HSE risk management
- complying with relevant laws and regulations and applying responsible standards where laws do not exist
- setting, measuring and reviewing objectives and targets that will drive continuous improvement in HSE performance
- embedding HSE considerations in our business planning and decision-making processes
- integrating HSE requirements when designing, purchasing, constructing and modifying equipment and facilities
- maintaining a culture in which everybody is aware of their HSE obligations and feels empowered to speak up and intervene on HSE issues
- undertaking and supporting research to improve our understanding of HSE and using science to support impact assessments and evidence-based decision making
- taking a collaborative and pro-active approach with our stakeholders
- requiring contractors to comply with our HSE expectations in a mutually beneficial manner
- publicly reporting on HSE performance

APPLICATION

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.

Updated by the Board in April 2021

APPROVED

WOODSIDE POLICY

Woodside

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.

APPLICATION

The Managing Director of Woodside is accountable to the Board of Directors for ensuring this policy is effectively implemented.

Managers are responsible for promoting and applying the Risk Management Policy. Responsibility for the effective application of this policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control.

This policy will be reviewed regularly and updated as required.

Revised by the Woodside Petroleum Ltd Board on 4 December 2020.

APPROVED

APPENDIX B RELEVANT REQUIREMENTS

The below table refers to Commonwealth Legislation related to the project.

Commonwealth Legislation	Legislation Summary
Air Navigation Act 1920 • *Air Navigation Regulations 1947* • *Air Navigation (Aerodrome Flight Corridors) Regulations 1994* • *Air Navigation (Aircraft Engine Emissions) Regulations 1995* • *Air Navigation (Aircraft Noise) Regulations 1984* • *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 • *Quarantine Regulations 2000* • *Biosecurity Regulation 2016* • *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. 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.
Environment Protection and Biodiversity Conservation Act 1999 *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. 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 *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 *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.

Commonwealth Legislation	Legislation Summary
National Environment Protection Measures (Implementation) Act 1998 *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. 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 *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 *Marine order 12 – Construction – subdivision and stability, machinery and electrical installations* *Marine order 30 - Prevention of collisions* *Marine order 47 – Offshore Industry units* *Marine order 57 - Helicopter operations* *Marine order 91 - Marine pollution prevention—oil* *Marine order 93 - Marine pollution prevention—noxious liquid substances* *Marine order 94 - Marine pollution prevention—packaged harmful substances* *Marine order 96 - Marine pollution prevention—sewage* *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 WIV and project vessels. This Act is the primary legislation that regulates ship and seafarer safety, shipboard aspects of marine environment protection and pollution prevention.
Offshore Petroleum and Greenhouse Gas Storage Act 2006 • *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* • *Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011* • *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 *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.

Commonwealth Legislation	Legislation Summary
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 *Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994* *Marine order 91 - Marine pollution prevention—oil* *Marine order 93 - Marine pollution prevention—noxious liquid substances* *Marine order 94 - Marine pollution prevention—packaged harmful substances* *Marine order 95 - Marine pollution prevention—garbage* *Marine order 96 - Marine pollution prevention—sewage* *Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007* 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. 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. 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*. 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 *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.

APPENDIX C EPBC ACT PROTECTED MATTERS SEARCH REPORTS

Australian Government
Department of Agriculture, Water and the Environment

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: 09-Jun-2022

- 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:	19
Listed Migratory Species:	33

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

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 http://www.environment.gov.au/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:	56
Whales and Other Cetaceans:	23
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:	23
Key Ecological Features (Marine):	1
Biologically Important Areas:	4
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
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically 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
Sternula nereis nereis		
Australian Fairy Tern [82950]	Vulnerable	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

Scientific Name	Threatened Category	Presence Text
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
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	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 may occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
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 Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		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		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may 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

Scientific Name	Threatened Category	Presence Text
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 likely to 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
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
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat likely to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may 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
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may 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

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	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

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		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 overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		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
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
Fish		
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptile		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		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
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may 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
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area
Leioselasma czeblukovi as Hydrophis czeblukovi Fine-spined Seasnake, Geometrical Seasnake [87374]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known 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		
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

Current Scientific Name	Status	Type of Presence
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area

Current Scientific Name	Status	Type of Presence
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris 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
Controlled action			
Browse to North West Shelf Development, Indian Ocean, WA	2018/8319	Controlled Action	Final PER or EIS
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Not controlled action			

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
'Goodwyn A' Low Pressure Train Project	2003/914	Not Controlled Action	Completed
Maia-Gaea Exploration wells	2000/17	Not Controlled Action	Completed
North Rankin B gas compression facility	2005/2500	Not Controlled Action	Completed
Pipeline System Modifications Project	2000/3	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Searipple gas and condensate field development	2000/89	Not Controlled Action	Completed
sub-sea tieback of Perseus field wells	2004/1326	Not Controlled Action	Completed
Telstra North Rankin Spur Fibre Optic Cable	2016/7836	Not Controlled Action	Completed
Western Flank Gas Development	2005/2464	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA	2013/6862	Not Controlled Action (Particular Manner)	Post-Approval
Cue Seismic Survey within WA-359-P, WA-361-P and WA-360-P	2007/3647	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Demeter 3D Seismic Survey, off Dampier, WA	2002/900	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Foxhound 3D Non-Exclusive Marine Seismic Survey	2009/4703	Not Controlled Action (Particular Manner)	Post-Approval
Greater Western Flank Phase 1 gas Development	2011/5980	Not Controlled Action (Particular Manner)	Post-Approval
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
Tidepole Maz 3D Seismic Survey Campaign	2007/3706	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	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
Ancient coastline at 125 m depth contour	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Marine Turtles		
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur

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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Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

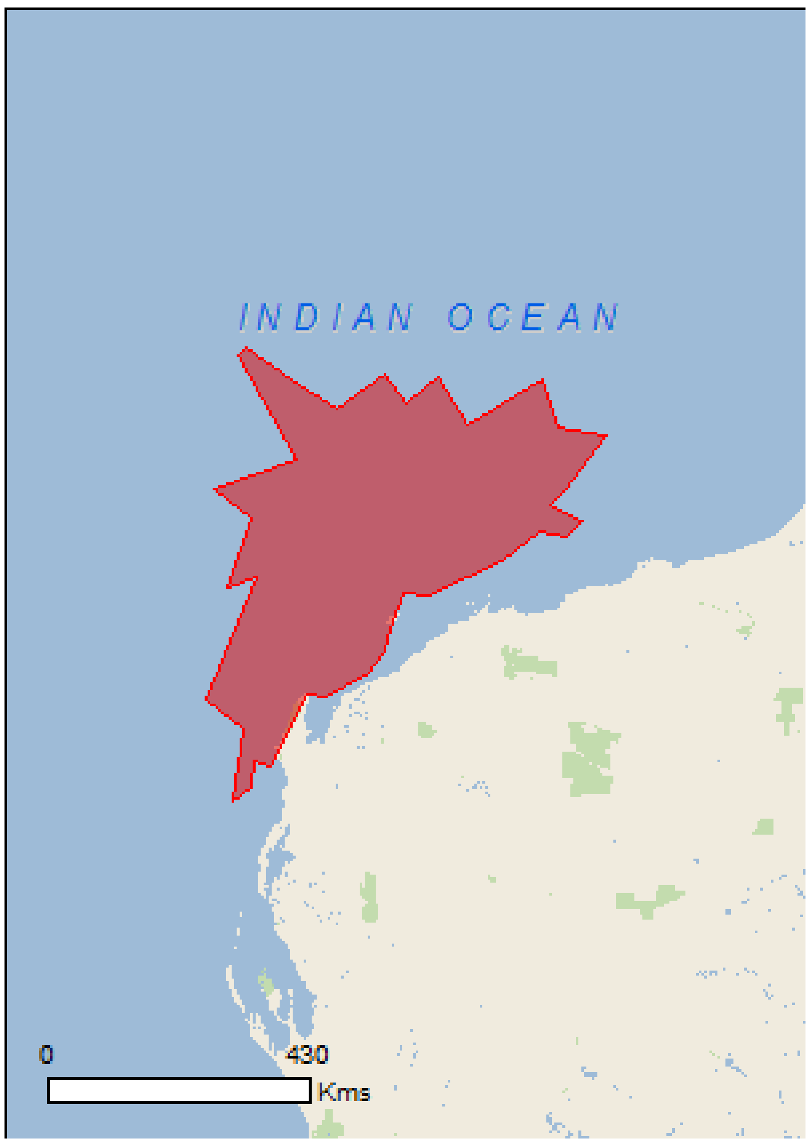
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

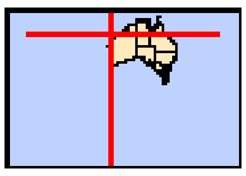
Report created: 13/06/22 18:34:36

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements



Coordinates

Buffer: 0.0Km



Summary

Matters of National Environmental 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:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	46
Listed Migratory Species:	61

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 http://www.environment.gov.au/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 Land:	3
Commonwealth Heritage Places:	2
Listed Marine Species:	103
Whales and Other Cetaceans:	29
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	6

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	14
Regional Forest Agreements:	None
Invasive Species:	11
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	6

Details

Matters of National Environmental Significance

World Heritage Properties		[Resource Information]
Name	State	Status
The Ningaloo Coast	WA	Declared property

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
The Ningaloo Coast	WA	Listed place

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 the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Malurus leucopterus edouardi White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	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
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Fish		
Milyeringa veritas Blind Gudgeon [66676]	Vulnerable	Species or species habitat known to occur within area
Ophisternon candidum Blind Cave Eel [66678]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Bettongia lesueur Barrow and Boodie Islands subspecies Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Species or species habitat known to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isoodon auratus barrowensis Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Lagorchestes conspicillatus conspicillatus Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes hirsutus Central Australian subspecies Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Translocated population known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Osphranter robustus isabellinus Barrow Island Wallaroo, Barrow Island Euro [89262]	Vulnerable	Species or species habitat likely to occur within area
Petrogale lateralis lateralis Black-flanked Rock-wallaby, Moororong, Black-footed Rock Wallaby [66647]	Endangered	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
Other		
Kumonga exleyi Cape Range Remipede [86875]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus zastictus Hamelin Ctenotus [25570]	Vulnerable	Species or species habitat likely 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	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to 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

Name	Status	Type of Presence
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

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia		
Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus		
Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus		
White-tailed Tropicbird [1014]		Species or species habitat known to occur within area
Sterna dougallii		
Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons		
Little Tern [82849]		Species or species habitat may occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
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	Foraging, feeding or related behaviour 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	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may 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
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat 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 Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - EXMOUTH VLF TRANSMITTER STATION
Defence - LEARMONTH - AIR WEAPONS RANGE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Learmonth Air Weapons Range Facility	WA	Listed place
Ningaloo Marine Area - Commonwealth Waters	WA	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat known to occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
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	Foraging, feeding or related behaviour 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	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area

Name	Status	Type of Presence
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely 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
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks	[Resource Information]
Name	Label
Argo-Rowley Terrace	Multiple Use Zone (IUCN VI)
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Ningaloo	National Park Zone (IUCN II)
Ningaloo	Recreational Use Zone (IUCN IV)

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Airlie Island	WA
Barrow Island	WA
Bessieres Island	WA
Boodie, Double Middle Islands	WA
Cape Range	WA
Jurabi Coastal Park	WA
Montebello Islands	WA
Muiron Islands	WA
Round Island	WA
Serrurier Island	WA
Unnamed WA40322	WA
Unnamed WA40828	WA
Unnamed WA41080	WA
Unnamed WA44665	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris		
Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus		
Goat [2]		Species or species habitat likely to occur within area
Equus caballus		
Horse [5]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Bundera Sinkhole	WA
Cape Range Subterranean Waterways	WA
Learmonth Air Weapons Range - Saline Coastal Flats	WA

Key Ecological Features (Marine) [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	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Exmouth Plateau	North-west
Glomar Shoals	North-west

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, 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 distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-18.5824 113.9635,-18.9799 112.7515,-19.387 113.2969,-20.3434 112.9226,-20.2042 113.3921,-21.8924 112.6276,-22.2978 113.1801,-23.2556 113.0176,-23.073 113.2767,-22.7287 113.3303,-22.8114 113.5805,-21.8083 114.1035,-21.8425 114.3916,-21.5091 115.0331,-21.2337 115.2714,-20.9511 115.3534,-20.4106 115.5466,-20.4786 115.8711,-19.984 116.9654,-19.5836 117.5245,-19.6543 117.917,-19.4282 118.1665,-19.2245 117.6894,-18.9858 117.9177,-18.2557 118.5158,-18.1259 117.8101,-17.4589 117.5711,-18.0836 116.4819,-17.4016 116.0296,-17.7936 115.5854,-17.3631 115.2453,-17.8665 114.5327,-17.0163 113.2202,-17.1042 113.0866,-18.5824 113.9635

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-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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APPENDIX D OIL SPILL PREPAREDNESS AND RESPONSE STRATEGY SELECTION AND EVALUATION

Oil Spill Preparedness and Response Mitigation Assessment for the TPA03 Well Intervention Environment Plan

Security & Emergency Management
Hydrocarbon Spill Preparedness Unit

August 2022

Revision 0

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EXECUTIVE SUMMARY

Woodside Energy Limited (Woodside) has developed its oil spill preparedness and response position for the TPA03 Well Intervention 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 Scenarios	**Credible Scenario-01 (CS-01): Unplanned hydrocarbon release of condensate – loss of well containment (LOWC) from TPA03 during well intervention** 56,441 m^3 release of condensate over 71 days (19° 45' 43.618" S, 115° 53' 23.986" E). 0.8% residual component of 451.5 m^3 or 6.4 m^3 per day. [1]	Section 2.2
	Credible Scenario-02 (CS-02): Surface release of Marine Diesel Oil (MDO) after a vessel fuel tank rupture near the well Instantaneous release of 492 m^3. [2] 5% residue of 24.6 m^3	
Hydrocarbon Properties	**GWA Condensate** N.B. GWA condensate has very similar properties to the hydrocarbon produced from TPA03 well and is therefore an appropriate surrogate – see footnote [1]. GWA condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In favourable evaporation conditions, about 65.9% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 22.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 10.8% should evaporate over several days (265 °C < BP < 380 °C). Approximately 0.8% of the oil is shown to be persistent. **MDO** MDO is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 5% of the oil is shown to be persistent.	Section 0 Section 6.7 of the EP Appendix A of the First Strike Plan

[1] Modelling for GDA05 LOWC, 6 km from TPA03 well and within the same title (WA-5-L), was undertaken in 2021 using NOPSEMA's contemporary modelling thresholds. TPA03 Well Intervention LOWC is expected to be circa 50% smaller (56,441 m^3) than the GDA05 LOWC volume (108,843 m^3), has the same residue (0.8%), occurs in similar water depths and both over a 71-day release period. Given that TPA03 spill parameters and geographic location fall within the envelope of GDA05, the existing modelling is an appropriate surrogate and therefore additional modelling was not required.

[2] Loss of marine vessel separation MDO modelling of 1000 m^3 was available for the GDA05 well location, 6 km from TPA03 and within the same title (WA-5-L). It was originally undertaken in 2019 and reprocessed in 2021 using NOPSEMA's contemporary modelling thresholds. The largest tank of the vessel proposed for the TPA03 Well Intervention activity is circa 50% smaller (492 m^3) than the modelled MDO volume (1000 m^3). Given that spill parameters and geographic location fall within the envelope of the existing MDO modelling, it is an appropriate surrogate and therefore additional modelling was not required.

Modelling Results

Section 2.3

Stochastic modelling

A quantitative, stochastic assessment has been undertaken for credible spill scenarios to help assess the environmental risk of a hydrocarbon spill.

A total of 100 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 (25 simulations per quarter).

Deterministic modelling

Deterministic modelling was then undertaken for scenario CS-01 (Table 2-1) as the worst-case credible scenario (WCCS) to establish the following for response planning purposes:

- Maximum cumulative area for contact by floating oil (at concentrations in excess of 50 g/m^2).
- Minimum time to floating oil contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m^2).
- Minimum time to commencement of oil accumulation at any shoreline receptor (at a threshold of 100 g/m^2).
- Maximum cumulative oil volume accumulated across all shoreline receptors (at concentrations in excess of 100 g/m^2).
- Maximum cumulative oil volume accumulated at any individual shoreline receptor (at concentrations in excess of 100 g/m^2).

Deterministic modelling was not undertaken for CS-02 but the stochastic results have been included here to ensure complete response planning. Results as follows:

	CS-01: Unplanned hydrocarbon release of condensate – LOWC from TPA03 during well intervention (56,441 m^3 over 71 days)	**CS-02: Surface release of MDO after a vessel fuel tank rupture near the well** (instantaneous release of 492 m^3 MDO)
Maximum cumulative area for contact by floating oil (at concentrations in excess of 50 g/m^2)	Model 20, Q1 2.9 km^2 (Open Ocean)	*No contact at threshold*
Minimum time to floating oil contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m^2)	*No contact at threshold*	*No contact at threshold*
Minimum time to commencement of oil accumulation at any shoreline receptor (at a threshold of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*
Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors contacted by accumulated hydrocarbons (at a concentration of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*

	Maximum cumulative oil volume accumulated at any individual shoreline receptor (at concentrations in excess of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*	
Net Environmental Benefit Assessment	Monitor and evaluate, source control via relief well drilling, source control via capping stack[3], source control (via vessel SOPEP), oiled wildlife response are all identified as potentially having a net environmental benefit (dependent on the actual spill scenario) and carried forward for further assessment.			Section 4
ALARP evaluation of selected response techniques	The evaluation of the selected response techniques shows the proposed controls reduced the risk to an ALARP and Acceptable level for the risks and impacts presented in Section 2 and Section 3, including the implementation of considered additional, alternative or improved control measures.			Section 5 Section 6

[3] Deployment of a capping stack will only be a feasible response option once the vertical Xmas Tree has been removed during intervention activities and a MODU BOP installed. A capping stack can then be directly installed onto the MODU BOP or wellhead, once plume conditions allow.

1 INTRODUCTION

1.1 Overview

Woodside has developed its oil spill preparedness and response position for the TPA03 Well Intervention, hereafter known as the 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* (Environment Regulations) relating to hydrocarbon spill response arrangements:

- The TPA03 Well Intervention Environment Plan (EP)
- Oil Pollution Emergency Arrangements (OPEA) (Australia)
- The TPA03 Well Intervention Oil Pollution Emergency Plan (OPEP) including:
  - First Strike Plan (FSP)
  - Relevant Operations Plans
  - Relevant Tactical Response Plans (TRPs)
  - Relevant Supporting Plans
  - Data Directory.

1.3 Scope

This document evaluates 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. It 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 PAP is shown in Figure 3-1 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.

ANNEX A 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 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 as set out in ANNEX B: Operational Monitoring Activation and Termination Criteria.

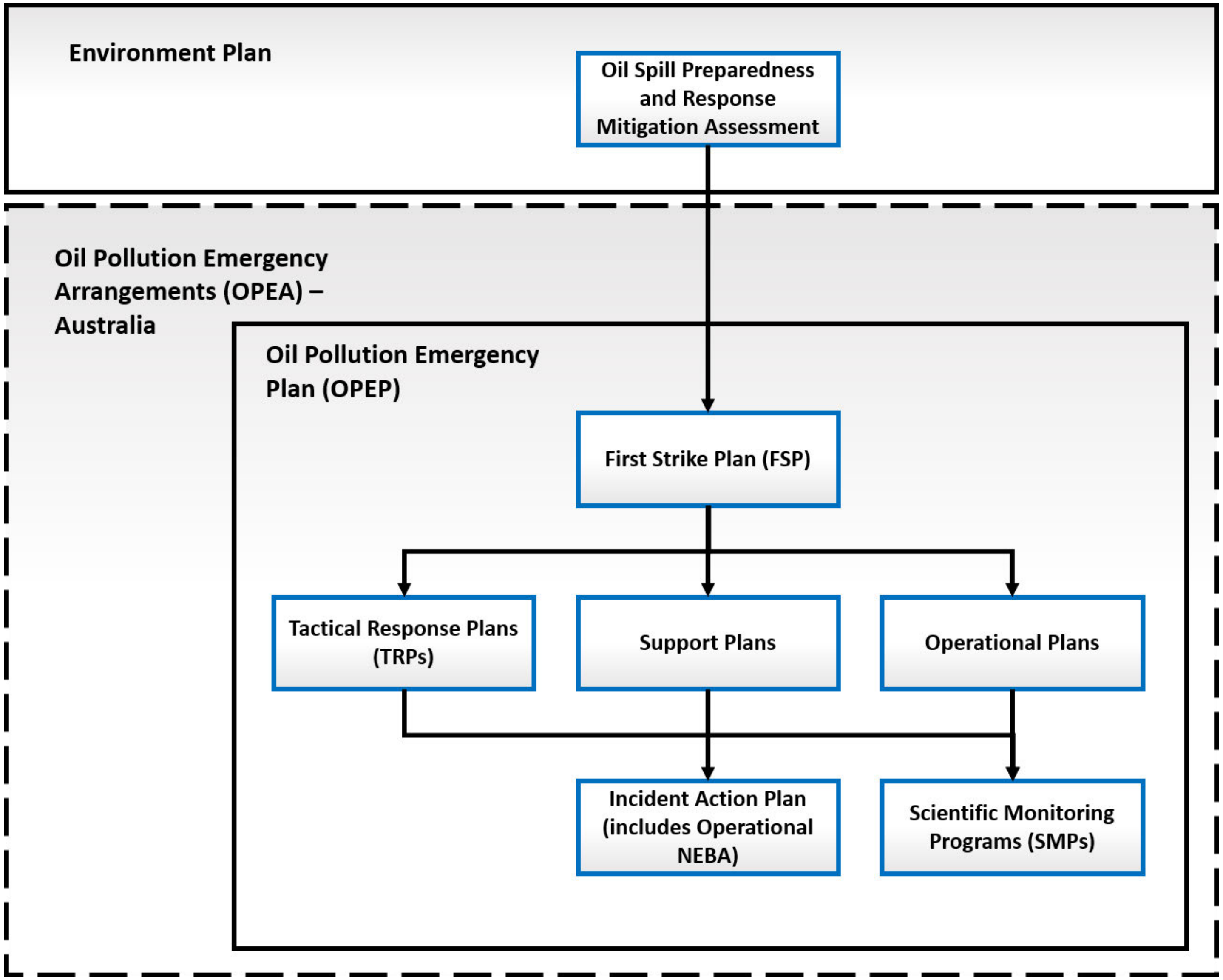


Figure 1-1: Woodside hydrocarbon spill document structure

Table 1-1: Hydrocarbon spill preparedness and response – document references

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
TPA03 Well Intervention EP	Demonstrates that potential adverse impacts on the environment associated with the GWA Facility Operations (during both routine and non-routine operations) are mitigated and managed to ALARP and will be of an acceptable level.	NOPSEMA Woodside internal	EP Section 6 (Environmental Risk Assessment, Performance Outcomes, Standards and Measurement Criteria). EP Section 7 (Implementation strategy – including emergency preparedness and response). 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 Woodside internal	All sections	
Oil Spill Preparedness and Response Mitigation Assessment for the TPA03 Well Intervention (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 Corporate Incident Control Centre (CICC): Control function in an ongoing spill response for activity-specific response information.	All performance outcomes, standards and measurement criteria related to hydrocarbon spill preparedness and response are included in this document.	
TPA03 Well Intervention Oil Pollution FSP	Facility specific document providing details and tasks required to mobilise a first strike response. Primarily applied to the first 24 hours of a response until a full IAP specific to the event is developed. Oil Pollution FSPs 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. CICC for initial response, activation and notification. CICC: 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. Relevant spill response options that could be initiated for mobilisation in the event of a spill. Recommended pre-planned tactics. Details and forms for use in immediate response. Activation process for oil spill trajectory modelling, aerial surveillance and oil spill tracking buoy details.	

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
Operational Plans	Lists the actions required to activate, mobilise and deploy personnel and resources to commence response operations. 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. 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.	CICC: Operations and Logistics functions for first strike activities. CICC: Planning Function to help inform the IAP on resources available.	Locations from where resources may be mobilised. How resources will be mobilised. Details of where resources may be mobilised to and what facilities are required once the resources arrive. Details on how to implement resources to undertake a response.	Operational Monitoring Plan Source Control Emergency Response Plan Vessel SOPEP Oiled Wildlife Scientific Monitoring
Tactical Response Plans	Provides options for response techniques in selected Response Protection Areas (RPAs). Provides site, access and deployment information to support a response at the location.	CICC: Planning Function to help develop IAPs, and Logistics function to assist with determining resources required.	Indicative response techniques. Access requirements and/or permissions. Relevant information for undertaking a response at that site. Where applicable, may include equipment deployment locations and site layouts.	A list of available Tactical Response Plans is available in **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.	CICC: Operations, Logistics and Planning functions.	Strategy for mobilising and managing additional resources outside of Woodside's immediate preparedness arrangements.	Logistics Support Plan Aviation Support Plan Marine Support Plan Accommodation & Catering Plan – Australia Transport Management Plan – Australia Waste Management Plan – Australia Health and Safety Support Plan

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
				Hydrocarbon Spill Responder Health Monitoring Guidelines People and Global Capability (Surge Labour Requirements) Support Plan (Land Based) Security Support Plan Stakeholder Engagement Support Plan Guidance for Hydrocarbon Spill Claims Management Communications Support Plan – Australia

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 TPA03 Well Intervention FSP 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.

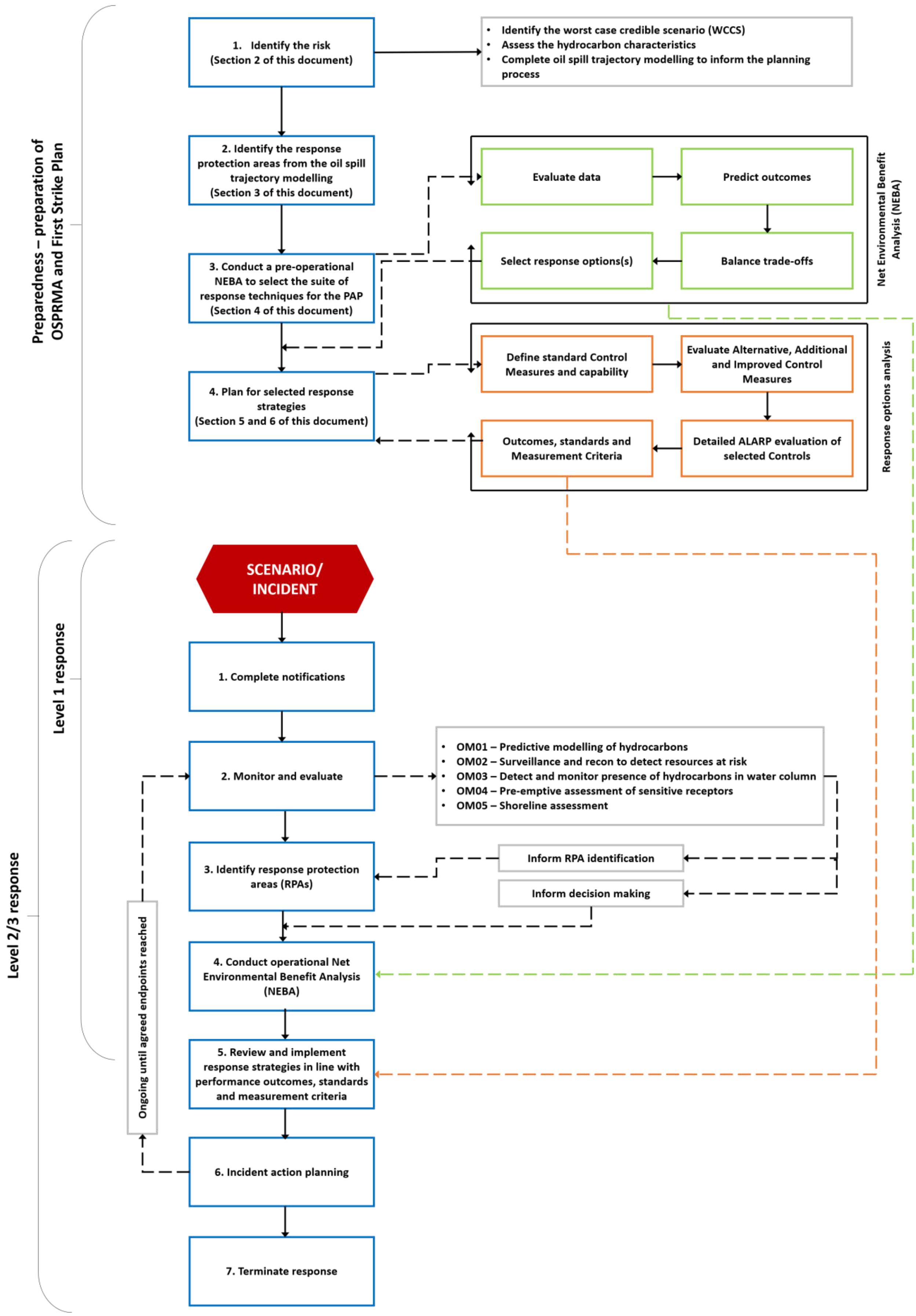


Figure 2-1: Response planning and selection process

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 >100g/m^2 (Refer to Table 2-4).

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

2.1.1 Response Planning Assumptions – Timing, Resourcing and Effectiveness

Figure 2-2 illustrates the initial steps of a response to an oil spill event and, where available, the indicative timing. For the latter stages, the timing will be specific to the selective response option.

IMT Call-out/ Notification	Contract Activation	Response Option Mobilisation	Response Option Deployment	Response Option Effectiveness
This is the time taken from call-out to mobilise the IMT to the designated Incident Control Centre	This is the time taken once the IMT has been mobilised to activate specific contracts for resources (SFRT, FWADC, AMOSC, AMSA, OSRL, etc)	This is the time taken to mobilise resources from home location to laydown/staging area (expected to be airport or sea port) close to response area	This is the time taken to deploy resources from laydown/staging area (expected to be airport or sea port) to response area/field	This relates to the performance of equipment/response option as well as required personnel resourcing (Specialists/Supervisors + support personnel)
Approx 2-4 hours	Approx 2-4 hours	Response Technique specific	Field/Location specific	Response Strategy specific

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. Two 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. One loss of well containment scenario (CS-01) was stochastically and deterministically modelled. The surface release of MDO after a vessel fuel tank rupture (CS-02) scenario was modelled stochastically only. Suitable surrogate modelling was available for both scenarios as described below:

- Modelling for GDA05 LOWC, 6 km from TPA03 well and within the same title (WA-5-L), was undertaken in 2021 using NOPSEMA's contemporary modelling thresholds. TPA03 Well Intervention LOWC is expected to be circa 50% smaller (56,441 m^3) than the GDA05 LOWC volume (108,843 m^3), has the same residue (0.8%), occurs in similar water depths and both over a 71-day release period. Given that TPA03 spill parameters and geographic location fall within the envelope of GDA05, the existing modelling is an appropriate surrogate and therefore additional modelling was not required.
- Loss of marine vessel separation MDO modelling of 1000 m^3 was available for the GDA05 well location, 6 km from TPA03 and within the same title (WA-5-L). It was originally undertaken in 2019 and reprocessed in 2021 using NOPSEMA's contemporary modelling thresholds. The largest tank of the vessel proposed for the TPA03 Well Intervention activity is circa 50% smaller (492 m^3) than the modelled MDO volume (1000 m^3). Given that spill parameters and geographic location fall within the envelope of the existing MDO modelling, it is an appropriate surrogate and therefore additional modelling was not required.

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.

Table 2-1: Petroleum Activities Program credible spill scenarios

Credible Spill Scenarios	Scenario selected for planning purposes	Scenario description	Maximum credible volume released (liquid m^3)	Incident Level	Hydrocarbon type	Residual proportion	Residual volume (liquid m^3)
CS-01	Yes	Unplanned hydrocarbon release of condensate – LOWC from TPA03 during well intervention[4] Uncontrolled subsea release of 794.9 m^3/day for 71 days	56,441	3	GWA Condensate used as an appropriate surrogate – see footnote [3]	0.8%	451.5 m^3 or 6.4 m^3 per day
CS-02	Yes	Surface release of MDO after a vessel fuel tank rupture near the well [5]	492	2	MDO	5%	24.6 m^3

[4] Modelling for GDA05 LOWC, 6 km from TPA03 well and within the same title (WA-5-L), was undertaken in 2021 using NOPSEMA's contemporary modelling thresholds. TPA03 Well Intervention LOWC is expected to be circa 50% smaller (56,441 m^3) than the GDA05 LOWC volume (108,843 m^3), has the same residue (0.8%), occurs in similar water depths and both over a 71-day release period. Given that TPA03 spill parameters and geographic location fall within the envelope of GDA05, the existing modelling is an appropriate surrogate and therefore additional modelling was not required.

[5] Loss of marine vessel separation MDO modelling of 1000 m^3 was available for the GDA05 well location, 6 km from TPA03 and within the same title (WA-5-L). It was originally undertaken in 2019 and reprocessed in 2021 using NOPSEMA's contemporary modelling thresholds. The largest tank of the vessel proposed for the TPA03 Well Intervention activity is circa 50% smaller (492 m^3) than the modelled MDO volume (1000 m^3). Given that spill parameters and geographic location fall within the envelope of the existing MDO modelling, it is an appropriate surrogate and therefore additional modelling was not required.

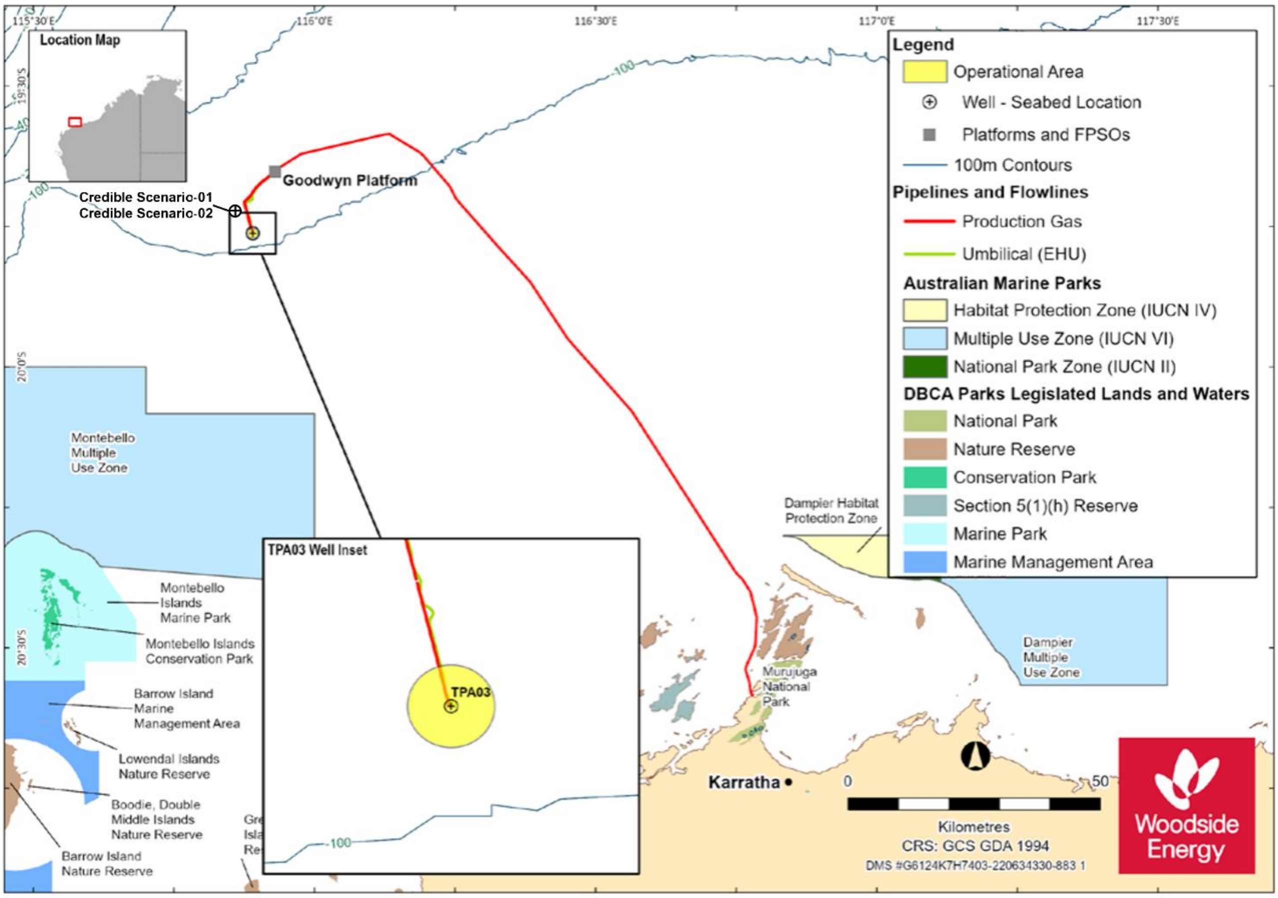


Figure 2-3: Location of credible spill scenarios

2.2.1 Hydrocarbon characteristics

More detailed hydrocarbon characteristics, including modelled weathering data and ecotoxicity, are included in Section 6 of the EP.

GWA Condensate

N.B. GWA condensate has very similar properties to the hydrocarbon produced from TPA03 well and is therefore an appropriate surrogate – see preceding footnote [**Error! Bookmark not defined.**].

GWA condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In favourable evaporation conditions, about 65.9% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 22.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 10.8% should evaporate over several days (265 °C < BP < 380 °C). Approximately 0.8% of the oil is shown to be persistent.

The whole oil has a low asphaltene content (< 0.5%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle.

Soluble, aromatic, hydrocarbons contribute approximately 16.3% by mass of the whole oil. Around 9.1% by mass is highly soluble and highly volatile. A further 7.2% by mass has semi-to-low volatility. These compounds dissolve more slowly but tend to persist in soluble form for longer. Discharge onto the water surface will favour the process of evaporation over dissolution under calm sea conditions, but increased entrainment of oil and dissolution of soluble compounds can be expected under breaking wave conditions.

MDO

MDO is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the oil mass should evaporate within the first 12 hours (boiling point < 180°C); a further 35% should evaporate within the first 24 hours (180°C < boiling point < 265°C); and a further 54% should evaporate over several days (265°C < boiling point < 380°C). About 5% of the oil is shown to be persistent. The aromatic content of the oil is about 3%.

The mass balance forecast for the constant-wind case for MDO shows that about 41% of the oil is predicted to evaporate within 24 hours. Under these calm conditions the majority of the remaining oil on the water surface weathers at a slower rate due to comprising the longer-chain compounds with higher boiling points. Evaporation of the residual compounds slows significantly and is then subject to more gradual decay through biological and photochemical processes.

The increased level of entrainment in the variable-wind case results in a higher percentage of biological and photochemical degradation, where the decay of the floating slicks and oil droplets in the water column occurs at an approximate rate of 2.4% per day with an accumulated total of ~16% after seven days, in comparison to a rate of ~0.2% per day and an accumulated total of 1.3% after seven days in the constant-wind case. Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons decay and/or evaporate over time scales of several weeks to a few months. This long weathering duration extends the area of potential effect.

2.3 Hydrocarbon spill modelling

Oil spill trajectory modelling (OSTM) 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 (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 damage 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 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

Quantitative, stochastic assessments have been undertaken for credible spill scenarios CS-01 and CS-02 (Table 2-1) to help assess the environmental consequences of a hydrocarbon spill.

A total of 100 replicate simulations were completed for each of 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 (25 simulations per quarter). Further details relating to the assessments for the scenarios can be found in Section 6 of the EP.

2.3.1.1 Environmental impact thresholds – Environment that May Be Affected (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 the 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 the EMBA and environmental impacts

Hydrocarbon Type	Surface hydrocarbon (g/m^2)	Dissolved hydrocarbon (ppb)	Entrained hydrocarbon (ppb)	Accumulated hydrocarbon (g/m^2)
Condensate	10	50	100	100
Diesel	10	50	100	100

2.3.2 Deterministic modelling

Woodside uses deterministic modelling results to evaluate risks and impacts and response capability requirements. These results are provided in both shapefile and data table format with each row of the data table representing a 1 km^2 cell. Smaller cell sizes have been considered but would not change the response need as the potential distance between cells would not allow multiple cells to be treated per day by response operations. Additionally, a 1 km^2 cell is expected to allow averaging of threshold concentrations and mass across the spatial extent to represent a conservative approach (patches of oil and windrows) to response planning that simulates operational monitoring feedback in a real event.

Deterministic modelling was carried out on scenario CS-01 (subsea loss of well containment scenario) and carried forward for response planning purposes as the WCCS. The impacts of all other scenarios are deemed to be lesser in nature and scale.

A sample of these deterministic results is provided below as an indication of the data format and content.

- Column A and B provide the latitude and longitude of the cell
- Column C is the elapsed time since the release occurred
- Column D represents the average concentration across the cell in g/m^2
- Column E represents the viscosity of the hydrocarbon in centistokes (cSt) at sea surface temperature

- Column F and G represents the mass of hydrocarbon across the entire cell in kg and tons respectively.

Table 2-3: Example Deterministic modelling data

Latitude A	Longitude B	Time_hour C	Conc_gm^2 D	Visc_cSt E	Mass_kg F	Mass_tons G
-19.657	115.929	60	53.16739	29.90083	53316.01	53.31601
-19.657	115.929	84	57.55573	30.83806	57716.61	57.71661
-19.657	115.9195	90	57.37641	37.27555	57536.86	57.53686
-19.648	115.929	114	50.54212	37.81493	50686.3	50.6863

The deterministic modelling data provides an indication of the response need by displaying the potential surface area and volume that may be treated or recovered by response operations. Existing capability is reviewed to approximate the surface area and volumes that can be treated or removed and a range of alternate, improved and additional options to reduce risks and impacts to ALARP are considered.

Woodside recognises that no single response technique will treat all available subsea or surface oil and that a combination of response techniques will be required for the identified scenario.

Woodside is committed to a realistic, scalable response capability that is commensurate to the level of risk and able to be practically implemented and feasibly sustained.

2.3.2.1 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 deterministic modelling is then used to assess the nature and scale of a response.

In the event of an actual response, existing deterministic modelling would be reviewed for suitability and additional modelling would be conducted using real-time data and field information to inform IMT decisions.

The deterministic 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) (Section 2.2). The thresholds used are derived from oil spill response planning literature and industry guidance and are summarised below.

Surface hydrocarbon concentrations

Table 2-4: Surface hydrocarbon thresholds for response planning

Surface hydrocarbon threshold (g/m^2)	Description	Bonn Agreement Oil Appearance Code	Mass per area (m^3/km^2)
>10	Predicted minimum threshold for commencing operational monitoring[6]	Code 3 – Dull metallic colours	5 to 50
50	Predicted minimum floating oil threshold for containment and recovery and surface dispersant application [7]	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

[6] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location, and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and control of the incident passes to statutory authorities e.g. Western Australia Department of Transport (WA DoT) or AMSA.

[7] At 50 g/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.

Shoreline hydrocarbon threshold (g/m^2)	Description	National Plan Guidance on Oil Contaminated Foreshores	Mass per area (m^3/km^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 to 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 the 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.

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.

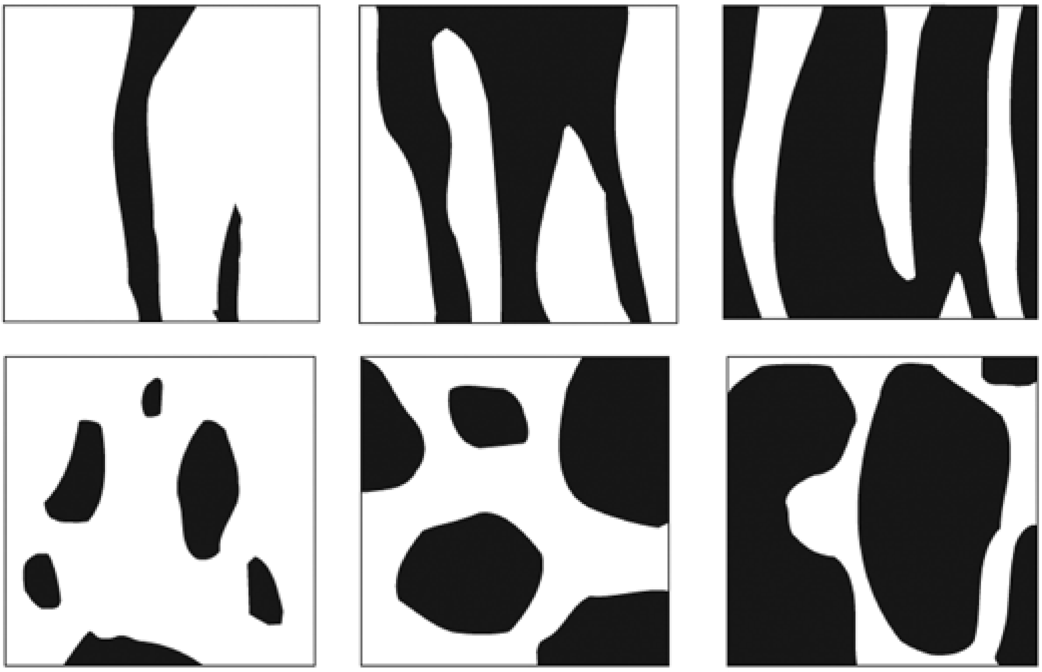
Spraying areas of oil designated as BAOAC Code 5 with dispersant (Continuous true oil colour and more than 0.2 mm thick) will, on average, deliver approximately half the recommended treatment rate of dispersant. Repeated application of these areas of thicker oil, or increased dosage ratios, will be required to achieve the recommended treatment rate of dispersant (EMSA 2012).

Guidance from NOAA in the United States is found in the document: *Characteristics of Response Strategies: 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 2-4 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 for offshore response operations (50 g/m^2 is an average of 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).



25% 50% 75%

Figure 2-4: Proportion of total area coverage (AMSA, 2014)

Figure 2-5 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.

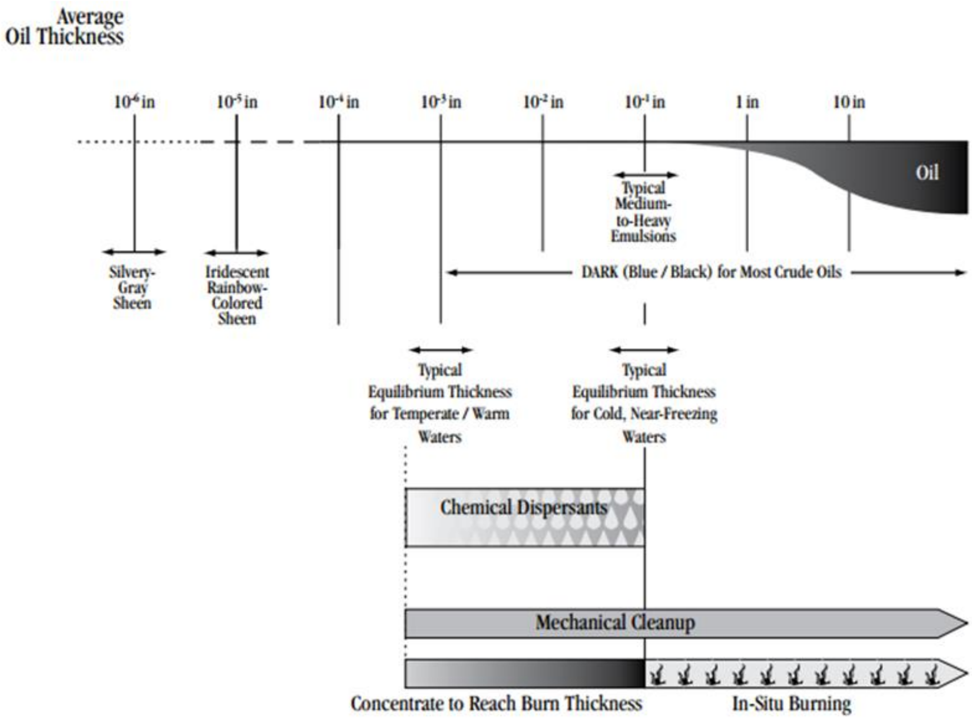


Figure 2-5: Oil thickness versus potential response options (from Allen & Dale 1996)

Wind and wave influence on the feasibility of response operations are also considered below (adapted from NOAA 2013):

- Mechanical Clean-up: Effectiveness drops significantly because of entrainment and/or splash-over as short period waves develop beyond 2–3 ft. (0.6–0.9m) in height. The ability to contain and recover oil decreases rapidly as the slick thickness becomes less than a thousandth of an inch (0.025 mm) (i.e., very low oil encounter rates). Waves and wind can also be limiting factors for the safe operation of vessels and aircraft.
- Dispersants: Effective dispersion requires a threshold amount of surface mixing energy (typically a few knots of wind and a light chop) to be effective. At higher wind and sea conditions, dispersant evaporation and wind-drift will limit chemical dispersion application effectiveness; and, there is a point (~25-kt winds, 10-ft waves) where natural dispersion forces become greater, particularly for light oils. Because of droplet size versus slick thickness constraints and application dose-rate limitations, dispersants work best on slick thicknesses of a few thousandths (approx. 50 g/m^2) to hundredths of an inch (approx. 250 g/m^2). Improved dispersants, higher dose rates, and multiple-pass techniques may extend the thickness limitation to 0.1 inch (2.5 mm) or more.

As offshore response operations (surface dispersant and containment and recovery) are intended to be undertaken at the thickest part of the slick, 50 g/m^2 and 100 g/m^2 (aligning with the lower limit of BAOAC 4 and midpoint of BAOAC 5) have been utilised by Woodside in deterministic modelling to identify the most likely locations for surface dispersant application and containment and recovery operations.

Surface hydrocarbon viscosity

Table 2-5: Surface hydrocarbon viscosity thresholds

Surface viscosity threshold (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	500-5,000
15,000*	Predicted maximum viscosity for effective surface dispersant operations	Sometimes possible to disperse	5,000-15,000

*Measured at sea surface temperature

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 (1,000 – 2,000 cSt) and then declining to a low level with an oil viscosity of 15,000 mPa (15,000 cSt). It was considered that some generally applicable viscosity limit, such as 2,000 or 5,000 mPa (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 (5,000 cSt) or more, and their performance gradually decreases with increasing viscosity; oils with a viscosity of more than 15,000 are in most cases, no longer dispersible. Guidance from CEDRE (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 – 15,000 cSt at sea temperature above pour point are sometimes possible to disperse, with products beyond 15,000 cSt at sea temperature below pour point are generally impossible to disperse.

To support decision making and response planning, a threshold of 15,000 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 2-6).

2.3.3 Spill modelling results

The selected deterministic runs used to represent the WCCS are based on response thresholds:

- Maximum cumulative area for contact by floating oil (at concentrations in excess of 50 g/m^2).

- Minimum time to floating oil contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m^2).
- Minimum time to commencement of oil accumulation at any shoreline receptor (at a threshold of 100 g/m^2).
- Maximum cumulative oil volume accumulated across all shoreline receptors (at concentrations in excess of 100 g/m^2).
- Maximum cumulative oil volume accumulated at any individual shoreline receptor (at concentrations in excess of 100 g/m^2).

The volumes as presented in Table 2-6 are the worst case volumes resulting from the deterministic modelling and have been used to determine appropriate level of response. Deterministic modelling was not undertaken for CS-02 but the stochastic results have been included here to ensure complete response planning:

Table 2-6: Worst case credible scenario modelling results

Response parameter	Modelled result	
	CS-01: Unplanned hydrocarbon release of condensate – LOWC from TPA03 during well intervention	**CS-02: Surface release of MDO after a vessel fuel tank rupture near the well**
Maximum continuous liquid hydrocarbon release rate and duration	56,441 m^3 of GWA Condensate over 71 days	Instantaneous release of 492m^3 of MDO
Maximum residual surface hydrocarbon after weathering	0.8% residual component of 451.5 m^3 or 6.4 m^3 per day	5% residual component of 24.6 m^3
Deterministic modelling results		
Maximum cumulative area for contact by floating oil (at concentrations in excess of 50 g/m^2)	Model 20, Q1 2.9 km^2 (Location N/A)	*No contact at threshold*
Minimum time to floating oil contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m^2)	*No contact at threshold*	*No contact at threshold*
Minimum time to commencement of oil accumulation at any shoreline receptor (at a threshold of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*
Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors contacted by accumulated hydrocarbons (at a concentration of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*
Maximum cumulative oil volume accumulated at any individual shoreline receptor (at concentrations in excess of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*

As shown in Table 2-6, deterministic modelling does not show floating oil at threshold (>10 g/m^2) at any RPA. Surface hydrocarbons at response threshold (>50 g/m^2) are, however, predicted to be present in open water within 1 km of the well for CS-01.

Due to the volatile nature of GWA Condensate and very low residue (0.8%), together with no predicted floating oil >10 g/m^2 at any RPA and minimal shoreline impact, subsea and surface dispersant are not appropriate response techniques as they would not provide a net environmental benefit.

Containment and recovery of volatile condensates poses a significant safety risk due to low flash points and thus corralling such hydrocarbons should be avoided. This response technique is therefore also not feasible.

Additional safety considerations that may prevent an offshore response include high winds (>20 knots), waves and/or sea states (>1.5m waves) and high ambient temperatures.

The above results from the deterministic modelling for CS-01 and the stochastic modelling for CS-02 have been used as the basis for response planning and are included in Section 4.2.

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.

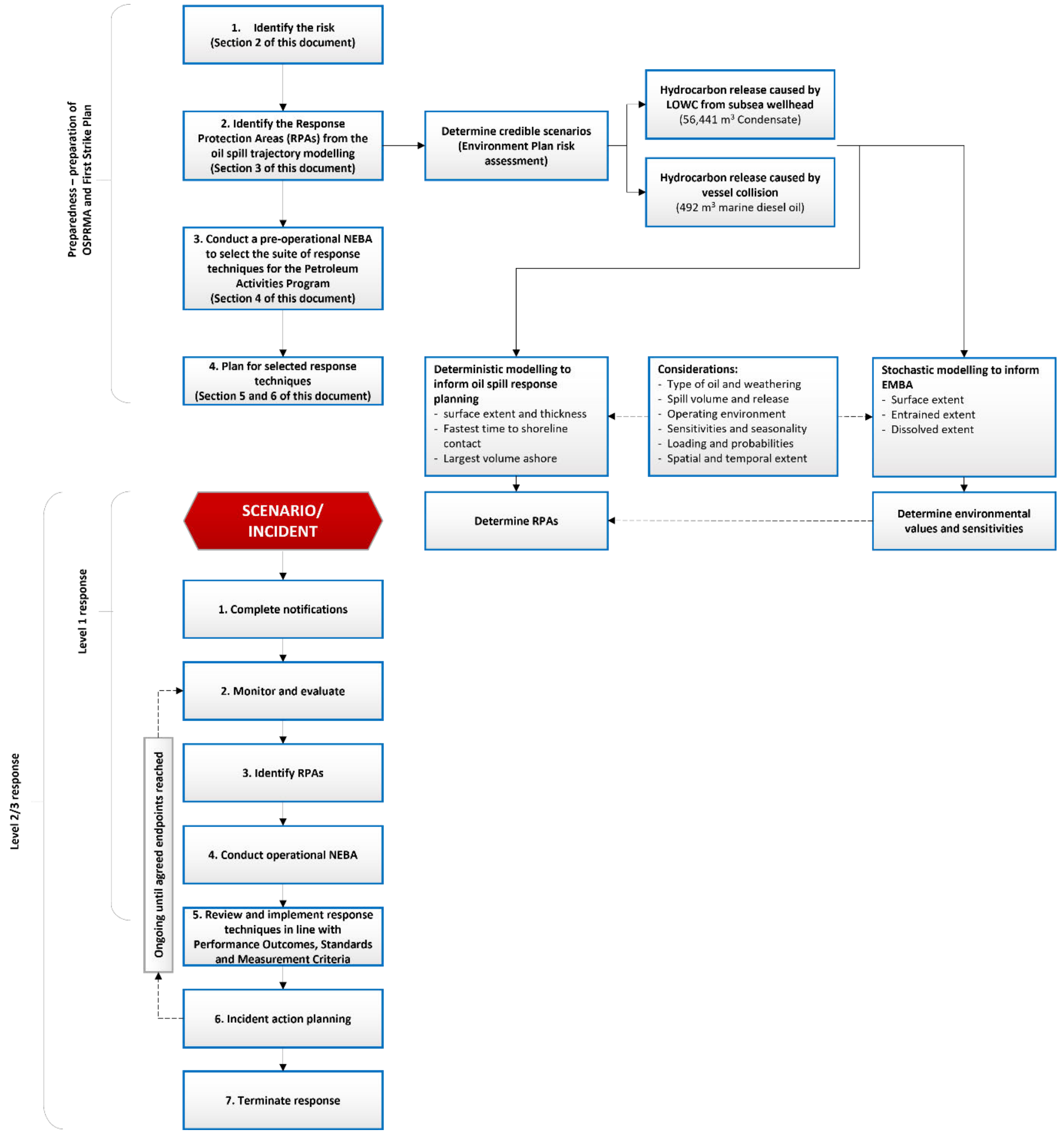


Figure 3-1: Identify Response Protection Areas flowchart

3.1 Identified sensitive receptor locations

Section 4 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 for Conservation of Nature (IUCN) marine protected area categories
  - high conservation value habitat and species
  - important socio-economic/heritage value.

3.2 Identify Response Protection Areas

RPAs are selected on the basis of their environmental ecological, social, economic, cultural and heritage values and sensitivities and the ability to conduct a response based on the minimum response thresholds (Section 2.3.2.1).

From the identified sensitive receptors described in Section 4 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[8]) would be selected for response planning purposes. While not discounting other sensitivities, these RPAs would then be used as the basis for demonstrating the capability to respond to the nature and scale of a spill from the WCCS and prioritising response techniques.

On this basis, no RPAs have been identified for either CS-01 or CS-02 scenario.

Additional sensitive receptors are presented in the existing environment description (Section 4 of the EP) and impact assessment section (Section 6 of the EP) for each respective spill scenario. The pre-operational NEBA (Section 4) considers the results from the stochastic modelling to ensure all feasible response techniques are considered in the planning phase, therefore additional receptors are also included in the pre-operational NEBA.

[8] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location, and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and/or control of the incident passes to statutory authorities e.g. WA DoT or AMSA.

4 NET ENVIRONMENTAL BENEFIT ANALYSIS

A Net Environmental Benefit Analysis (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.

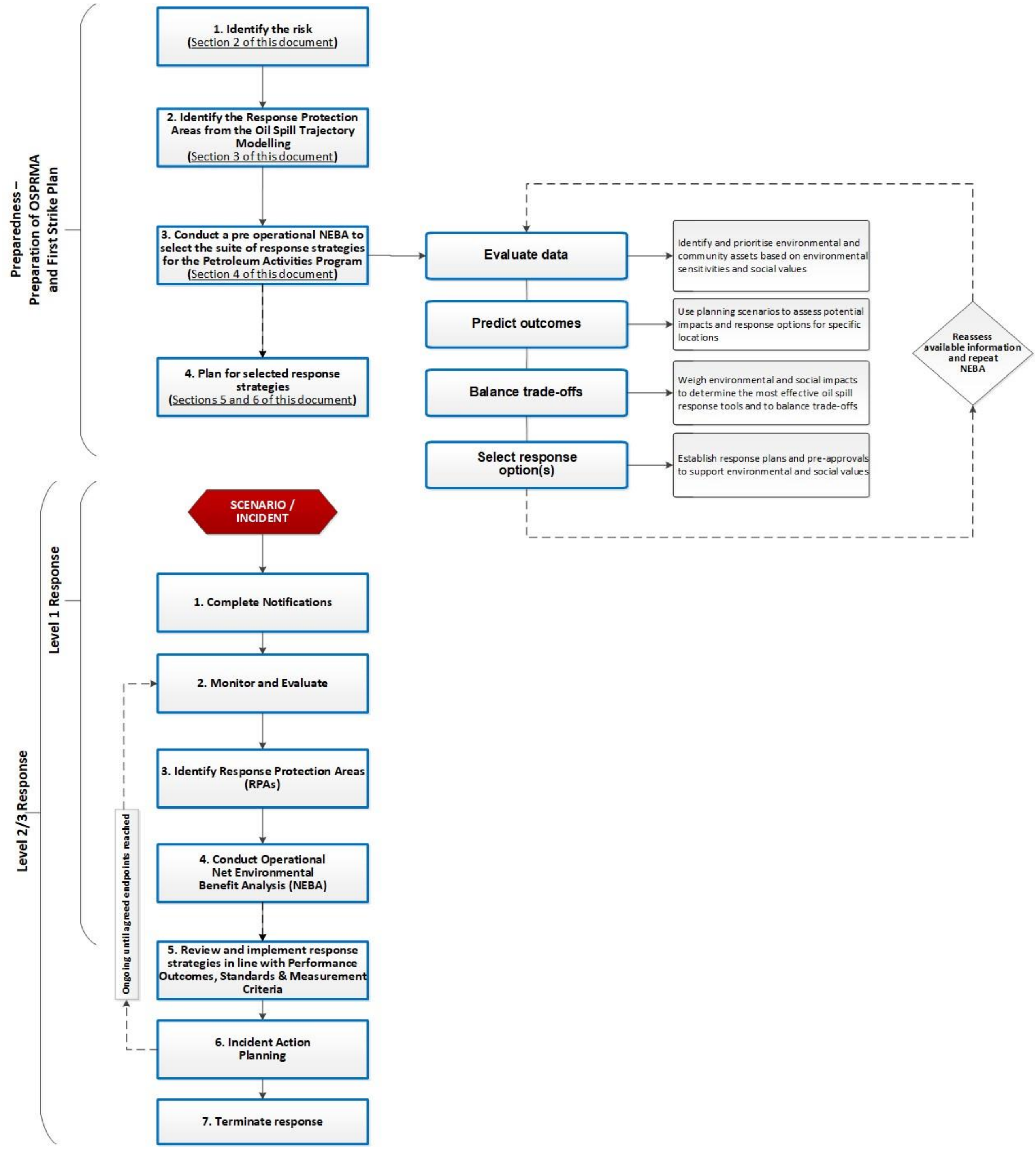


Figure 4-1: Net Environmental Benefit Analysis (NEBA) flowchart

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 2.3.2.1) and the surface concentrations (Section 0) from the deterministic modelling.

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 overall WCCS is then selected for deterministic modelling and is used for this pre-operational NEBA. Outlier locations with potential environmental impacts, selected from the stochastic modelling may also be included for assessment. The worst-case diesel scenario is also analysed to meet regulatory requirements. Response thresholds and deterministic modelling 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	Unplanned hydrocarbon release of condensate – LOWC from TPA03 during well intervention
Location	Lat: 19° 45’ 43.618” S Long: 115° 53’ 23.986” E
Oil Type	GWA Condensate
Fate and Weathering	65.9% of the mass should evaporate within the first 12 hours (BP < 180 °C) 22.5% of the mass should evaporate within the first 24 hours (180 °C < BP < 265 °C) 10.8% of the mass should evaporate over several days (265 °C < BP < 380 °C) 0.8% residue
Volume and duration of release	56,441 m^3 over 71 days
Scenario summary information (CS-02)	
Scenario	Surface release of MDO after a vessel fuel tank rupture near the well
Location	Lat: 19° 45' 10.681" S Long: 115° 52' 42.898" E
Oil Type	MDO
Fate and Weathering	6% of the oil mass should evaporate within the first 12 hours (BP < 180 °C) 35% should evaporate within the first 24 hours (180 °C < BP < 265 °C) 54% should evaporate over several days (265 °C < BP < 380 °C) 5% residue
Volume and duration of release	492 m^3 (instantaneous)

4.2.1.1 Hydrocarbon characteristics

GWA Condensate

N.B. GWA condensate has very similar properties to the hydrocarbon produced from TPA03 well and is therefore an appropriate surrogate – see footnote [3].

GWA condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In favourable evaporation conditions, about 65.9% of the oil mass should evaporate within the first 12 hours (BP < 180 °C); a further 22.5% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and a further 10.8% should evaporate over several days (265 °C < BP < 380 °C). Approximately 0.8% of the oil is shown to be persistent.

The whole oil has a low asphaltene content (< 0.5%), indicating a low propensity for the mixture to take up water to form water-in-oil emulsion over the weathering cycle.

Soluble, aromatic, hydrocarbons contribute approximately 16.3% by mass of the whole oil. Around 9.1% by mass is highly soluble and highly volatile. A further 7.2% by mass has semi-to-low volatility. These compounds dissolve more slowly but tend to persist in soluble form for longer. Discharge onto the water surface will favour the process of evaporation over dissolution under calm sea conditions, but increased entrainment of oil and dissolution of soluble compounds can be expected under breaking wave conditions.

MDO

MDO is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the oil mass should evaporate within the first 12 hours (boiling point < 180°C); a further 35% should evaporate within the first 24 hours (180°C < boiling point < 265°C); and a further 54% should evaporate over several days (265°C < boiling point < 380°C). About 5% of the oil is shown to be persistent. The aromatic content of the oil is about 3%.

The mass balance forecast for the constant-wind case for MDO shows that about 41% of the oil is predicted to evaporate within 24 hours. Under these calm conditions the majority of the remaining oil on the water surface weathers at a slower rate due to comprising the longer-chain compounds with higher boiling points. Evaporation of the residual compounds slows significantly and is then subject to more gradual decay through biological and photochemical processes.

The increased level of entrainment in the variable-wind case results in a higher percentage of biological and photochemical degradation, where the decay of the floating slicks and oil droplets in the water column occurs at an approximate rate of 2.4% per day with an accumulated total of ~16% after seven days, in comparison to a rate of ~0.2% per day and an accumulated total of 1.3% after seven days in the constant-wind case. Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons decay and/or evaporate over time scales of several weeks to a few months. This long weathering duration extends the area of potential effect.

Table 4-2: Oil fate, behaviour and impacts

Modelling results		
	CS-01	**CS-02**
Surface area of hydrocarbons (>50g/m^2 and <15,000cSt)	Surface hydrocarbons at response threshold (>50 g/m^2 and <15,000 cSt) are predicted to be present in the open water within 1 km of the well covering an area of 2.9 km^2	Nil
Maximum cumulative area for contact by floating oil (at concentrations in excess of 50 g/m^2)	Model 20, Q1 2.9 km^2 (open water)	*No contact at threshold*
Minimum time to floating oil contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m^2)	*No contact at threshold*	*No contact at threshold*
Minimum time to commencement of oil accumulation at any shoreline receptor (at a threshold of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*
Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors contacted by accumulated hydrocarbons (at a concentration of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*
Maximum cumulative oil volume accumulated at any individual shoreline receptor (at concentrations in excess of 100 g/m^2)	*No contact at threshold*	*No contact at threshold*

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)
- source control
  - remotely operated vehicle (ROV) intervention
  - debris clearance and/or removal
  - capping stack
  - relief well drilling
- source control on the vessel
- subsea dispersant injection
- surface dispersant application:
  - aerial dispersant application
  - vessel dispersant application
- mechanical dispersion
- in-situ burning
- containment and recovery
- 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.

Support functions may include:

- waste management
- post spill monitoring/ scientific monitoring.

Assessments of which response options are feasible for the scenarios are included below in Table 4-3, and Table 4-4. These options are evaluated against each 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, when and timings throughout the response.

Table 4-3: Response technique evaluation – Condensate release from loss of well containment

Response technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: GWA Condensate				
Monitor and evaluate	Will be effective in tracking the location of the spill, informing when it has entered State Waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques. • OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill. • OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill. • OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk. • OM05 Shoreline assessment – once OM02, OM03 and OM04 inform which RPAs have been impacted.	Monitoring of a GWA Condensate spill is a feasible response technique and an essential element of all spill response incidents. Outputs will be used to guide decision making on the use of other monitoring/response techniques and providing required information to regulatory agencies including AMSA and Western Australia Department of Transport (WA DoT).	**Yes**	Monitoring the spill will be necessary to: • validate trajectory and weathering models • determine the behaviour of the oil in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • provide regulatory agencies with required information.
Source control via blowout preventer (BOP) intervention using ROV and hotstab	Controlling a loss of well containment at source through BOP intervention using ROV and hot stab would be the most effective way to limit the quantity of hydrocarbon entering the marine environment.	In the event of the worst-case scenario with a loss of well containment during well intervention operations, ROV operations to locally operate the BOP would be attempted.	**Yes**	The use of source control through BOP intervention using ROV and hot stab may be feasible (depending on local concentration of atmospheric volatiles) and may reduce or stop quantity of hydrocarbons entering the marine environment.
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.	Evaluation of the viability of utilising a capping stack for the TPA03 Well Intervention activity has concluded that it is not a feasible response strategy whilst the Xmas tree remain in place. The well has a vertical subsea Xmas Tree (VXT). A VXT has an incompatible connector size and profile (Taurus iii 13 ⅝" connector) with capping stacks (H4/HC 18 ¾" connector). However, once the VXT has been removed during intervention activities, a MODU BOP will be installed. A capping stack will become a feasible response option after VXT removal, by direct installation onto the MODU BOP or wellhead, and once plume conditions allow.	**Yes**	A capping stack will be a feasible response option once the VXT has been removed and plume conditions allow. Prior to that a capping stack cannot be utilised due to incompatibility of connector sizes with the VXT and/or, if the trees remain in place, the existing barriers would remain active.
Source control via relief well drilling	Relief well drilling will be the primary option to stop the release.	For a spill from the TPA03 subsea wellhead, relief well drilling will be the primary means of controlling a well containment event.	**Yes**	Relief well drilling will be the primary feasible technique employed to control a loss of well containment event. Relief well drilling is a widely accepted and utilised technique.
Subsea Dispersant Injection (SSDI)	Application of subsea dispersant may reduce the scale and extent of hydrocarbons reaching the surface and thus reduce spill volumes contacting RPAs. SSDI can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons. Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which may be otherwise unaffected. Entrained oil plume likely to be increased resulting in greater spatial extent of entrained oil.	GWA Condensate is highly volatile with a low residue of 0.8%. Modelling predicts temporally and spatially limited oil at threshold (>50 g/m^2) on the surface and no shoreline contact. The use of SSDI would therefore not provide an environmental benefit and would increase entrained hydrocarbon levels which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons.	**No**	A spill from the TPA03 well is not predicted to result in significant surface oil at threshold and no shoreline impacts therefore the use of SSDI would increase dispersed/entrained hydrocarbon levels without providing a net environmental benefit. General safety risks associated with responding in close proximity to well release of volatile hydrocarbons.
Surface dispersant application	Application of surface dispersant would likely reduce the volumes of hydrocarbons contacting sensitive surface receptors. Dispersant can also enhance biodegradation and may reduce VOCs in some circumstances therefore reducing potential health and safety risk to responders.	Dispersants are not generally considered a feasible response technique when applied on thin surface films such as condensate as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon. GWA Condensate is highly volatile with a low residue of 0.8%. Modelling predicts rapid spreading and evaporation with temporally and spatially limited oil at threshold (>50 g/m^2) on the surface with no shoreline at feasible response thresholds. The use of surface dispersant would therefore not provide an environmental benefit and	**No**	Use of surface dispersant is not deemed to be an appropriate technique for use on highly volatile, low residue condensate and would unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons without any net environmental benefit.

Response technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: GWA Condensate				
	Dispersant can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons. Subsurface oil plume likely to increase in size resulting in greater spatial extent of entrained oil. Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which otherwise may have been unaffected.	would increase entrained hydrocarbon levels which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons. Additionally, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles.		Furthermore, atmospheric volatile levels would make in unsafe for response personnel.
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. The volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. 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. 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. This method will not be adopted due to significant safety risks.
In-situ burning	In-situ burning is only effective where minimum slick thickness can be achieved and where calm metocean conditions can be ensured. Use of this technique would also cause an increase the release of atmospheric pollutants.	There is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which would be difficult to achieve. Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles.	**No**	The safety concerns and the predicted low effectiveness associated with implementing an in-situ burning response outweigh the potential environmental benefit. Also, there is a lack of equipment and trained personnel available in Australia.
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. It has the potential to reduce the magnitude, probability, extent, contact and accumulation of hydrocarbon on shorelines receptors when suitable encounter rates can be achieved. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by removing oil before further natural entraining/dissolving of hydrocarbons occurs.	Predicted low effectiveness – typical expectation is less than 10% of hydrocarbon released can be contained and recovered. Deepwater Horizon/Macondo effectiveness was approx. 3–5% with the largest containment and recovery operation ever conducted. Modelling of a GWA Condensate spill predicts that floating oil will be prone to rapid spreading and evaporation and will only reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within 1 km of the well. Surface hydrocarbon would need to be corralled to a sufficient thickness to permit efficient recovery by skimmers, however, corralling a volatile, low flash point substance poses a significant safety risk and should be avoided. Meteorological conditions and sea-state must also allow the deployment of booms and skimmers.	**No**	Potential to slightly reduce the magnitude, probability of, extent of, contact with and accumulation on shorelines receptors if and when appropriate encounter rates can be achieved and in conditions that are safe for response personnel. Surface concentrations will meet the 50 g/m^2 minimum concentration required for response options to be deployed, however, corralling a volatile hydrocarbon such as GWA. Condensate poses a significant safety risk due to low flash points and thus should be avoided. This response technique is therefore not recommended.
Shoreline protection and deflection	Shoreline protection and deflection can be effective at preventing contamination of sensitive resources and can be used to corral oil into slicks thick enough to skim effectively.	Modelling does not predict any shoreline contact at feasible response thresholds for the duration of the spill. Furthermore, the volatile nature of GWA Condensate is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving toward shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).	**No**	No RPAs are predicted to be contacted at feasible response thresholds. If RPAs are deemed to be at risk, based on real-time monitoring during a spill event, shoreline protection and deflection techniques may be employed if safe to do so to minimise hydrocarbon contact providing net environmental benefit.
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.	Modelling does not predict any shoreline contact at feasible response thresholds for the duration of the spill. Furthermore, the volatile nature of GWA Condensate is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving toward shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).	**No**	No RPAs are predicted to be contacted at feasible response thresholds. If RPAs are deemed to be at risk, based on real-time monitoring during a spill event, shoreline protection and deflection techniques may be employed if safe to do so to minimise hydrocarbon contact providing net environmental benefit.

Response technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: GWA Condensate				
Oiled wildlife response	Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination.	In the event that wildlife is at risk of contamination, oiled wildlife response will be undertaken in accordance with the Wildlife Response Operational Plan as and where required. In addition, any rehabilitation could only be undertaken by trained specialists. Due to the likely volatile atmospheric conditions surrounding a GWA Condensate spill, response options may be limited to hazing to ensure the safety of response personnel.	**Yes**	This technique may prevent impact to and/or treat oiled wildlife providing net environmental benefit.

Table 4-4: Response technique evaluation – MDO release from vessel collision (CS-02)

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: MDO				
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. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques. • OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill. • OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill. • OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk. • OM05 Shoreline assessment – once OM02, OM03 and OM04 inform if any RPAs have been impacted.	Monitoring of a MDO 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 WA DoT. Practicable techniques that could be used for this scenario include predictive modelling (OM01), surveillance and reconnaissance OM02) and monitoring of hydrocarbon presence in water (OM03). Modelling does not predict impact of any shoreline receptors at threshold, however, pre-emptive assessment of sensitive receptors at risk (OM04) and monitoring of contaminated resources (OM05) would be utilised if any sensitive shoreline receptors are deemed to be at risk of impact.	**Yes**	Monitoring the spill will be necessary to: • validate trajectory and weathering models • determine the behaviour of the oil in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • provide regulatory agencies with required information.
Source control via vessel SOPEP	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 or facility can safely 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 MDO as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon resulting in the unnecessary addition of chemicals to the marine environment	MDO is prone to rapid spreading and evaporation and is not suitable for surface dispersant application. Furthermore, modelling predicts that floating oil will not reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within any RPA or in open waters. The volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon thus this response technique is deemed inappropriate.	**No**	The application of dispersant to MDO 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.
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. The volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. 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. 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 MDO 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 and its used would unnecessarily cause an increase the release of atmospheric pollutants.	**No**	Diesel characteristics are not appropriate for the use of in-situ burning and would unnecessarily cause an increase the release of atmospheric pollutants.
Containment and recovery	Containment and recovery have an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5 with a 50-100% coverage of 100 g/m^2 to 200 g/m^2.	MDO is prone to rapid spreading and evaporation and is deemed unsuitable for effective containment and recovery operations. Furthermore, modelling predicts that floating oil will not reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within any RPA or in open waters. The volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon thus this response technique is deemed inappropriate.	**No**	Containment and recovery would be an inappropriate response technique for a spill of MDO. In addition to the safety issues, most of the spilled diesel would have been subject to rapid evaporation prior to the commencement of containment and recovery operations.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: MDO				
Shoreline protection and deflection	Shoreline protection and deflection can be effective at preventing contamination of at-risk areas.	Modelling does not predict any shoreline contact at feasible response thresholds for the duration of the spill. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving toward shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).	**No**	No RPAs are predicted to be contacted at feasible response thresholds. If RPAs are deemed to be at risk, based on real-time monitoring during a spill event, shoreline protection and deflection techniques may be employed if safe to do so to minimise hydrocarbon contact providing net environmental benefit.
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.	Modelling does not predict any shoreline contact at feasible response thresholds for the duration of the spill. Furthermore, the volatile nature of MDO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon. If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving toward shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills).	**No**	No RPAs are predicted to be contacted at feasible response thresholds. If RPAs are deemed to be at risk, based on real-time monitoring during a spill event, shoreline protection and deflection techniques may be employed if safe to do so to minimise hydrocarbon contact providing net environmental benefit.
Oiled wildlife response	Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination.	Due to the likely volatile atmospheric conditions surrounding a diesel spill, response options may be limited to hazing to ensure the safety of response personnel. The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. Monitor and evaluate will, however, be deployed from the outset of a spill to track the spill location and fate in real-time. Thus, in the event that wildlife is at risk of contamination, oiled wildlife response will be undertaken in accordance with the Wildlife Response Operational Plan as and where required. In addition, any rehabilitation could only be undertaken by trained specialists.	**Yes**	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 is at risk of contamination, oiled wildlife response will be undertaken as and where required.

4.2.3 Exclusion of response techniques

Response techniques that are not feasible for all scenarios for this PAP are detailed in the subsections below and are excluded from further assessment within this document.

4.2.3.1 Subsea dispersant injection

GWA Condensate is highly volatile with a low residue of 0.8%. Modelling for CS-01 predicts temporally and spatially limited oil at threshold (>50 g/m^2) on the surface and no shoreline contact. The use of SSDI would therefore not provide an environmental benefit and would increase dispersed/entrained hydrocarbon levels which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons.

Subsea dispersant is not applicable for spills of MDO.

4.2.3.2 Surface dispersant application

GWA Condensate is highly volatile, has very low residues and is prone to rapid spreading and evaporation. Modelling results for CS-01 indicates that there will be temporally and spatially limited surface oil at response threshold (>50 g/m^2) for surface dispersant application in the open ocean within 1 km of the spill location. No floating oil at threshold reaches any sensitive offshore receptors and no shoreline receptors are contacted at response thresholds. Surface dispersant application would therefore be unlikely to prevent further impacts and would unnecessarily introduce additional chemical substances to the marine environment and increase exposure of subsea species and habitats to hydrocarbons. It would thus not provide a net environmental benefit.

Additionally, the ongoing nature of the release combined with the potential for the plume to breach the surface may cause conditions leading to high local concentrations of atmospheric volatiles producing a health and safety risk, thus limiting the ability of a surface dispersant response to safely target fresh GWA Condensate.

Surface dispersant is not appropriate for spills of MDO.

4.2.3.3 Mechanical dispersion

Mechanical dispersion involves the use of a vessel’s propeller wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. This technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages. Additionally, the volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon.

Any vessel used for mechanical dispersion activities would become contaminated by the hydrocarbon and could potentially cause secondary contamination of unimpacted areas when exiting the spill area. The decontamination of a vessel used for mechanical dispersion activities would result in additional quantities of oily waste requiring appropriate handling and treatment.

4.2.3.4 In-situ burning

This technique requires calm sea state conditions as is required for containment and recovery operations, which limits its feasibility in the region. Optimum weather conditions are <20 knot wind speed and waves <1 to 1.5 m with oil collected to a minimum 3 mm thick layer. Due to the conditions in the region it is expected that the ability to contain oil may be limited as the sea state may exceed the optimum conditions. It is preferable that oil is fresh and does not emulsify to maximise burn efficiency and reduce residue thickness.

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.

4.2.3.5 Containment and recovery

GWA Condensate is highly volatile, has very low residues and is prone to rapid spreading and evaporation. Modelling results for CS-01 indicates that there will be temporally and spatially limited surface oil at response threshold (>50 g/m^2) suitable for containment and recovery in the open ocean within 1 km of the spill location. No floating oil at threshold reaches any sensitive offshore receptors and no shoreline receptors are contacted at response thresholds.

Corralling a volatile, low flash point substance such as GWA Condensate, however, poses a significant safety risk and should be avoided. Therefore, due to the limited availability of recoverable hydrocarbons, the safety implications outweigh any predicted environmental benefit.

Containment and recovery is not appropriate for spills of MDO.

4.2.3.6 Shoreline protection and deflection

Modelling does not predict shoreline contact at response thresholds (>100 g/m^2), for either scenario for this petroleum activity program. Shoreline protection and deflection is therefore not required.

4.2.3.7 Shoreline clean-up

Modelling does not predict shoreline contact at response thresholds (>100 g/m^2), for either scenario for this petroleum activity program. Shoreline clean-up is therefore not required.

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 (ANNEX A: Net Environmental Benefit Analysis detailed outcomes).

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 4-5: 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	Source control – debris clearance and 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: Unplanned hydrocarbon release of condensate – LOWC from TPA03 during well intervention. 56,441 m^3 over 71 days (residual component of 451.5 m^3 or 6.4 m^3 per day).	Fastest time to shoreline accumulation >100 g/m^2 – no contact	Yes	Yes[9]	N/A	Yes	No	No	No	No	No	No	No	Yes	Monitor and evaluate. Initiate debris clearance and capping stack deployment Initiate relief well drilling. Plan for oiled wildlife response and implement if oiled wildlife is observed.
CS-02: Surface release of MDO after a vessel fuel tank rupture near the well. Instantaneous release of 492 m^3 MDO (residual component of m^3)	Fastest time to shoreline accumulation >100 g/m^2 – no contact	Yes	N/A	Yes	N/A	N/A	No	No	No	No	No	No	Yes	Monitor and evaluate. Initiate vessel source control if feasible. Plan for oiled wildlife response and implement if oiled wildlife is observed.

From the NEBA undertaken on the WCCSs identified (loss of well containment – CS-01), and MDO from a support vessel collision (CS-02), the recommended response techniques are;

- monitor and evaluate (all scenarios)
- source control via debris clearance and capping stack (CS-01)
- source control via relief well drilling (CS-01)
- source control on the vessel (CS-02)
- oiled wildlife response (all scenarios).

Support functions include:

- waste management (all scenarios)
- scientific monitoring programs (all scenarios).

[9] Deployment of a capping stack will only be a feasible response option once the vertical Xmas Tree has been removed during intervention activities and a MODU BOP installed. A capping stack can then be directly installed onto the MODU BOP or wellhead, once plume conditions allow.

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 Spill 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
    - 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
    - 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 event.

The table below provides the operational 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, Response Protection Areas (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 Karratha/Dampier to the spill event location means that multiple logistical options are available to monitor the spill in relatively short timeframes.

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:

- Operational monitoring will be undertaken from the outset of a spill. This is needed to assess the nature of the spill and track its location. The data collected from the operational monitoring will inform the need for any additional operational monitoring, deployment of response techniques and may assist post-spill scientific monitoring. It also informs when the spill has entered State Waters and control of the incident passes to WA DoT.
- Surface hydrocarbons at >10 g/m^2 are predicted to be present in open water within 30 km of the TPA03 well (CS-01) and 48 km of the spill site (CS-02). Surface hydrocarbons at >50 g/m^2 are predicted to be present in open water around the well location (CS-01).
- No shoreline contact is predicted at threshold concentrations for either CS-01 or CS-02.
- The shortest time to contact for entrained hydrocarbons greater than 100 ppb is 18 hours at Rankin Bank for both CS-01 and CS-02.
- 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 71 days (CS-01).
- The location, trajectory and fate of the spill will be verified by real-time spill tracking via modelling, direct observation and remote sensing (OM01, OM02, OM03, OM04 and OM05).

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 (Section 5.8)**
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 COP daily to improve the accuracy of other monitor and evaluate strategies.	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 strategies.	1, 3B, 4
		3.6	Satellite Imagery services available and employed during response.	1, 3C, 4
4	Aerial surveillance	4.1	2 trained aerial observers available to be deployed by day 1 from resource pool.	1, 2, 3B, 3C, 4
		4.2	1 aircraft available for 2 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
		4.4	Unmanned Aerial Vehicles/Systems (UAV/UASs) to support Shoreline Clean-up Assessment Technique (SCAT), containment and recovery and surface dispersal and pre-emptive assessments as contingency if required.	1, 2
5	Hydrocarbon detections in water	5.1	Activate 3rd party service provider as per First Strike plan. Deploy resources within 3 days: • 3 specialists in water quality monitoring • 2 monitoring systems and ancillaries • 1 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	1, 2, 3C, 4

			operational SIMA confirms conventional methods are unsafe or not possible.	
6	Pre-emptive assessment of sensitive receptors	6.1	10 days prior to any predicted impact, in agreement with WA DoT (for Level 2/3 incidents), deployment of 2 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 Response Protection Areas (RPAs) and maximise effective utilisation of resources.	1, 3B, 4
7	Shoreline assessment	7.1	10 days prior to any predicted impact, in agreement with WA DoT (for Level 2/3 incidents), deployment of 1 specialist(s) in SCAT from resource pool for each of the Response Protection Areas (RPAs) with predicted impacts	1, 2, 3B, 3C, 4
		7.2	SCAT reports provided to IMT daily detailing the assessed areas to maximise effective utilisation of resources.	1, 3B, 4
8	Management of environmental impact of the response risks	8.1	Shoreline access routes with the least environmental impact identified will be selected by a specialist in SCAT operations.	1
		8.2	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	
		8.3	Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines	
		8.4	Vehicular access will be restricted on dunes, turtle nesting beaches and in mangroves	

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 6.1.
- 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 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 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 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 Woodside *Source Control Response Procedure* 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. A dynamically positioned (DP) MODU is not suitable for the TPA03 well water depth, therefore jack-up or moored MODU would be required.

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.

5.2.1 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)
  - a relief well is drilled and first attempt at well kill within 71 days
  - a capping stack is in place.[10]
- 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 71 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 will prepare an Activity SCERP in conjunction with the SCERP Planning Guideline which will provide detail on feasibility of capping stack deployment Various options for safe and effective deployment of a capping stack in these conditions were assessed but due to the complex nature of implementation or inability to implement were deemed as not ALARP. These are detailed in Section 6.2.7.1.
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: • hydrocarbon gas and/or liquid exposure • high winds, waves and/or sea states • high ambient temperatures.

[10] Deployment of a capping stack will only be a feasible response option once the vertical Xmas Tree has been removed during intervention activities and a MODU BOP installed. A capping stack can then be directly installed onto the MODU BOP or wellhead, once plume conditions allow.

Feasibility considerations	Woodside's primary source control option would be relief well drilling for the TPA03 well. Capping stack may be viable for this well once the vertical Xmas Tree has been removed and where a loss of well containment of a lower magnitude than the worst case credible scenario occurs with a plume radius is ~25 m. The following approaches outline Woodside's hierarchy for relief well drilling; • Primary relief well – review internal drilling programs and MODU availability to source an appropriate rig operating within Australia with an approved Safety Case; • Alternate relief well – source and contract a MODU through APPEA MOU that is operating within Australia with an approved Safety Case; • Contingency relief well –-source and contract a MODU outside Australia with an approved Australian Safety Case

5.2.2 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 (Section 5.8)**
9	Subsea First Response Toolkit (SFRT)	9.1	Oceaneering support staff available all year round, via contract, to assist with the mobilisation, deployment, and operation of the SFRT equipment.	1, 3B, 3C
		9.2	Intervention vessel with minimum requirement of a working class ROV and operator.	1, 3C
		9.3	Mobilised to site for deployment within 11 days.	1, 3B, 3C
		9.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
10	Well intervention	10.1	Frame agreements with ROV providers in place to be mobilised upon notification. ROV equipment deployed within 7 days.	1, 3B, 3C
		10.2	Source Control vessel will have the following minimum specifications: • Active Heave Compensated crane, rated to at least 150T in shallow water and 250T in deeper water • At least 90m in length • Deck has water/electricity supply • Deck capacity to hold at least 110T of capping stack	1, 3B, 3C
		10.3	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
		10.4	Hot Stab and/or well intervention attempt made using ROV and SFRT within 11 days.	1, 3B, 3C
		10.5	Capping stack on suitable vessel mobilised to site within 16 days[11]. Deployment and well intervention attempt will be made if plume size is acceptable and safety and metocean conditions are suitable.	1, 3C
		10.6	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
		10.7	MODU mobilised to site for relief well drilling within 21 days.	1, 3C
		10.8	First well kill attempt completed within 71 days	1, 3B, 3C
		10.9	Open communication line(s) to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
		10.10	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
11	Support vessels	11.1	Monthly monitoring of availability of larger vessels through existing Frame Agreements and market intelligence to meet specifications for source control.	3C
		11.2	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
		11.3	MODU and vessel contracts include clause outlining requirement for support in the event if an emergency	1, 3C
12	Safety case	12.1	Woodside will prioritise MODU or vessel(s) for intervention work(s) that have an existing safety case.	1, 3C

[11] Deployment of a capping stack will only be a feasible response option once the vertical Xmas Tree has been removed during intervention activities and a MODU BOP installed. A capping stack can then be directly installed onto the MODU BOP or wellhead, once plume conditions allow.

		12.2	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
		12.3	Woodside will maintain minimum safe operating standards that can be provided to MODU and vessel operators for safety case guidance.	1, 3C
13	Management of environmental impact of the response risks	13.1	Seabed disturbance from MODU mooring limited to that required to ensure adequate MODU station-holding capacity.	1

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.

5.3 Source Control via Vessel SOPEP

Vessel source control will be conducted, where feasible and in accordance with MARPOL 73/78 Annex I, by the Vessel Master under the Shipboard Oil Pollution Emergency Plan (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 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 MDO and thus minimise the release.

5.3.1 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.

5.4 Oiled wildlife response

Woodside would implement a response in accordance with the *Oiled Wildlife Operational Plan*. 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 Department of Biodivseristy, Conservation and Attractions (DBCA).

Oiled wildlife response is undertaken in accordance with the Western Australian Oiled Wildlife Response Plan 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 Western Australian Oiled Wildlife Response Plan, specifically vessels used in hazing/pre-emptive capture will approach wildlife 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.

Shoreline access will be considered as part of the operational NEBA. Vehicular access would be restricted on dunes, turtle nesting beaches and in mangroves. Woodside retains specialist personnel to support and manage oiled wildlife operations, including trained and competent responders in Exmouth and Dampier. Additional personnel would be sourced through Woodside's arrangements to support an oiled wildlife response as required.

5.4.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- There is no shoreline impact predicted at shoreline response threshold (>100 g/m^2) for CS-01 or CS-02. The shortest timeframe that shoreline contact from floating oil at ~10 g/m^2 is predicted to be 66 days at Peak Island (CS-01) and 17 days at Ningaloo Coast North WHA (CS-02).
- The offshore location of the release site is expected to initially result in low numbers of at-risk or impacted wildlife.
- As the surface oil approaches shorelines, potential for oiled wildlife impacts are likely to increase.
- It is estimated that an oiled wildlife response would be between Level 1 and 3, as defined in the WA OWRP (Table 5-7).

Table 5-5: Key at-risk species potentially in Response Protection Areas and open ocean

Species	Peak Island	Ningaloo Coast North WHA	Open ocean
Marine turtles	✓	✓	✓
Whale sharks	✓	✓	✓
Seabirds and/or migratory shorebirds	✓	✓	✓
Cetaceans – migratory whales	✓	✓	✓
Cetaceans – dolphins and porpoises	✓	✓	✓
Dugongs	✓	✓	✓
Sharks and rays	✓	✓	✓

The oiled wildlife response technique targets key wildlife populations at risk within Commonwealth open waters and the nearshore waters as described in Section 4 of the EP. 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. It includes consideration of deterrence practices such as 'hazing' to prevent wildlife from entering areas potentially contaminated by spilled hydrocarbons, as well as dispersing, displacing or relocating wildlife 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. 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. Suitable staging sites in the Dampier and Exmouth have been identified in the draft Regional 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 wildlife are observed on water or transiting near or within the spill area, observations would be recorded through surveillance records. The shoreline assessments would be done in accordance with OM05, which would be used as a further tool to identify wildlife and habitats contacted by hydrocarbons.

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 Dampier and Exmouth 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 DBAC 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 level (adapted from the WA OWRP, 2014)

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

5.4.2 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 (WAOWRP) to ensure it is conducted in accordance with legislative requirements to house, release or euthanise wildlife under the Animal Welfare Act 2002.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.8)**
14	Wildlife response equipment	14.1	Contracted capability to treat 100 individual wildlife for immediate mobilisation to Response Protection Areas (RPAs).	1, 3A, 3B, 3C, 4
		14.2	Contracted capability to treat up to an additional 250 individual wildlife within a 5-day period.	
		14.3	National plan access to additional resources under the guidance of the WA DoT (up to a Level 5 oiled wildlife response as specified in the OWRP), with the ability to treat about 600 individual wildlife by the time hydrocarbons contact the shoreline.	1, 3C, 4
		14.4	Vessels used in hazing/pre-emptive capture will approach wildlife at slow speeds to ensure animals are not directed towards the hydrocarbons.	1, 3A, 3B, 4
		14.5	Facilities for the rehabilitation of oiled wildlife are operational 24/7 as per WAOWRP.	1, 3A, 4
15	Wildlife responders	15.1	2 OWR team members to lead the oiled wildlife operations who have completed an Oiled Wildlife Response Management course.	1, 2, 3B
		15.2	Wildlife responders to be accessed through resource pool and additional agreements with specialist providers.	1, 2, 3A, 3B, 3C, 4
		15.3	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
16	Management of environmental impact of the response risks	16.1	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.	1

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 subsea or 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 wildlife collection team to each impacted RPA as directed by operational monitoring.
- Mobilisation and deployment of up to two central wildlife treatment and rehabilitation locations at Exmouth and Dampier in accordance with WA OWRP, if required.
- The waste storage capacity is sufficient to meet the need (circa 1 m^3 waste generated per wildlife unit cleaned).

Woodside would establish a wildlife collection point at the RPA for identified oiled wildlife collection and sorting. From these locations, recovered wildlife would be transported to a central treatment location at Dampier or Exmouth.

5.5 Waste Management

Waste management is considered a support technique to shoreline clean-up and 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 (e.g. seaweed, sand, woods, and plastics) collected during wildlife response.

Expected waste volumes during an event are likely to vary depending on oil type, volume released, response techniques employed and how 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 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. $1m^3$ 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 (Section 5.8)**
17	Waste Management	17.1	Contract with waste management services for transport, removal, treatment and disposal of waste.	1, 3A, 3B, 3C, 4
		17.2	Recovered hydrocarbons and wastes will be transferred to licensed treatment facility for reprocessing or disposal.	
		17.3	Teams will segregate liquid and solid wastes at the earliest opportunity.	
		17.4	Waste management provider support staff available year-round to assist in the event of an incident with waste management as detailed in contract.	
		17.5	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
		17.6	Waste management to be conducted in accordance with Australian laws and regulations.	1, 3A, 3B, 3C, 4
		17.7	Waste management services available and employed during response.	
18	Management of environmental impact of the response risks	18.1	All oiled wildlife response sites zoned and marked before operations commence to prevent secondary contamination and minimise the mixing of clean and oiled waste	1, 3A, 3B

The resulting waste management capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to waste management at identified RPAs.

It indicates that the waste management capability has the following expected performance:

- Waste contractor has the capacity to treat up to 120,000 m^3 overall waste volumes. The waste management requirements are within Woodside's and its service providers existing capacity.
- 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 6.5.

5.6 Scientific monitoring

A scientific monitoring program (SMP) 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 Environment that Maybe Affected (EMBA) and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the credible spill scenario(s) or other identified unplanned hydrocarbon releases associated with the operational activities (refer to **Table 2-1**: PAP credible spill scenarios).

The outputs of the stochastic hydrocarbon spill modelling are used to assess the environmental risk, in terms of delineating which areas of the marine environment are predicted to be exposed to hydrocarbons exceeding environmental threshold concentrations (refer to **Table 2-2**, **Section 2.3.1.1**). The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as the EMBA. The Petroleum Activities Program worst-case credible spill scenario (CS-01) defines the EMBA and is the basis of the SMP approach presented in this section.

It should be noted that the resulting SMP receptor locations may 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 scientific monitoring program 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 EPBC Act 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), and for this activity is shown in **Figure 5-1**.

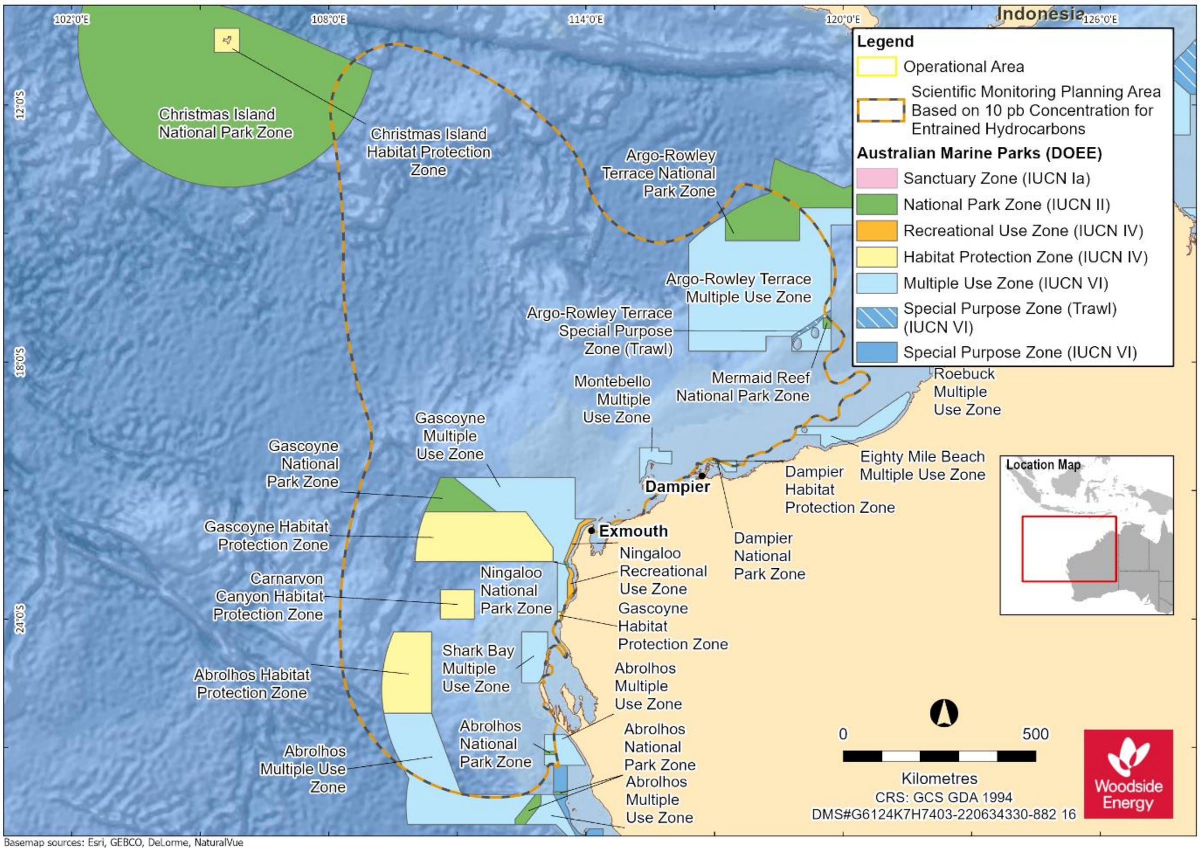


Figure 5-1: The planning area for scientific monitoring based on the area potentially contacted by the low (below ecological impact) entrained hydrocarbon threshold of 10 ppb in the event of the worst-case credible spill scenarios (CS-01 and CS-02).

Please note that **Figure 5-1** represents the overall combined extent of the oil spill model outputs based on a total of 100 replicate simulations over an annual period for CS-01 and therefore represents the largest spatial boundaries of 100 CS-01 hydrocarbon spill combinations, not the spatial extent of a single CS-01 hydrocarbon spill trajectory.

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	Pre-emptive Baseline Areas (PBAs) of the following two categories: • PBAs within the predicted <10-day hydrocarbon contact time prediction: As part of this assessment, a desktop review was conducted of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted within 10 days of a spill (based on the EMBA). Furthermore, the need to conduct baseline data collection to address data gaps and demonstrate spill response preparedness is assessed (refer to Annex D). In the scenario, that baseline data needs are identified, planning for baseline data acquisition is typically commenced pre-PAP and the execution of studies undertaken considers: receptor type, seasonality and temporal assessment requirements and location conditions. • PBAs predicted >10 days to hydrocarbon contact: 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 5.6.2**). In the event of a spill, the SMP activation (as per the TPA03 Well Intervention Oil Pollution First Strike Plan) directs the SMP team to follow the steps outlined in the SMP Operational Plan. The steps include: the review of availability and type of existing baseline data, with particular reference to any Pre-emptive Baseline Areas (PBAs) identified as >10 days to hydrocarbon contact as predicted by forecast modelling trajectories. 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 (refer to **Section 5.6.2**) and the process 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 are the identified limits for implementing SMPs: • Waves <1 m for nearshore systems • Waves <1.5 m for offshore systems • Winds <20 knots • Daylight operations only 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	
Pre-emptive Baseline Areas (PBAs)	Pre-emptive Baseline Areas (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: • PBAs for which baseline data exist or are planned for and data collection may commence pre-PAP (≤ 10 days minimum time to contact). • PBAs (> 10 days minimum time to contact) for which baseline data may be collected in the event of an unplanned hydrocarbon release. In the event of a spill, response phase PBAs

	are prioritized based on vulnerability (i.e. time to contact and environmental sensitivity) to potential impacts from hydrocarbon contact and an identified need to acquire baseline data. 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 activity. The PBAs for TPA03 Well Intervention are identified and listed in ANNEX D, Table D-1. The listed PBAs, together with the situational awareness (provided by the operational monitoring) are the basis for the response phase SMP planning and implementation.
Pre-Spill	Activity: TPA03 Well Intervention A review of existing baseline data for receptor locations (refer to Annex D, Table D-1) with potential to be contacted by surface, dissolved or entrained hydrocarbons at environmental thresholds ≤10 days, relating to the worse case credible scenarios (CS-01) hydrocarbon release for the activity has identified the following: • Rankin Bank • Ningaloo Coast [12] • Muiron Islands [13] • Glomar Shoal • Montebello State Marine Park • Barrow Island/ Lowendal /Montebello Island groups • Southern Pilbara Island group Refer to ANNEX D, Table D-2 – baseline data available. Australian Marine Parks (AMPs) potentially affected includes: • Montebello AMP • Ningaloo AMP. All the Australian Marine Parks (AMPs) are located in offshore waters where hydrocarbon exposure is possible from floating hydrocarbons (on surface waters) and in the upper water column (0-20 m depth range, approximately).
In the Event of a Spill	Receptor 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 ICC) 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). The full list of receptor locations is presented in Annex D, based on the PAP worse-case credible spill scenario (CS-01) (Table 2-1). To address the initial focus in a response phase SMP planning situation, receptor locations predicted to be contacted between >10 days have been identified as follows: • Shark Bay • Rowley Shoals (including Mermaid Reef State Marine Park). Australian Marine Parks (AMPs) potentially affected includes: • Gascoyne AMP • Carnarvon AMP • Shark Bay AMP and WHA. The unfolding spill affected area predictions and confirmation of appropriate baseline data will determine the selection of receptor locations and SMPs to be activated in order to gather pre-emptive (pre-hydrocarbon contact) data. Refer to ANNEX C for further details on the process for scientific monitoring plan implementation and delivery. The timing of SMP activation and mobilisation of the individual SMPs to undertake data collection will be decided and documented by the Woodside SMP team following the process outlined in the SMP Operational Plan.

[12] Ningaloo Coast includes the WHA, State Marine Park
[13] Muiron Islands includes the WHA and State Marine Management Area

	In the event key receptors within geographic locations potentially impacted after 10 days (following a spill event or commencement of the spill), a response phase SMP effort to collect baseline data would be addressed. SMP planning would assess where adequate and appropriate baseline data are not available and a response phase effort to collect baseline data for the following purposes: • 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). With reference to the TP03 Well Intervention PAP, priority would be focused on the Ningaloo Coast, south of the predicted minimum time to contact locations. • 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. • Collection of 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. The worse case credible spill scenario CS-01 is presented in TP03 Well Intervention EP (Section 6). • The key receptors at risk by location and corresponding SMPs based on the EMBA for the PAP are presented in ANNEX D, Table D-1, as per the worst case credible spill event, CS-01. 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 types and locations. • The status of baseline studies relevant to the PAP are tracked by Woodside through the maintenance of a SMP 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)[1] (refer to ANNEX C).

5.6.3 Summary – scientific monitoring

The resulting scientific monitoring capability has been assessed against the PAP worst case credible spill scenario, CS-01. The SMP assessment provides for a range of strategies and an ongoing approach to monitoring the response and 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 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:

- Ningaloo Coast
- Muiron Islands
- Shark Bay
- Barrow Island/ Lowendal/ Montebello Island groups
- Southern Pilbara Island group

[1] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

- Rowley Shoals
- Montebello AMP
- Ningaloo AMP
- Gascoyne AMP

Documented baseline studies are available for certain sensitive receptor locations including the Rankin Bank and Glomar Shoal, Ningaloo Coast and Muiron Islands (ANNEX D, Table D-2). 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, i.e., the sections of the Ningaloo Coast not immediately contacted to 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**
19	Woodside has an established and dedicated SMP team comprising the Environmental Science Team and additional Environment Advisers within the HSE Function.	19.1	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 • Training attendance registers • 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.
20	• Woodside has a contracted SMP service provider to supply scientific personnel and equipment to implement the SMPs. The service will resource a base capability of one team per SMP (SM01-SM10), see Table C-2, ANNEX C and as detailed in Woodside's SMP standby contractor Implementation Plan. The availability of relevant personnel is reported to Woodside on a monthly basis via a simple report on the base-loading availability of suitable people for each of the SMPs comprising field work for data collection (SMP resourcing report register). • In the event of a spill and the SMP is activated, the base-loading availability of scientific personnel will be provided by the	20.1	Woodside maintains the capability to mobilise personnel required to conduct scientific monitoring programs SM01 – SM10 (except desktop based SM08): • Personnel are sourced through the existing standby contract with SMP standby contractor, as detailed within the SMP Implementation Plan. • Scientific Monitoring Program	• Hydrocarbon Spill Preparedness (HSP) Internal Control Environment tracks the quarterly review of the Oil Spill Contracts. • SMP resource report of personnel availability provided by SMP contractor on monthly basis

	SMP standby contractor for the individual SMPs and where gaps in resources are identified, the SMP standby contractor and Woodside will seek additional personnel (if needed) from other sources including Woodside's Environmental Services Panel.		Implementation Plan describes the process for standing up and implementing the scientific monitoring programs. • SMP team stand up personnel receive training regarding the stand up, activation and implementation of the SMP on an annual basis	(SMP resourcing report register). • Training materials • Training attendance registers • Competency criteria for SMP roles • SMP annual arrangement testing and reporting.
21	• 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 CICC) 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 response. • SMP Team structure, interface with SMP standby contractor (standby SMP contractor) and linkage to the CICC is presented in Figure C-1, ANNEX C • Woodside has a defined Command, Control and Coordination structure for Incident and Emergency Management that is based on the AIIMS framework utilised in Australia. • Woodside utilises an online Incident Management Information System (IMIS) 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. • SMP activated via the First Strike Plan (FSP) • Step by step process to activation of individual SMPs provided in the SMP Operational Plan • All decisions made regarding SMP logged in the online IMIS (SMP team members trained in using Woodside's online Incident Management System) • SMP component input to the ICC Incident Action Plan (IAP) as per the identified ICC timed sessions and the SMP IAP logged on the online IMIS • Woodside Environmental Science Team provide 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. • Woodside Environmental Science Team provide awareness training on the activation and stand-up of the Scientific	21.1	• Woodside has established an SMP organisational structure and processes to stand up and deliver the SMP.	• SMP Oil Spill Scientific Monitoring Operational Plan • SMP Implementation Plan • SMP annual arrangement testing and reporting.

	Monitoring Programme (SMP) for the SMP standby contractor. • Woodside Environmental Science Team co-ordinates an annual SMP arrangement testing exercise which the SMP standby contractor.			
22	• Chartered and mutual aid vessels. • 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. • 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). • 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. • 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 and if additional surge capacity is required this would be available through the other Woodside Environmental Services Panel Contractors and specialist contractors. SMP standby contractor can also address equipment redundancy through either individual or multiple suppliers. MoUs are in place with one marine sampling equipment company and one analytical laboratory (SMP resourcing report register). • 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 'to acquire, where practicable, the environmental baseline data prior to hydrocarbon contact required to support the post-response SMP'.	22.1	Woodside maintains standby SMP capability to mobilise equipment required to conduct scientific monitoring programs SM01 – SM10 (except desktop based SM08): • Equipment is sourced through the existing standby contract with SMP standby contractor as detailed within the SMP Implementation Plan.	• HSP Internal Control Environment tracks the quarterly review of the Oil Spill Contracts • SMP standby monthly resource reports of equipment availability provided by SMP contractor (SMP resourcing report register). • SMP annual arrangement testing and reporting

23	Woodside's SMP approach addresses the pre-PAP acquisition of baseline data for Pre-emptive Baseline Areas (PBAs) with ≤10 days if required following a baseline gap analysis process. Woodside maintains knowledge of Environmental Baseline data through: • Documentation annual reviews of the Woodside SMP Baseline Environmental Studies Database, and specific activity baseline gap analyses. • Accessing external databases such as the Department of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA) (refer to ANNEX C: Oil Spill Scientific Monitoring Program).	23.1	• Annual reviews of environmental baseline data • PAP specific Pre-emptive Baseline Area baseline gap analysis	• Annual review/update of Woodside Baseline Environmental Studies Database • Desktop review to assess the environmental baseline study gaps completed prior to EP submission • Accessing baseline knowledge via the SMP annual arrangement testing

Environmental Performance Outcome		SMP plan to acquire response phase monitoring targeting pre-emptive data achieved.		
Control measure		**Performance Standard**		**Measurement Criteria**
24	Woodside's SMP approach addresses: • Scientific data acquisition for PBAs >10 days to hydrocarbon contact and activated in the response phase and • Transition into post-response SMP monitoring.	24.1	**Pre-emptive Baseline Area (PBA) baseline data acquisition in the response phase** If baseline data gaps are identified for PBAs predicted to have hydrocarbon contact in >10 days, there will be a response phase effort to collect baseline data. Priority in implementing SMPs will be given to receptors where pre-emptive baseline data can be acquired or improved. SMP team (within the Environment Unit of the CICC) contribute SMP component of the CICC Planning Function in development of the IAP.	• Response SMP plan • Woodside's online Incident Management System records • SMP component of the Incident Action Plan.
		24.2	**Post Spill contact** 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 • SMP Decision Log • Incident Action Plans (IAPs)
Environmental Performance Outcome		Implementation of the SMP (response and post-response phases).		

<table>
<tr><th colspan="2">Control measure</th><th colspan="2">Performance Standard</th><th>Measurement Criteria</th></tr>
<tr><td rowspan="3">25</td><td rowspan="3">Scientific monitoring will address quantitative assessment of environmental impacts of a level 2 or 3 spill or any release event with the potential to contact sensitive environmental receptors. The SMP comprises ten targeted environmental monitoring programs.
SMP supporting documentation: (1) Oil Spill Scientific Monitoring Operational Plan; (2) SMP Implementation Plan and (3) SMP Process and Methodologies Guideline.
The Oil Spill Scientific Monitoring Operational Plan details the process of SMP selection, input to the 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.
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.</td><td>25.1</td><td>Implementation of SM01
SM01 will be implemented to assess the presence, quantity and character of hydrocarbons in marine waters during the spill event in nearshore areas</td><td>Evidence SM01 has been triggered:
Documentation as per requirements of the SMP Operational Plan
Woodside’s online Incident Management System Records.
SMP component of the IAP
SMP data records from field</td></tr>
<tr><td>25.2</td><td>Implementation of SM02-SM10
SM02-SM10 will be implemented in accordance with the objectives and activation triggers as per Table C-2 of Annex C.</td><td>Evidence SMPs have been triggered:
Documentation as per requirements of the SMP Operational Plan
Woodside’s online Incident Management System Records.
SMP component of the IAP
SMP Data records from field</td></tr>
<tr><td>25.3</td><td>Termination of SMP plans
The Scientific Monitoring Program will be terminated in accordance with termination triggers for the SMPs 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):</td><td>Evidence of Termination Criteria triggered:
Documentation and approval by relevant stakeholders to end SMPs for specific receptor types.</td></tr>
</table>

5.7 Incident Management System

The Incident Management System 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 ICC 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 IC may request the ICC to complete notifications internally within Woodside, to stakeholders and government agencies as required. Depending on the type and scale of the incident either the ICC 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 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 OPEA. In effect the operational NEBA will determine whether there is net environmental benefit to continue response operations.

5.7.3 Stakeholder engagement process

Woodside will ensure stakeholders are engaged during the spill response in accordance with internal standards. This process requires that Woodside will:

- Undertake all required notifications (including government notifications) for stakeholders in the region (identified in the FSP). This includes notification to mariners to communicate navigational hazards introduced through response equipment and personnel.
- Identify and engage with relevant stakeholders and continually assess and review.

5.7.4 Environmental performance based on need

Table 5-14: Environmental Performance – Incident Management System

<table>
<tr><th colspan="2">Environmental Performance Outcome</th><td colspan="3">To support the effectiveness of all other control measures and monitor/record the performance levels achieved.</td></tr>
<tr><th colspan="2">Control measure</th><th colspan="2">Performance Standard</th><th>Measurement Criteria (Section 5.8)</th></tr>
<tr><td rowspan="3">26</td><td rowspan="3">Operational SIMA</td><td>26.1</td><td>Confirm that the response strategies adopted at the time of acceptance remain appropriate to reduce the consequences of the spill within 24 hours.</td><td rowspan="6">1, 3A</td></tr>
<tr><td>26.2</td><td>Record the evidence and justification for any deviation from the planned response activities.</td></tr>
<tr><td>26.3</td><td>Record the information and data from operational and scientific monitoring activities used to inform the SIMA.</td></tr>
<tr><td rowspan="3">27</td><td rowspan="3">Stakeholder engagement</td><td>27.1</td><td>Prompt and record all notifications (including government notifications) for stakeholders in the region are made.</td></tr>
<tr><td>27.2</td><td>In the event of a response, identification of relevant stakeholders will be re-assessed throughout the response period.</td></tr>
<tr><td>27.3</td><td>Undertake communications in accordance with:
• Woodside Crisis Management Functional Support Team Guideline – Reputation
• External Communication and Continuous Disclosure Procedure
• External Stakeholder Engagement Procedure</td></tr>
<tr><td rowspan="8">28</td><td rowspan="8">Personnel required to support any response</td><td>28.1</td><td>Action planning is an ongoing process that involves continual review to ensure strategies to control the incident are appropriate to the situation at the time.</td><td>1, 3B</td></tr>
<tr><td>28.2</td><td>A duty roster of trained and competent people will be maintained to ensure that minimum manning requirements are met all year round.</td><td>3C</td></tr>
<tr><td>28.3</td><td>Immediately activate the IMT with personnel filling one or more of the following roles:
• Operations Duty Manager
• D&C Duty Manager
• Operations Coordinator
• Deputy Operations Coordinator
• Planning Coordinator
• Logistics (materials, aviation, marine and support positions)
• Management Support
• Health and Safety Advisor
• Environment Duty Manage
• People Coordinator
• Public Information Coordinator
• Intelligence Coordinator
• Finance Coordinator.</td><td rowspan="4">1, 2, 3B, 3C, 4</td></tr>
<tr><td>28.4</td><td>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.</td></tr>
<tr><td>28.5</td><td>S&EM advisors will be integrated into ICC to monitor performance of all functional roles.</td></tr>
<tr><td>28.6</td><td>Continually communicate the status of the spill and support Woodside to determine the most appropriate response by delivering on the responsibilities of their role.</td></tr>
<tr><td>28.7</td><td>Follow the OPEA, Operational Plans, FSPs, support plans and the IAPs developed.</td><td>1, 2, 3A, 4</td></tr>
<tr><td>28.8</td><td>Contribute to Woodside’s response in accordance with the aims and objectives set by the Duty Manager.</td><td>1, 2, 3B, 3C, 4</td></tr>
</table>

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.

The 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 Security & Emergency Management Competency Dashboard*

The Security & 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 depending 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
- AMOSC core group
- AMOSC
- OSRL
- Marine Spill Response Corporation (MSRC)
- AMSA
- Woodside contracted workforce

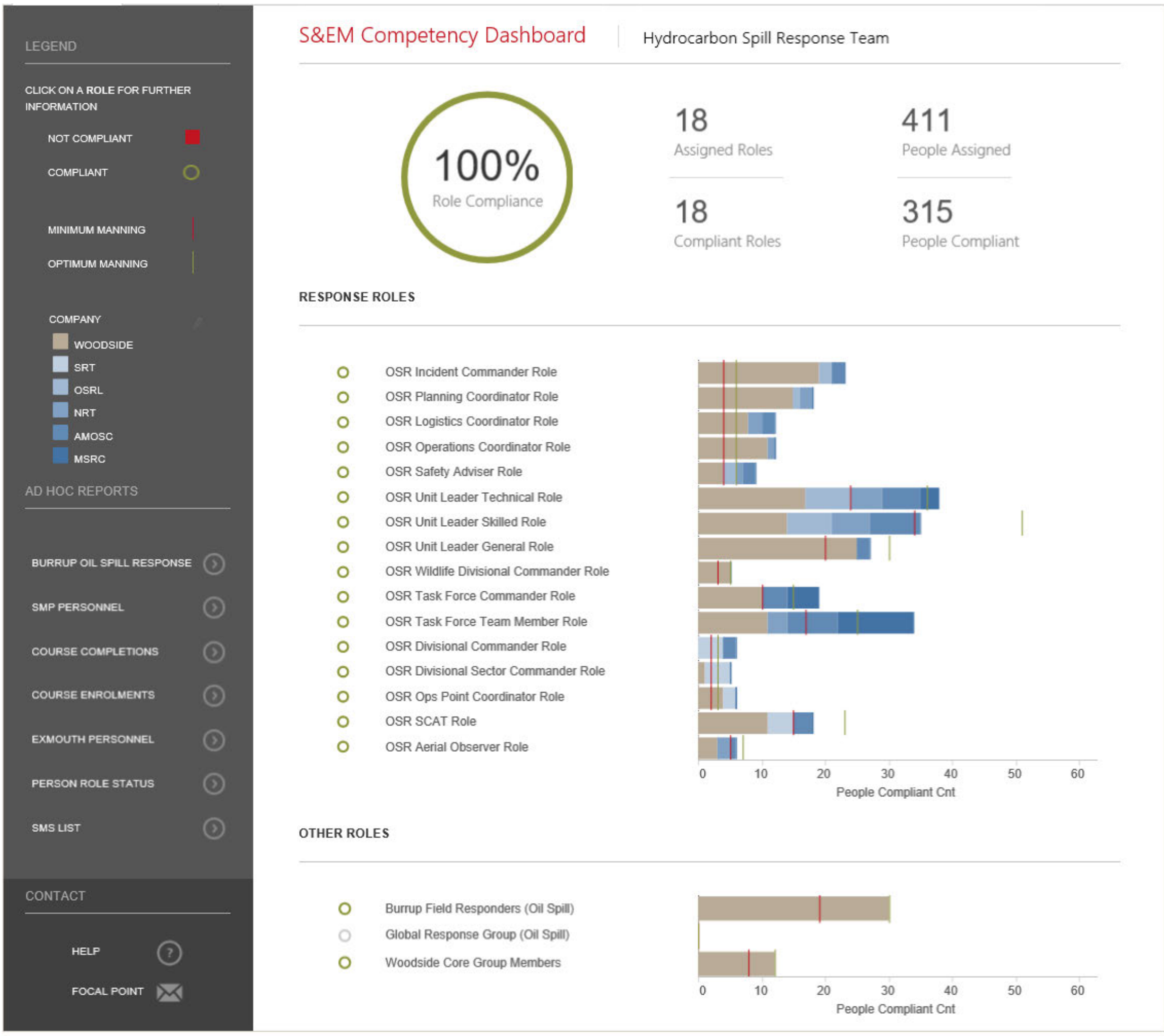


Figure 5-2: Example screen shot of the Hydrocarbon Spill Preparedness competency dashboard

The Dashboard is one of Woodside's key means of monitoring its readiness to respond. It also 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 Operations Point Coordinator role and the training modules required to show competence.

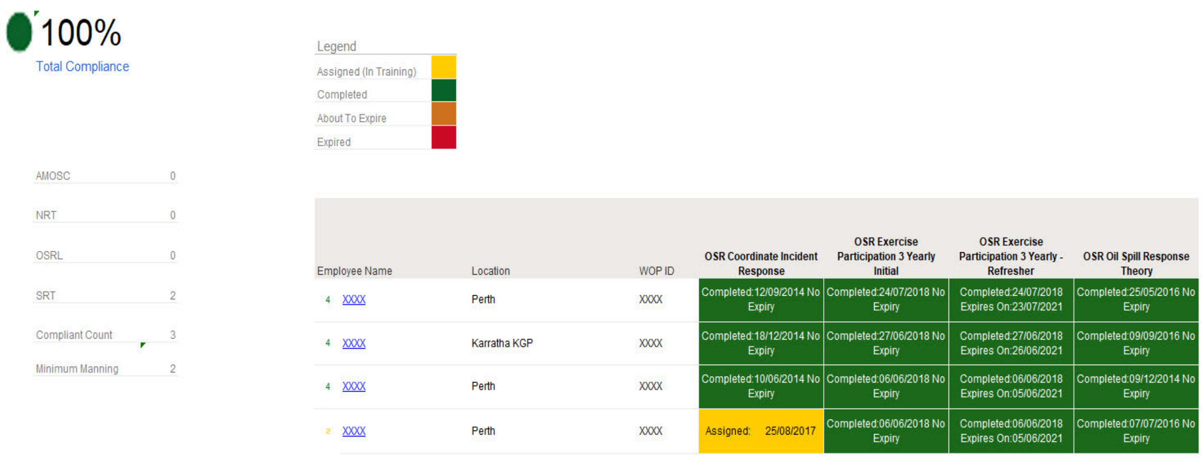


Figure 5-3: Example screen shot for the Operations Point Coordinator role

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: OPEA, FSPs, operational plans, support plans and TRPs) 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 ICC, 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[14] vessel schedule, dispersant availability, rig/vessels monitoring, equipment stockpiles, tracking buoy locations and the CICC 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 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
- 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:

[14] 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

- 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 ALARP EVALUATION

This Section should be read in conjunction with Section 5 which is the capability planned for this activity.

6.1 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.

6.1.1 Monitor and Evaluate – Control Measure Options Analysis

6.1.1.1 Alternative Control Measures

Alternative Control Measures considered
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

6.1.1.2 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

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

6.1.1.3 Improved 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
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 ICC roster to be called as soon as required. However initial information needs to be gathered by ICC 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	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 *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*					
		gained, as images from sensors (IR, UV, etc). will be low quality. Flight time limitations will be adhered to.			
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. Shortening the timeframes for vessel availability would require dedicated response vessels on standby in KBSB. 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. 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

6.1.2 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 – 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 primary source control and well intervention techniques which would be conducted concurrently:

- Capping stack if feasible[15]
- Relief well drilling.

6.2.1 ROV Intervention

Following confirmation of an emergency event involving a subsurface release, Woodside would mobilise inspection class ROVs via existing frame agreements to undertake inspection activities. ROV would be 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 GWA and 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

	Estimate ROV inspection duration (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.*

6.2.1.1 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.

[15] Deployment of a capping stack will only be a feasible response option once the vertical Xmas Tree has been removed during intervention activities and a MODU BOP installed. A capping stack can then be directly installed onto the MODU BOP or wellhead, once plume conditions allow.

6.2.2 Debris clearance and/or removal

The Woodside Source Control Response Procedure 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.

6.2.2.1 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.

6.2.3 Capping stack

The Woodside Source Control Emergency Response Procedure 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. Deployment of a capping stack on TPA03 well will only be a feasible response option once the vertical Xmas Tree has been removed during intervention activities and a MODU BOP installed. A capping stack can then be directly installed onto the MODU BOP or wellhead, once plume conditions allow.

In the event of a loss of well containment at less than the WCCS (plume radius is ~25 m), the use of a subsea deployment method such as a heavy lift vessel, which is more commonly used in industry, is a more reliable and, in turn, ALARP approach. If environmental conditions permit (wind speed, wave height, current and plume radius is ~25 m), and only if the vertical Xmas Tree is no longer in place, deployment of a capping stack with a heavy lift vessel with a 150 T crane capacity could be feasible.

Woodside assumes that sourcing conventional capping stack deployment vessels would be per the Source Control Emergency Response Plan. 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 plume size is acceptable (~25 m radius) and safety and metocean conditions are suitable.

6.2.3.1 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 16-day 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 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 6-4. 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 6.2.5.

6.2.4 Relief Well drilling

The options analysis detailed in this section considers options to source, contract and mobilise a MODU 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 is illustrated in Figure 6-1:

- Primary – review internal Woodside drilling programs and MODU availability to source an appropriate rig 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.

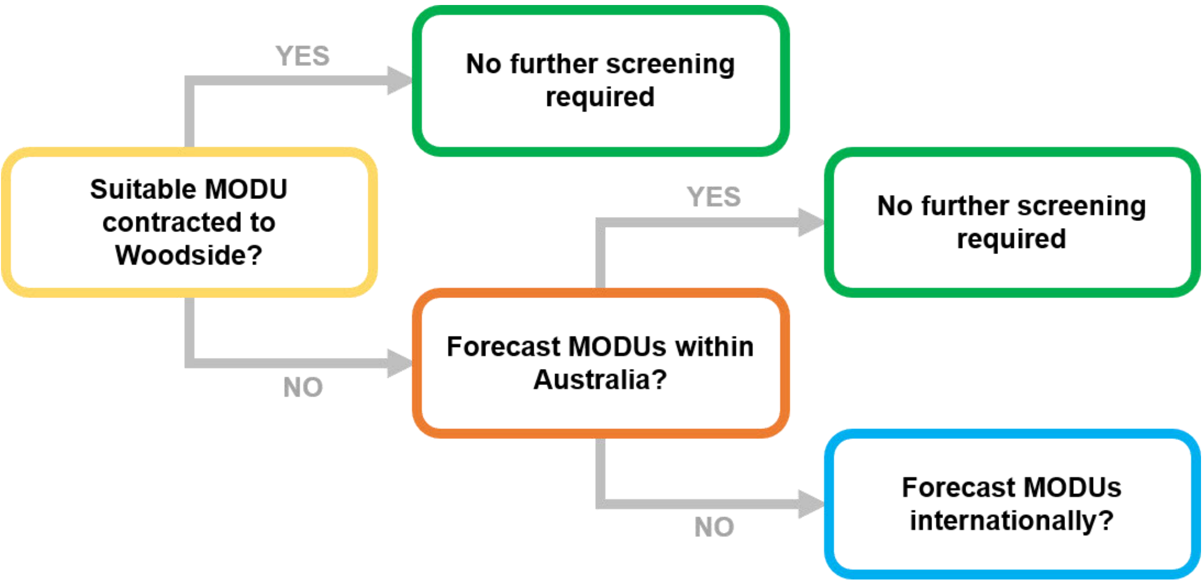


Figure 6-1: TPA03 process for sourcing relief well MODU

The internal and external availability of 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 Australia safety case is not identified, an internal review will be undertaken, NOPSEMA notified and the issue tables 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 environmental management of change requirements and relevant regulatory triggers. The lookahead timeframe would allow two years' warning of any potential gap. Woodside will execute relief well drilling in the fastest possible timeframe.

Based on the detail provided, the Primary and Alternate approaches are expected to be achieved within the relief well duration period.

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.

6.2.4.1 Relief Well drilling timings

The duration of a blowout (from initiation to a successful kill) is assessed as 71 days for TPA03. Relief wells for other wells within the field are expected to be similar duration.

Details on the steps and time required to drill a relief well is shown in Table 6-2 below. A moored MODU would be required for drilling a relief well for TPA03 and thus moored MODU timeframes have been used as the basis for the analysis within this document.

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 contains the breakdown for relief well drilling for GDA05 as indicative of the relief well timeframe for TPA03.

Table 6-2: Relief well drilling timings

	Estimate Relief Well duration for TPA03 Well (days) – moored MODU
Source and contract MODU comprising the following stages:	**21 days total:**
Activate MOU. Secure and suspend well. Complete relief well design. Secure relief well materials.	*8 days*
Transit to location based on mobilisation from Northwest shelf region.	*2 days*
Backload and loadout bulks and equipment, complete internal assurance of relief well design.	*2 days*
Contingency for unforeseen event (e.g. longer transit from another area, problems in securing well, cyclone event)	*9 days*
Pre-spud survey	**Already included**
Mooring Spread Installation *NB Occurs in parallel with the 21 days to mobilise the rig, so the timing included here is the difference*	**16 days**
Drilling, casing and look ahead estimate	**20.0 days**
Intersection & well kill comprising the following stages:	**14.0 days total:**
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.	*9.5 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*
	71.0 days

The following conditions and assumptions are applicable:

- A moored MODU is used for a TPA03 relief well.
- A pre-lay mooring spread is required to moor the rig over subsea infrastructure. Estimated duration to procure and install the pre-lay moorings is five (5) weeks, which would occur in parallel to MODU mobilisation. The breakdown of this timeframe is as follows:

Table 6-3: Mooring Spread installation timings

Activity	Duration (days)
Design mooring spread and commence sourcing equipment	7
Source equipment and mobilise to supply base (carried out concurrently while sourcing rig)	21
Install pre-lay spread	7
Connect to pre-laid moorings and prepare to spud	2
Total	**37**

Woodside has considered a broad range of alternate, additional, and improved options as outlined in Section 6.2.5.

Intersect and kill duration is estimated at 14 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.

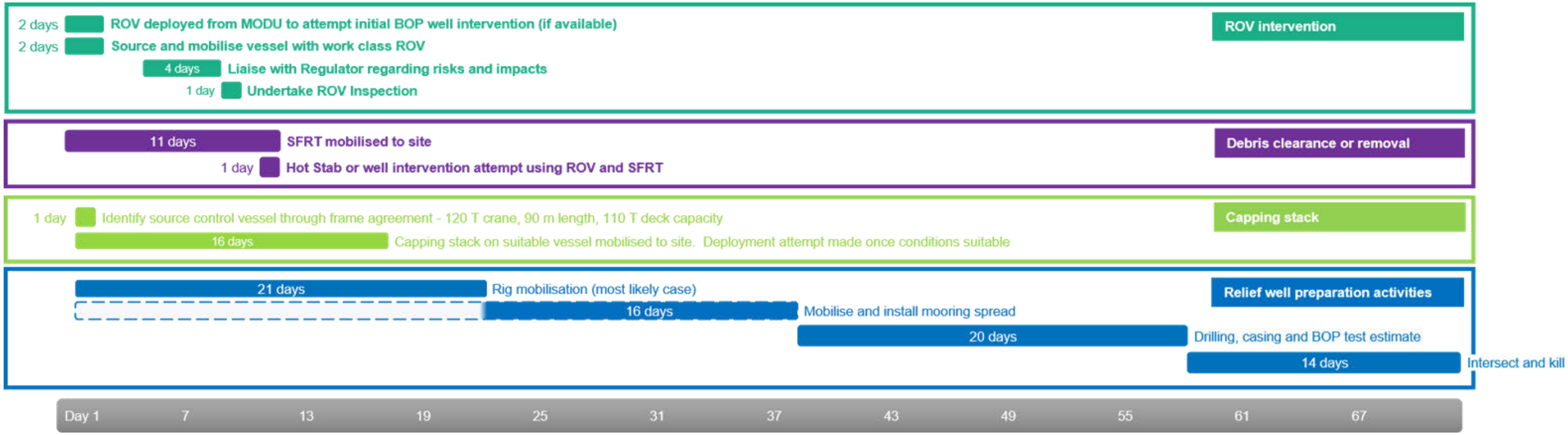


Figure 6-2: Source control and well intervention response strategy deployment timeframes

6.2.4.2 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 6-4.

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 GWF3 and Lambert Deep Drilling and Subsea Installation, 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.

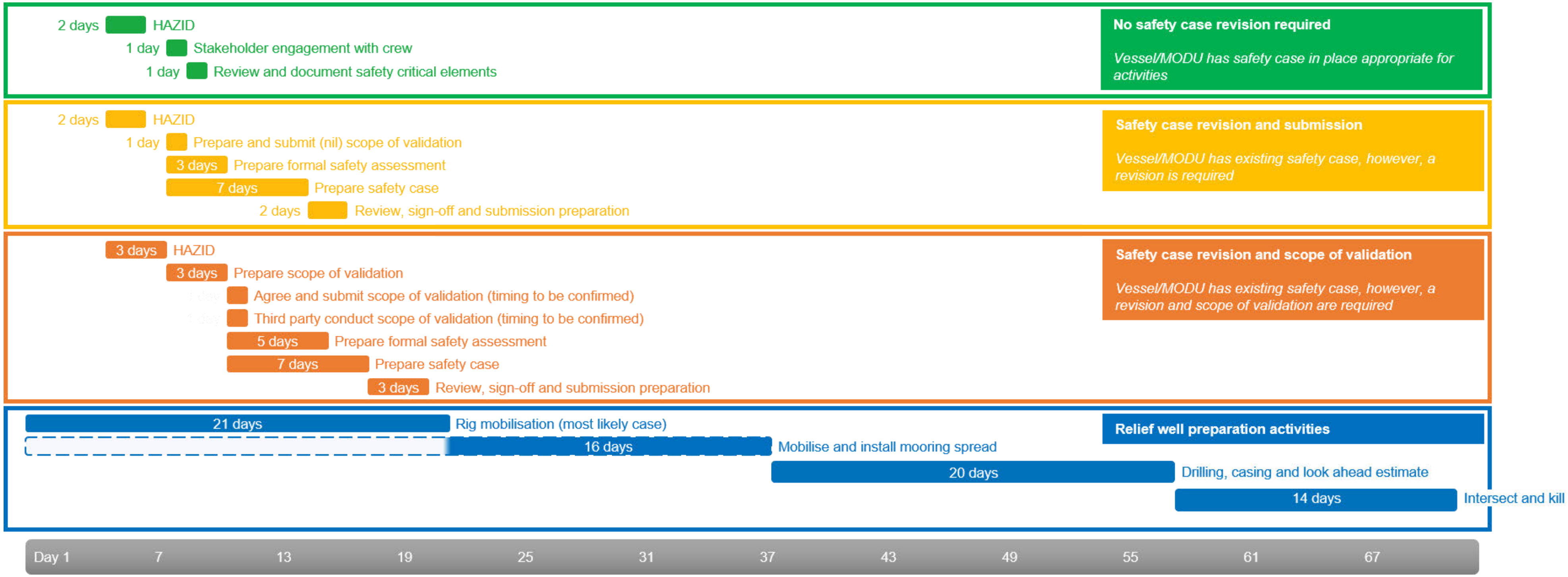


Figure 6-3: Timeline showing safety case revision timings alongside other relief well preparation activity timings

Table 6-4: 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 SSDI 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.

6.2.5 Source Control – Control Measure Options Analysis

The assessments described in Sections 6.2.1, 6.2.2, 6.2.3 and 6.2.4 outline the primary and alternate approaches that Woodside would implement for source control. In Sections 6.2.6 and 6.2.7, 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.

6.2.5.1 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

6.2.5.2 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).

6.2.6 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 5.2 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.

6.2.6.1 Alternative control measures

Alternative Control Measures Considered *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

6.2.6.2 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*					
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 a rig from outside Australia with an existing Safety Case. This would require development and approval of a safety case revision for the rig 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

6.2.6.3 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	**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 a relief well drilling rig within Woodside. 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. 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 a relief well drilling rig 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

6.2.7 Deployment – Control Measure Options Analysis

6.2.7.1 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 feasibility issues surrounding an offset capping deployment in the water depths at the TPA03 well (114 m), together with mobilisation lead times for both a cap and required vessels/ support equipment, would minimise any environmental benefit gained.	Technical feasibility: • The base case considerations for OIE requires a coordinated response by 4 to 7 vessels working simultaneously outside of the 500m exclusion zone. In the event of a worst-case shallow water gas discharge, the 10% LEL modelled radius extends beyond the area of activity required for the OIE deployment thereby introducing health and safety risk to any vessels required for the initial deployment of the carrier and subsequent operations with ROV during capping operations. Though manageable for single vessels, it is prohibitive for operations requiring SIMOPs with numerous vessels working at 180 degrees from one another. • Water depth is also a key consideration as buoyancy modules have not been proven for use in these depths or with the expected worst-case gas blowout rates. Other factors: • 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. • 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. • The March 2019 OSRL exercise in Europe tested deployment of the OIE and highlighted that it will require a 600+MT 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.	Woodside has confidence in availability of suitable relief well MODUs across the required drilling time frame thus the OIE would provide no advantage. Implementation of OIE has been assessed as a complex and unfeasible SIMOPs operation, precluded by a combination of the site-specific metocean and worst-case discharge conditions at the TPA03 location. 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. As such the primary source control response and ALARP position remains 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 in the water depths at TPA03 well (114 m), together with mobilisation lead times for both a cap and required vessels and support equipment, would minimise any environmental benefit.	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.	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 71 days (TPA03) 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 71 days (TPA03) 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 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 drilling (plus standby time) for the well as the worst-case scenario.	This option would not provide an environmental benefit due to the additional environmental impacts coupled with a lack of improved relief well timings.	No
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

6.2.7.2 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

6.2.8 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

6.3 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 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.

6.3.1 Source Control via Vessel SOPEP – Control Measure Options Analysis

6.3.1.1 Alternative control measures

Alternative Control Measures considered *Alternative, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control*				
Option considered	**Environmental consideration**	**Feasibility**	**Approx. Cost**	**Implemented**
No reasonably practical alternative control measures identified.				N/A

6.3.1.2 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*				
Option considered	**Environmental consideration**	**Feasibility**	**Approx. Cost**	**Implemented**
No reasonably practical alternative control measures identified.				N/A

6.3.1.3 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**	**Approx. Cost**	**Implemented**
No reasonably practical alternative control measures identified.				N/A

6.3.1.4 Selected control measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the activity.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.4 Oiled 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 per day, 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.

6.4.2 Oiled Wildlife Response – Control Measure Options Analysis

6.4.2.1 Alternative Control Measures

Alternative Control Measures Considered *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**
Direct contracts with service providers	This option duplicates the capability accessed through AMOSC and OSRL and would compete for the same resources. Does not provide a significant increase in environmental benefit.	These delivery options provide increased effectiveness through more direct communication and control of specialists. However, no significant net benefit is anticipated.	Duplication of capability – already subscribed to through contracts with AMOSC and OSRL	This option is not adopted as the existing capability meets the need.	No

6.4.2.2 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*					
Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**Implemented**
Additional wildlife treatment systems	The selected delivery options provide access to call-off contracts with selected specialist providers. The agreements ensure that these resources can be mobilised to meet the required response objectives, commensurate with the progressive nature of environmental impact and the time available to monitor hydrocarbon plume trajectories. Provides response equipment and personnel by Day 3. The additional cost in having a dedicated oiled wildlife response (equipment and personnel) in place is disproportionate to environmental benefit. These selected delivery options provide capacity to carry out an oiled wildlife response if contact is predicted; and to scale up the response if required to treat widespread contamination. Current capability meets the needs required and there is no additional environmental benefit in adopting the improvements.	Given the low likelihood of such an event occurring and the low environmental benefit of an offshore response, the cost of implementing measures to reduce the mobilisation time is considered disproportionate to the benefit. 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. Oiled wildlife response capacity would be addressed for open Commonwealth waters through the AMOSC arrangements, as informed by operational monitoring. The cost and organisational complexity of this approach is moderate, and the overall delivery effectiveness is high.	Additional wildlife response resources could total A$1700 per operational site per day.	This option is not adopted as the existing capability meets the need.	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. The potential environmental benefit of training additional personnel is expected to be low.	The capability provides the capacity to treat approximately 600 wildlife units (primarily avian wildlife) by Day 6, with additional capacity available from OSRL. Additional equipment and facilities would be required to support ongoing response, depending on the scale of the event and the impact to wildlife. Materials for holding facilities, portable pools, enclosures and rehabilitation areas would be sourced as required.	Additional wildlife response personnel cost A$2000 per person per day	This option is not adopted as the existing capability meets the need.	No

6.4.2.3 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**
Faster mobilisation time for wildlife response	Response time is limited by specialist personnel mobilisation time. Current timing is sufficient for expected first shoreline contact. This control measure provides increased effectiveness through faster mobilisation of specialists. However, no significant net environmental benefit is expected due to shoreline stranding times.	Pre-positioning vessels or equipment would reduce mobilisation time for oiled wildlife response activities. However, given the effectiveness of an oiled wildlife response is expected to be low, an earlier response would provide a marginal increase in environmental benefit. The selected delivery options provide the capacity to mobilise an oiled wildlife response capable of treating up to 600 wildlife from at least Day 6 and exceeds the estimated Level 1-2 oiled wildlife 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 availability of vessels and personnel meets the response need.	Wildlife response packages to preposition at vulnerable sites identified through the deterministic modelling cost A$700 per package per day. The cost of having dedicated equipment and personnel available to respond faster is considered disproportionate to the environmental benefit.	This option is not adopted as the existing capability meets the need.	No

6.4.3 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

6.5 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 exiting level of capability is based on internal and third-party resources that are available 24 hours per day, 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/restocking 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 *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**
No reasonably practical alternative control measures identified.					

6.5.2.2 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*					
Option considered	**Environmental consideration**	**Feasibility**	**Approximate cost**	**Assessment conclusions**	**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 waste contractor'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.	Cost for increased waste disposal capability would be approx. A$1300 per m^3. Cost for increased onshore temporary waste storage capability would be approx. A$40 per unit per day.	This option is not adopted as the existing capability meets the need.	No

6.5.2.3 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**
Faster response time	The access to waste contractor 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. Bulk transport to waste contractor's licensed waste management facilities would be undertaken via controlled-waste-licensed vehicles and in accordance with Environmental Protection (Controlled Waste) Regulations 2004. 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. 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 time of the event is considered low and existing arrangements provide adequate storage to support the response.	Woodside already maintains an equipment stockpile in Exmouth to enable shorter response times to incidents. This stockpile includes temporary waste storage equipment. 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 predicted shoreline contact times.	This option is not adopted as the existing capability meets the need.	No

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 5.6** 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, refuelling/ re-stocking provisions, and other similar logistic and operational limitation 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 over to the East coast. 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 Karratha or Exmouth 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

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 LOWC or loss of marine diesel due to vessel collision from the PAP activities.	As part of Woodside's Scientific Monitoring Program the following are considered and incorporated in the SMP Standby Service contract. i. Woodside rely 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 a loss of marine diesel due to vessel collision from the PAP activities based on receptors predicted to have hydrocarbon contact >10 days. ii. Ensure there is appropriate baseline for key receptors for all geographic locations that are potentially impacted <10 days of spill event. iii. Address resourcing needs to collect pre-emptive baseline as the spill expands in the event of a LOWC or loss of marine diesel due to vessel collision from the PAP activities.

6.6.2.3 Improved Control Measures

Improved Control Measures considered – No reasonably practicable improved Control Measures identified.

6.6.3 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
  - 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 6-5.

Table 6-5: Scientific monitoring program operational plan actions

Responsibility	Action
Activation	
CICC Planning (CICC Planning – Environment Unit)	Mobilises SMP Lead/Manager and SMP Coordinator to the CICC Planning function.
CICC Planning (CICC Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	Constantly assesses all outputs from OM01, OM02 and OM03 (**Annex B**) 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. Review baseline data for receptors at risk.
CICC Planning (CICC Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	SMP co-ordinator stands up SMP Standby contractor. Stands up subject matter experts, if required.
CICC Planning (CICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Establish if, and where, pre-contact baseline data acquisition is required. Determines practicable baseline acquisition program based on predicted timescales to contact and anticipated SMP mobilisation times. Determines scope for preliminary post-contact surveys during the Response Phase. Determines which SMP activities are required at each location based on the identified receptor sensitivities.
CICC Planning (CICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	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 IMT.
CICC Planning (CICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	SMP standby contractor, to prepare the Field Implementation Plan. Prepare and obtain sign-off of the Response Phase SMP work plan and Field Implementation Plan. Update the IAP.

Responsibility	Action
CICC Planning (CICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Liaise with CICC Logistics, and determine the status and availability of aircraft, vessels and road transportation available to transport survey personnel and equipment to point of departure. Engage with SMP standby contractor, SMP Manager and CICC Logistics to establish mobilisation plan, secure logistics resources and establish ongoing logistical support operations, including: • Vessels, vehicles and other logistics resources • Vessel fit-out specifications (as • Detailed in the Scientific Monitoring Program Operational Plan • Equipment storage and pick-up locations • Personnel pick-up/airport departure locations • Ports of departure • Land based operational centres and forward operations bases, Accommodation and food requirements.
CICC Planning (CICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Confirm communications procedures between Woodside SMP team, SMP standby contractor, SMP Team Leads and Operations Point Coordinator.
Mobilisation	
CICC Logistics	Engage vessels and vehicles and arrange fitting out as specified by the mobilisation Plan Confirm vessel departure windows and communicate with the Service Provider SMP Manager. Agree SMP mobilisation timeline and induction procedures with the Division and Sector Command Point(s).
CICC Logistics	Coordinate with SMP standby contractor 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 Sector Command point(s).

Document to be read in conjunction with the TPA03 Well Intervention Environment Plan.

6.6.5 ALARP and Acceptability Summary

<table>
<tr><th colspan="3">ALARP and Acceptability Summary</th></tr>
<tr><td colspan="3">Scientific Monitoring</td></tr>
<tr><td rowspan="4">ALARP Summary</td><td></td><td>All known reasonably practicable control measures have been adopted</td></tr>
<tr><td>X</td><td>Additional Measures: Determine baseline data needs and activate SMPs for any identified PBAs in the event of an unplanned hydrocarbon release</td></tr>
<tr><td></td><td>No reasonably practical additional, alternative, and/or improved control measure exists</td></tr>
<tr><td colspan="2">The resulting scientific monitoring capability has been assessed against the worst-case credible spill scenario (CS-01). 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 considered Medium. The SMP’s main objectives can be met, with the addition of one alternative control measures to provide further benefit.</td></tr>
<tr><td>Acceptability Summary</td><td colspan="2">The control measures selected for implementation manage the potential impacts and risks to ALARP.
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.
Throughout the PAP, relevant Australian standards and codes of practice will be followed to evaluate the impacts from a loss of marine diesel due to vessel collision.
The level of impact and risk to the environment has been considered with regards to the principles of 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 worse case credible case scenario, and uncertainty has not been used as a reason for postponing control measures.</td></tr>
<tr><td colspan="3">On the basis of the impact assessment above and in Section 7 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.</td></tr>
</table>

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

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
- disturbance to seabed
- vessel operations and anchoring
- presence of personnel on the shoreline
- vegetation cutting
- 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 response					✓	✓	
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).

Disturbance to the seabed

If relief well drilling is required via moored MODU, 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 the 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 semi-submersible MODU with an 8 to 12-point anchoring system could disturb up to 0.013 km^2 for one well (13,000 m^2), allowing for anchor footprint and disturbance from anchor chains (NERA, 2018).

Relief well drilling activities may result in intermittent or discontinuous direct physical or mechanical disturbance to the seabed up to an approximate 100 m radial distance around the well location due to the installation of the BOP and conductor.

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). 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.

Presence of personnel on the shoreline

Presence of personnel on the shoreline during shoreline operations could potentially result in disturbance to wildlife and habitats. During the implementation of response techniques, it is possible that personnel may have minimal, localised impacts on habitats, wildlife and coastlines. The impacts associated with human presence on shorelines during shoreline surveys and response operations may include:

- damage to vegetation/habitat, especially in sensitive locations such as mangroves and turtle nesting beaches, to gain access to areas of shoreline oiling
- damage or disturbance to wildlife during shoreline surveys
- removal of surface layers of intertidal sediments (potential habitat depletion)
- excessive removal of substrate causing erosion and instability of localised areas of the shoreline
- compaction of sediments.

Any impacts are expected to be localised 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 the selected response techniques will result in the generation of the following waste streams that will require management and disposal:

- liquids (recovered oil/water mixture), generated from oiled wildlife response operations
- semi-solids/solids (oily solids), generated from oiled wildlife response operations
- debris (e.g. seaweed, sand, woods, plastics), generated from oiled wildlife response operations.

If not managed and disposed of correctly, wastes generated during the response have the potential for secondary contamination similar to that described above, 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, TRPs, and/or the FSP.

Disturbance to the seabed

- Seabed disturbance from MODU mooring limited to that required to ensure adequate MODU station-holding capacity (Performance Standard (PS) 13.1).

Vessel operations and access in the nearshore environment

- 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 8.2).
- Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines (PS 8.3).

Presence of personnel on the shoreline

- Shoreline access route (foot, car, vessel and helicopter) with the least environmental impact identified will be selected by a specialist in SCAT operations (PS 8.1).

- Vehicular access will be restricted on dunes, turtle nesting beaches and in mangroves (PS 8.4).

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 16.1).

Waste generation

- All oiled wildlife response sites zoned and marked before operations commence to prevent secondary contamination and minimise the mixing of clean and oiled waste (PS 18.1).

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 has 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 scenarios 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 considers 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 (external stakeholders) 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.
Environment that may be affected	The summary of quantitative modelling where the marine environment could be exposed to hydrocarbons levels exceeding hydrocarbon threshold concentrations.
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.
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. 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. (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 (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 OPEA 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 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.
Zone of Application	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
AIIMS	Australasian Inter-Service Incident Management System
AHV	Anchor Handling Vessel
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
APPEA	Australian Petroleum Production and Exploration Association
AUV	Autonomous Underwater Vehicle
BAOAC	Bonn Agreement Oil Appearance Code
BOP	Blowout Preventer
CEDRE	Centre for Documentation, Research and Experimentation on Accidental Water Pollution
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (US)
CFD	Computational Fluid Dynamic
CICC	Corporate Incident Coordination Centre
CMT	Crisis Management Team
cSt	Centistokes
DBCA	Western Australia Department of Biodiversity, Conservation and Attractions (former Western Australian Department of Parks and Wildlife)
DM	Duty Manager
DOR	Dispersant to Oil Ratio
EMBA	Environment that May Be Affected
EMSA	European Maritime Safety Agency
Environment Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009
EP	Environment Plan
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESI	Environmental Sensitivity Index
ESD	Environmentally Sustainable Development
ESP	Environmental Services Panel
FSP	First Strike Plan
FWADC	Fixed Wing Aerial Dispersant Contract
GDS	Global Dispersant Stockpile (service from OSRL)
GIS	Geographic Information System
GRN	Global Response Network
HAZID	Hazard Identification
HSEQ	Health Safety Environment and Quality
IAP	Incident Action Plan
ICC	Incident Coordination Centre

Abbreviation	Meaning
ICE	Incident Control Environment
IGEM	Industry-Government Environmental Meta-database
IMS	Incident Management System
IMSA	Index of Marine Surveys for Assessment
IMT	Incident Management Team
IOGP	International Association of Oil and Gas Producers
IPIECA	International Petroleum Industry Environment Conservation Association
ISV	Infield support vessel
IT	Information Technology
ITOPF	International Tanker Owners Pollution Federation
IUCN	International Union for Conservation of Nature
KBSF	King Bay Support Facility
LEL	Lower Explosive Limit
LOWC	Loss of Well Containment
MARPOL	International Convention for the Prevention of Pollution from Ships
MDO	Marine Diesel Oil
MMA	Marine Management Area
MODU	Mobile Offshore Drilling Unit
MOU	Memorandum of Understanding
MSRC	Marine Spill Response Corporation
NATA	National Association of Testing Authorities (Australia)
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
OPEA	Oil Pollution Emergency Arrangements
OPEP	Oil Pollution Emergency Plan
OSCA	Oil Spill Cleaning Agent (registered for use within the National Plan)
OSPRMA	Oil Spill Preparedness and Response Mitigation Assessment
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organisations
OSTM	Oil Spill Trajectory Modelling
OWRP	Oiled Wildlife Response Plan
OWROP	Regional Oiled Wildlife Response Operational Plan
PAP	Petroleum Activities Program

Abbreviation	Meaning
PBA	Pre-emptive Baseline Areas
PPB	Parts per billion
PPM	Parts per million
PS	Performance Standard
QA/QC	Quality Assurance/ Quality Control
ROV	Remotely Operated Vehicle(s)
RPA	Response Protection Area
S&EM	Security & Emergency Management
SCAT	Shoreline Clean-up Assessment Technique
SDA	Surface Dispersant Application
SFRT	Subsea First Response Toolkit
SIMA	Spill Impact Mitigation Assessment
SIMAP	Integrated Oil Spill Impact Model System
SIMOPs	Simultaneous Operations
SMP	Scientific Monitoring Program
SSDI	Subsea Dispersant Injection
SFRT	Subsea First Response Toolkit
SIMA	Spill Impact Mitigation Assessment
SM	Scientific Monitoring
SME	Subject Matter Expert
SMP	Scientific Monitoring Program
SPD	Shoreline Protection and Deflection
TRP	Tactical Response Plan
TRSV	Tubing Retrievable Safety Valve
TSS	Total Suspended Solids
UAS	Unmanned Aerial Systems
UAV	Unmanned Aerial Vehicles
VOC	Volatile Organic Compound
WA DoT	Western Australia Department of Transport
WBM	Water Based Muds
WCCS	Worst Case Credible Scenario
WHA	World Heritage Area
WiRCS	Woodside Integrated Risk & Compliance System
Woodside	Woodside Energy Group Limited
WWCI	Wild Well Control Inc
ZoA	Zone of Application

ANNEX A: NET ENVIRONMENTAL BENEFIT ANALYSIS DETAILED OUTCOMES

Pre-operational NEBAs have been conducted to assess the net environmental benefit of different response techniques to selected receptors in the event of an oil spill from the PAP for a loss of well containment of GWA Condensate (CS-01) and a spill of MDO from a vessel collision (CS-02). The complete list of potential receptor locations within the EMBA within the PAP is included in Section 6 of the EP.

The locations utilised for the NEBA were limited to the identified RPAs of the PAP identified from modelling (see Section 3 for outline of selection). These include receptors which have potential for the following:

- Surface contact (>50 g/m^2) at any time
- Shoreline accumulation (>100g/m^2) at any time (none predicted for either CS-01 or CS-02)
- Entrained contact (>100 ppb) < 14 days

The detailed NEBA assessment outcomes are shown below. The TPA03 preoperational NEBAs contains the full assessments.

Table A-1: NEBA assessment technique recommendations for a loss of well containment (CS-01)

Receptor	Monitor and evaluate	Source control and well intervention	Dispersant application: sub-sea	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Mechanical dispersion	In situ burning	Containment and recovery	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled wildlife response
Open water	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
Montebello MP	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
Rankin Bank	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
Tryal Rocks	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes

Overall assessment

	Monitor and evaluate	Source control and well intervention	Dispersant application: sub-sea	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Mechanical dispersion	In situ burning	Containment and recovery	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled wildlife response
Is this response practicable?	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
NEBA identifies response potentially of net environmental benefit?	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes

Table A-2: NEBA assessment technique recommendations for MDO (CS-02)

Receptor	Monitor and evaluate	Source control (vessel)	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Mechanical dispersion	In situ burning	Containment and recovery	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled wildlife response
Open water	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Glomar Shoals	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Montebello Islands	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Montebello MP	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Montebello State Marine Park	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Muiron Islands MMA-WHA	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Pilbara Islands – Southern Island Group	Yes	Yes	No	No	No	No	No	No	No	No	Yes

Overall assessment

	Monitor and evaluate	Source control (vessel)	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Mechanical dispersion	In situ burning	Containment and recovery	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled wildlife response
Is this response Practicable?	Yes	Yes	No	No	No	No	No	No	No	No	Yes
NEBA identifies response potentially of net environmental benefit?	Yes	Yes	No	No	No	No	No	No	No	No	Yes

NEBA Impact Ranking Classification Guidance

To reduce variability between assessments, the following ranking descriptions have been devised to guide the workshop process:

			Degree of impact	Potential duration of impact	Equivalent Woodside Corporate Risk Matrix Consequence Level
Positive	3P	Major	Likely to prevent: • behavioural impact to biological receptors • behavioural impact to socio-economic receptors e.g. changes to day-today business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches) or regulatory designations.	Decrease in duration of impact by >5 years	N/A
	2P	Moderate	Likely to prevent: • significant impact to a single phase of reproductive cycle of biological receptors • detectable financial impact, either directly (e.g. loss of income) or indirectly (e.g. via public perception), for socio-economic receptors.	Decrease in duration of impact by 1–5 years	N/A
	1P	Minor	Likely to prevent impacts on: • significant proportion of population or breeding stages of biological receptors • socio-economic receptors such as: ○ significant impact to the sensitivity of protective designation; or ○ significant and long-term impact to business/industry.	Decrease in duration of impact by several seasons (< 1 year)	N/A
	0	Non-mitigated spill impact	**No detectable difference to unmitigated spill scenario.**		
Negative	1N	Minor	Likely to result in: • behavioural impact to biological receptors • behavioural impact to socio-economic receptors e.g. changes to day-to-day business operations, public opinion/behaviours (e.g. avoidance of amenities such as beaches), or regulatory designations. **[See NOTE]**	Increase in duration of impact by several seasons (< 1 year)	Increase in risk by one sub-category, without changing category (e.g. Minor (E) to Minor (D))
	2N	Moderate	Likely to result in: • significant impact to a single phase of reproductive cycle for biological receptors; or • detectable financial impact, either directly (e.g. loss of income) or indirectly (e.g. via public perception), for socio-economic receptors. This level of negative impact is recoverable and unlikely to result in closure of business/industry in the region.	Increase in duration of impact by 1–5 years	Increase in risk by one category (e.g. Minor (D) to Moderate (C or B))
	3N	Major	Likely to result in impacts on: • significant proportion of population or breeding stages of biological receptors • socio-economic receptors resulting in either: ○ significant impact to the sensitivity of protective designation; or ○ significant and long-term impact to business/industry.	Increase in duration of impact by >5 years or unrecoverable	Increase in risk by two categories (e.g. Minor (E) to Major (A))

NOTE: the maximum likely impact should be considered; for example, if a spill were to directly impact the behaviour that results in an impact to reproduction and/or the breeding population (such as fish failing to aggregate to spawn), then the score should be a 2 or 3 rather than a 1. Similarly, if a change in behaviour resulted in an increased risk of mortality of a population, then it should be scored as a 2 or 3.

ANNEX B: OPERATIONAL MONITORING ACTIVATION AND TERMINATION CRITERIA

Table B-1: Operational monitoring objectives, triggers and termination criteria

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan 1 (OM01) Predictive Modelling of Hydrocarbons to Assess Resources at Risk	OM01 focuses on the conditions that have prevailed since a spill commenced, as well as those that are forecasted in the short term (1–3 days ahead) and longer term. OM01 utilises computer-based forecasting methods to predict hydrocarbon spill movement and guide the management and execution of spill response operations to maximise the protection of environmental resources at risk. The objectives of OM01 are to: • Provide forecasting of the movement and weathering of spilled hydrocarbons • Identify resources that are potentially at risk of contamination • Provide simulations showing the outcome of alternative response options (booming patterns etc.) to inform on-going Net Environmental Benefit Analysis (NEBA) and continually assess the efficacy of available response options in order to reduce risks to ALARP	OM01 will be triggered immediately following a level 2/3 hydrocarbon spill.	The criteria for the termination of OM01 are: • The hydrocarbon discharge has ceased, and no further surface oil is visible • Response activities have ceased • Hydrocarbon spill modelling (as verified by OM02 surveillance observations) predicts no additional natural resources will be impacted

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan 2 (OM02) Surveillance and reconnaissance to detect hydrocarbons and resources at risk	OM02 aims to provide regular, on-going hydrocarbon spill surveillance throughout a broad region, in the event of a spill. The objectives of OM02 are: • Verify spill modelling results and recalibrate spill trajectory models (OM01). • Understand the behaviour, weathering and fate of surface hydrocarbons. • Identify environmental receptors and locations at risk or contaminated by hydrocarbons. • Inform ongoing Net Environmental Benefit Analysis (NEBA) and continually assess the efficacy of available response options in order to reduce risks to ALARP. • To aid in the subsequent assessment of the short- to long-term impacts and/or recovery of natural resources (assessed in SMPs) by ensuring that the visible cause and effect relationships between the hydrocarbon spill and its impacts to natural resources have been observed and recorded during the operational phase.	OM02 will be triggered immediately following a level 2/3 hydrocarbon spill.	The termination triggers for the OM02 are: • 72 hours has elapsed since the last confirmed observation of surface hydrocarbons. • Latest hydrocarbon spill modelling results (OM01) do not predict surface exposures at visible levels.
Operational Monitoring Operational Plan 3 (OM03) Monitoring of hydrocarbon presence, properties, behaviour and weathering in water	OM03 will measure surface, entrained and dissolved hydrocarbons in the water column to inform decision-making for spill response activities. The specific objectives of OM03 are as follows: • Detect and monitor for the presence, quantity, properties, behaviour and weathering of surface, entrained and dissolved hydrocarbons. • Verify predictions made by OM01 and observations made by OM02 about the presence and extent of hydrocarbon contamination. Data collected in OM03 will also be used for the purpose of longer-term water quality monitoring during SM01.	OM03 will be triggered immediately following a level 2/3 hydrocarbon spill.	The criteria for the termination of OM03 are as follows: • The hydrocarbon release has ceased. • Response activities have ceased. • Concentrations of hydrocarbons in the water are below available ANZECC/ ARMCANZ (2018) trigger values for 99% species protection.

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan 4 (OM04) Pre-emptive assessment of sensitive receptors at risk	OM04 aims to undertake a rapid assessment of the presence, extent and current status of shoreline sensitive receptors prior to contact from the hydrocarbon spill, by providing categorical or semi-quantitative information on the characteristics of resources at risk. The primary objective of OM04 is to confirm understanding of the status and characteristics of environmental resources predicted by OM01 and OM02 to be at risk, to further assist in making decisions on the selection of appropriate response actions and prioritisation of resources. Indirectly, qualitative/semi-quantitative pre-contact information collected by OM04 on the status of environmental resources may also aid in the verification of environmental baseline data and provide context for the assessment of environmental impacts, as determined through subsequent SMPs. OM04 would be undertaken in liaison with WA DoT as the control agency once the oil is in State Waters (if a Level 2/3 incident).	Triggers for commencing OM04 include: • Contact of a sensitive habitat or shoreline is predicted by OM01, OM02 and/or OM03. • The pre-emptive assessment methods can be implemented before contact from hydrocarbons (once a receptor has been contacted by hydrocarbons it will be assessed under OM05).	The criteria for the termination of OM04 at any given location are: • Locations predicted to be contacted by hydrocarbons have been contacted. • The location has not been contacted by hydrocarbons and is no longer predicted to be contacted by hydrocarbons (resources should be reallocated as appropriate).

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational monitoring operational plan 5 (OM05) Monitoring of contaminated resources	OM05 aims to implement surveys to assess the condition of wildlife and habitats contacted by hydrocarbons at sensitive habitat and shoreline locations. The primary objectives of OM05 are: • Record evidence of oiled wildlife (mortalities, sub-lethal impacts, number, extent, location) and habitats (mortalities, sub-lethal impacts, type, extent of cover, area, hydrocarbon character, thickness, mass and content) throughout the response and clean-up at locations contacted by hydrocarbons to inform and prioritise clean-up efforts and resources, while minimising the potential impacts of these activities. Indirectly, the information collected by OM05 may also support the assessment of environmental impacts, as determined through subsequent SMPs. OM05 would be undertaken in liaison with WA DoT as the control agency once the oil is in State Waters (if a Level 2/3 incident).	OM05 will be triggered when a sensitive habitat or shoreline is predicted to be contacted by hydrocarbons by OM01, OM02 and/or OM03.	The criteria for the termination of OM05 at any given location are: • No additional response or clean-up of wildlife or habitats is predicted. • Spill response and clean-up activities have ceased. OM05 survey sites established at sensitive habitat and shoreline locations will continue to be monitored during SM02. The formal transition from OM05 to SM02 will begin on cessation of spill response and clean-up activities.

ANNEX C: OIL SPILL SCIENTIFIC MONITORING PROGRAM

Oil Spill Environmental Monitoring

The following provides some further detail on Woodside's oil spill scientific monitoring Program and includes the following:

- The organisation, roles and responsibilities of the Woodside oil spill scientific monitoring team and external resourcing.
- A summary table of the ten scientific monitoring programs as per the specific focus receptor, objectives, activation triggers and termination criteria.
- Details on the oil spill environmental monitoring activation and termination decision-making processes.
- Baseline knowledge and environmental studies knowledge access via geo-spatial metadata databases.
- An outline of the reporting requirements for oil spill scientific monitoring programs.

Oil Spill Scientific Monitoring – Delivery Team Roles and Responsibilities

Woodside Oil Spill Scientific Monitoring Delivery Team

The Woodside science team are responsible for the delivery of the oil spill scientific monitoring. The roles and responsibilities of the Woodside scientific monitoring delivery team are presented in Table C-1 and the organisational structure and Central Incident Control Centre (CICC) linkage provided in Figure C-1.

Woodside Oil Spill Scientific monitoring program – External Resourcing

In the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors, scientific monitoring personnel and scientific equipment to implement the appropriate SMPs will be provided by SMP Standby contractor who hold a standby contract for SMP via the Woodside Environmental Services Panel (ESP). In the event that additional resources are required other consultancy capacity within the Woodside ESP will be utilised (as needed and may extend to specialist contractors such as research agencies engaged in long-term marine monitoring programs). In consultation with the SMP Standby Contractor and/or specialist contractors, the selection, field sampling and approach of the SMPs will be determined by the nature and scale of the spill.

Table C-1: Woodside and Environmental Service Provider – Oil Spill Scientific Monitoring Program Delivery Team Key Roles and Responsibilities

Role	Location	Responsibility
Woodside Roles		
SMP Lead/ Manager	Onshore	• Approves activated the SMPs based on operational monitoring data provided by the Planning Function • Provides advice to the CICC in relation to scientific monitoring • Provides technical advice regarding the implementation of scientific monitoring • Approves detailed sampling plans prepared for SMPs • Directs liaison between statutory authorities, advisors and government agencies in relation to SMPs.
SMP Co-ordinator	Onshore	• Activates the SMPs based on operational monitoring data provided by the Planning Function • Sits in the Planning function of the CICC. • Liaises with other CICC functions to deliver required logistics, resources and operational support from Woodside to support the Environmental Service Provider in delivering on the SMPs. Acts as the conduit for advice from the SMP Lead/Manager to the Environmental Service Provider • Manages the Environmental Service Provider's implementation of the SMPs • Liaises with the Environmental Service Provider on delivery of the SMPs • Arranges all contractual matters, on behalf of Woodside, associated with the Environmental Service Provider's delivery of the SMPs.
Environmental Service Provider Roles		
SMP Standby Contractor – SMP Duty Manager/Project Manager (SMP Liaison Officer)	Onshore	• Coordinates the delivery of the SMPs • Provides costings, schedule and progress updates for delivery of SMPs • Determines the structure of the Environmental Service Provider's team to necessitate delivery of the SMPs • Verifies that HSE Plans, detailed sampling plans and other relevant deliverables are developed and implemented for delivery of the SMPs • Directs field teams to deliver SMPs • Arranges all contractual matters, on behalf of Environmental Service Provider, associated with the delivery of the SMPs to Woodside • Manages sub-consultant delivery to Woodside • Provides required personnel and equipment to deliver the SMPs.
SMP Field Teams	Offshore – Monitoring Locations	• Delivers the SMPs in the field consistent with the detailed sampling plans and HSE requirements, within time and budget. • Early communication of time, budget, HSE risks associated with delivery of the SMPs to the Environmental Service Provider – Project Manager • Provides start up, progress and termination updates to the Environmental Service Provider – Project Manager (will be led in-field by a party chief).

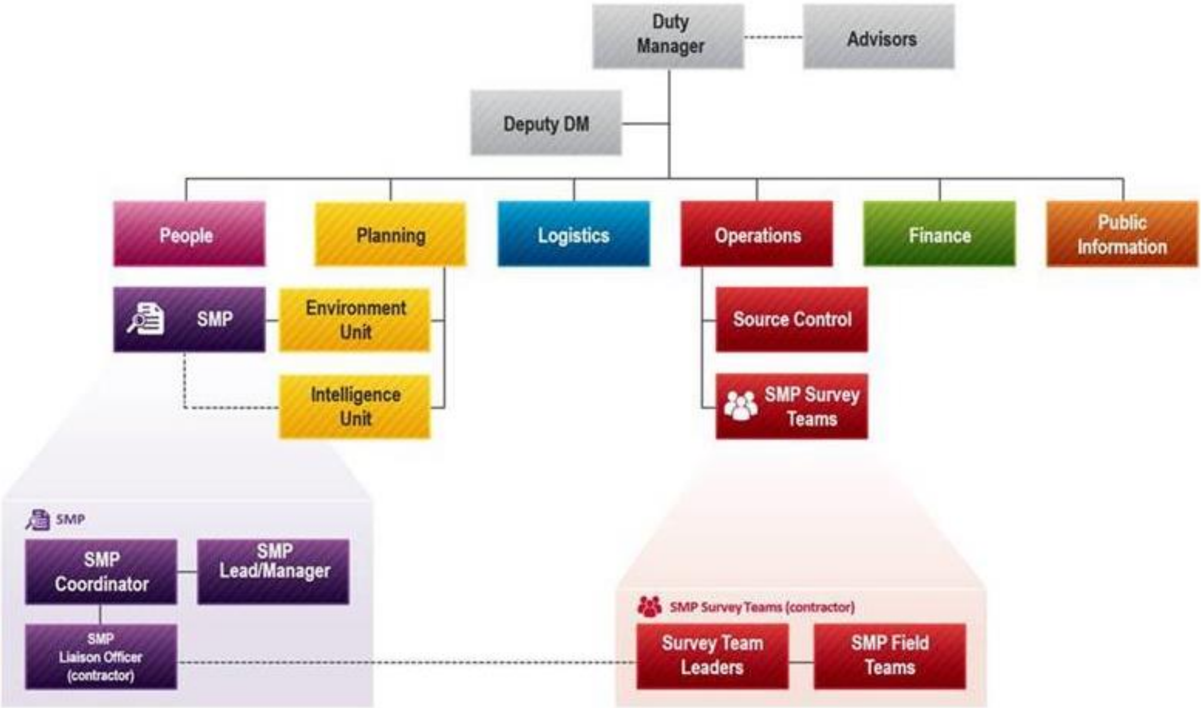

Figure C-1: Woodside Oil Spill Scientific Monitoring Program Delivery Team and Linkage to Corporate Incident Coordination Centre (CICC) organisational structure.

Table C-2: Oil Spill Environmental Monitoring: Scientific Monitoring Program – Objectives, Activation Triggers and Termination Criteria

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
Scientific monitoring program 1 (SM01) **Assessment of Hydrocarbons in Marine Waters**	SM01 will detect and monitor the presence, extent, persistence and properties of hydrocarbons in marine waters following the spill and the response. The specific objectives of SM01 are as follows: • Assess and document the extent, severity and persistence of hydrocarbon contamination with reference to observations made during surveillance activities and / or in-water measurements made during operational monitoring; and • Provide information that may be used to interpret potential cause and effect drivers for environmental impacts recorded for sensitive receptors monitored under other SMPs.	SM01 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors	SM01 will be terminated when: • Operational monitoring data relating to observations and / or measurements of hydrocarbons on and in water have been compiled, analysed and reported; and • The report provides details of the extent, severity and persistence of hydrocarbons which can be used for analysis of impacts recorded for sensitive receptors monitored under other SMPs. SMP monitoring of sensitive receptor sites: • Concentrations of hydrocarbons in water samples are below NOPSEMA guidance note (2019[16]) concentrations of 1 g/m^2 for floating, 10 ppb for entrained and dissolved; and • Details of the extent, severity and persistence of hydrocarbons from concentrations recorded in water have been documented at sensitive receptor sites monitored under other SMPs.
Scientific monitoring program 2 (SM02) **Assessment of the Presence, Quantity and Character of Hydrocarbons in Marine Sediments**	SM02 will detect and monitor the presence, extent, persistence and properties of hydrocarbons in marine sediments following the spill and the response. The specific objectives of SM02 are as follows: • Determine the extent, severity and persistence of hydrocarbons in marine sediments across selected sites where hydrocarbons were observed or recorded during operational monitoring; and • Provide information that may be used to interpret potential cause and effect drivers for environmental impacts recorded for sensitive receptors monitored under other SMPs.	SM02 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • Response activities have ceased; and • Operational monitoring results made during the response phase indicate that shoreline, intertidal or sub-tidal sediments have been exposed to surface, entrained or dissolved hydrocarbons (at or above 0.5 g/m^2 surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m^2 for shoreline accumulation).	SM02 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of: • Concentrations of hydrocarbons in sediment samples are below ANZECC/ ARMCANZ (2013[17]) sediment quality guideline values (SQGVs) for biological disturbance; and • Details of the extent, severity and persistence of hydrocarbons from concentrations recorded in sediments have been documented.
Scientific monitoring program 3 (SM03) **Assessment of Impacts and Recovery of Subtidal and Intertidal Benthos**	The objectives of SM03 are: • Characterize the status of intertidal and subtidal benthic habitats and quantify any impacts to functional groups, abundance and density that may be a result of the spill; and • Determine the impact of the hydrocarbon spill and subsequent recovery (including impacts associated with the implementation of response options). Categories of intertidal and subtidal habitats that may be monitored include: • Coral reefs • Seagrass • Macro-algae • Filter-feeders SM03 will be supported by sediment contamination records (SM02) and characteristics of the spill derived from OMPs.	SM03 will be activated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • As part of a pre-emptive assessment of PBAs of receptor locations identified by time to hydrocarbon contact >10 days, to target receptors and sites where it is possible to acquire pre-hydrocarbon contact baseline; and • Operational monitoring identified shoreline potential contact of hydrocarbons (at or above 0.5 g/m^2 surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m^2 for shoreline accumulation) for subtidal and intertidal benthic habitat.	SM03 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of: • Overall impacts to benthic habitats from hydrocarbon exposure have been quantified. • Recovery of impacted benthic habitats has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 4 (SM04) **Assessment of Impacts and Recovery of Mangroves / Saltmarsh**	The objectives of SM04 are: • Characterize the status of mangroves (and associated salt marsh habitat) at shorelines exposed/contacted by spilled hydrocarbons; • Quantify any impacts to species (abundance and density) and mangrove/saltmarsh community structure; and • Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options). SM03 will be supported by sediment sampling undertaken in SM02 and characteristics of the spill derived from OMPs.	SM04 will be activated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; and	SM04 will be terminated once pre-spill condition is reached and agreed upon as per the SMP termination criteria process and include consideration of: • Impacts to mangrove and saltmarsh habitat from hydrocarbon exposure have been quantified. • Recovery of impacted mangrove/saltmarsh habitat has been evaluated.

[16] NOPSEMA (2019) Bulletin #1 – Oil spill modelling – April 2019, https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf
[17] Simpson SL, Batley GB and Chariton AA (2013). Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO and Water Science Report 08/07. Land and Water, pp. 132.

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
		• Operational monitoring identified shoreline potential contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) for mangrove/saltmarsh habitat.	• Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 5 (SM05) **Assessment of Impacts and Recovery of Seabird and Shorebird Populations**	The Objectives of SM05 are to: • Collate and quantify impacts to avian wildlife from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population level; and • Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to seabirds and shorebird populations at targeted breeding colonies / staging sites / important coastal wetlands where hydrocarbon contact was recorded.	SM05 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; • Operational monitoring predicts shoreline contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at important bird colonies / staging sites / important coastal wetland locations; or • Records of dead, oiled or injured bird species made during the hydrocarbon spill or response.	SM05 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to seabird and shorebird populations from hydrocarbon exposure have been quantified. • Recovery of impacted seabird and shorebird populations has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 6 (SM06) **Assessment of Impacts and Recovery of Nesting Marine Turtle Populations**	The objectives of SM06 are to: • To quantify impacts of hydrocarbon exposure or contact on marine turtle nesting populations (including impacts associated with the implementation of response options); • Collate and quantify impacts to adult and hatchling marine turtles from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels (including impacts associated with the implementation of response options); and • Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to nesting marine turtle populations at known rookeries (including impacts associated with the implementation of response options).	SM06 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; • Predicted shoreline contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at known marine turtle rookery locations; or • Records of dead, oiled or injured marine turtle species made during the hydrocarbon spill or response.	SM06 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to nesting marine turtle populations from hydrocarbon exposure have been quantified. • Recovery of impacted nesting marine turtle populations has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 7 (SM07) **Assessment of Impacts to Pinniped Colonies including Haul-out Site Populations**	The objectives of SM07 are to: • Quantify impacts on pinniped colonies and haul-out sites as a result of hydrocarbon exposure/contact. • Collate and quantify impacts to pinniped populations from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels.	SM07 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; • Identified shoreline contact of hydrocarbons ((at or above 0.5 g/m² surface, ≥5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at known pinniped colony or haul-out site(s) (i.e. most northern site is the Houtman Abrolhos Islands); or • Records of dead, oiled or injured pinniped species made during the hydrocarbon spill or response.	SM07 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to pinniped populations from hydrocarbon exposure have been quantified. • Recovery of pinniped populations has been evaluated. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 8 (SM08) **Desk-Based Assessment of Impacts to Other Non-Avian Marine Megafauna**	The objective of SM08 is to provide a desk-based assessment which collates the results of OM02 and OM05 where observations relate to the mortality, stranding or oiling of mobile marine megafauna species not addressed in SM06 or SM07, including: • Cetaceans; • Dugongs; • Whale sharks and other shark and ray populations; • Sea snakes; and • Crocodiles.	SM08 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring reports records of dead, oiled or injured non-avian marine megafauna during the spill/ response phase.	SM08 will be terminated when the results of the post-spill monitoring have quantified impacts to non-avian megafauna. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
	The desk-based assessment will include population analysis to infer potential impacts to marine megafauna species populations.		
Scientific monitoring program 9 (SM09) **Assessment of Impacts and Recovery of Marine Fish associated with SM03 habitats**	The objectives of SM09 are: • Characterise the status of resident fish populations associated with habitats monitored in SM03 exposed/contacted by spilled hydrocarbons; • Quantify any impacts to species (abundance, richness and density) and resident fish population structure (representative functional trophic groups); and • Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options).	SM09 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented with SMO3.	SM09 will be undertaken and terminated concurrent with monitoring undertaken for SM03, as per the SMP termination criteria process • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 10 (SM10) **SM10 - Assessment of physiological impacts important fish and shellfish species (fish health and seafood quality/safety) and recovery**	SM10 aims to assess any physiological impacts to important commercial fish and shellfish species (assessment of fish health) and if applicable, seafood quality/safety. Monitoring will be designed to sample key commercial fish and shellfish species and analyse tissues to identify fish health indicators and biomarkers, for example: • Liver Detoxification Enzymes (ethoxyresorufin-O-deethylase (EROD) activity) • Polyaromatic Hydrocarbon (PAH) Biliary Metabolites • Oxidative DNA Damage • Serum Sorbitol Dehydrogenase (SDH) • Other physiological parameters, such as condition factor (CF), liver somatic index (LSI), gonado-somatic index (GSI) and gonad histology, total weight, length, condition, parasites, egg development, testes development, abnormalities. • Seafood tainting may be included (where appropriate) using applicable sensory tests to objectively assess targeted finfish and shellfish species for hydrocarbon contamination. Results will be used to make inferences on the health of commercial fisheries and the potential magnitude of impacts to fishing industries.	SM10 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring (OM01, OM02 and OM05) indicates the following: • The hydrocarbon spill will or has intersected with active commercial fisheries or aquaculture activities. • Commercially targeted finfish and/or shellfish mortality has been observed/recorded. • Commercial fishing or aquaculture areas have been exposed to hydrocarbons (≥0.5 g/m² surface and ≥5 ppb for entrained/dissolved hydrocarbons); and • Taste, odour or appearance of seafood presenting a potential human health risk is observed.	SM10 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Physiological impacts to important commercial fish and shellfish species from hydrocarbon exposure have been quantified. • Recovery of important commercial fish and shellfish species from hydrocarbon exposure has been evaluated. • Impacts to seafood quality/safety (if applicable) have been assessed and information provided to the relevant stakeholders and regulators for the management of any impacted fisheries. • Agreement with relevant stakeholders and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.

Activation Triggers and Termination Criteria

Scientific monitoring program Activation

The Woodside oil spill scientific monitoring team will be stood up immediately with the occurrence of a hydrocarbon spill (actual or suspected) Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors via the FSRP for the PAP. The presence of any level of hydrocarbons in the marine environment triggers the activation of the oil spill scientific monitoring program (SMP). This is to ensure the full range of eventualities relating to the environmental, socio-economic and health consequences of the spill are considered in the planning and execution of the SMP. The activation process also takes into consideration the management objectives, species recovery plans, conservation advices and conservations plans for any World Heritage Area (WHA), CMRs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the Environment Protection and Biodiversity Conservation (EPBC) Act) potentially exposed to hydrocarbons. With the first 24-48 hours of a spill event, such information will be sourced and evaluated as part of the SMP planning process guided by Appendix D (identified receptors vulnerable to hydrocarbon contact), the information presented in the Existing Environment section of the EP as well as other information sources such as the Woodside Baseline Environmental Studies Database.

The starting point for decision-making on what SMPs are activated and spatial extent of monitoring activities will be based on the predictive modelling results (OM01) in the first 24-48 hours until more information is made available from other operational monitoring activities such as aerial surveillance and shoreline surveys. Pre-emptive Baseline Areas (WHA, CMRs and State Marine Parks encompassing key ecological and socio-economic values) are a key focus of the SMP activation decision-making process, particularly, in the early spill event/response phase. As the operational monitoring progresses and further situational awareness information becomes available, it will be possible to understand the nature and scale of the spill. The SMP activation and implementation decision-making will be revisited on a daily basis to account for the updates on spill information. One of the priority focus areas in the early phase of the incident will be to identify and execute pre-emptive SMP assessments at key receptor locations, as required. The SMP activation and implementation decision tree is presented in Figure C-2.

Scientific monitoring Program Termination

The basis of the termination process for the active SMPs (SMPs 1-10) will include quantification of impacts, evaluation of recovery for the receptor at risk and consultation with relevant authorities, persons and organisations. Termination of each SMP will not be considered until the results (as presented in annual SMP reports for the duration of each program) indicate that the target receptor has returned to pre-spill condition.

Once the SMP results indicate impacted receptor(s) have returned to pre-spill condition (as identified by Woodside) a termination decision-making process will be triggered and a number of steps will be undertaken as follows:

- Woodside will engage expert opinion on whether the receptor has returned to pre-spill condition (based on monitoring data). Subject Matter Expert (SMEs) will be engaged (via the Woodside SME scientific monitoring terms of reference) to review program outcomes, provide expert advice and recommendations for the duration of each SMP.
- Where expert opinion agrees that the receptor has returned to pre-spill condition, findings will then be presented to the relevant authorities, persons and organisations (as defined by the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulation 11A). Stakeholder identification, planning and engagement will be managed by Woodside's Reputation Functional Support Team (FST) and follow the stakeholder management FST. These guidelines outline the FST roles and responsibilities, competencies, stakeholder communications and planning processes. An assessment of the merits of any objection to termination will be documented in the SMP final report.
- Woodside will decide on termination of SMP based on expert opinion and merits of any stakeholder objections. The final report following termination will include: monitoring results, expert opinion and stakeholder consultation including merits of any objections.

- Termination of SMPs will also consider applicable management objectives, species recovery plans, conservation advices and conservations plans for any World Heritage Area (WHA), CMRs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the EPBC Act).

The SMP termination decision-making process will be applied to each active SMP and an iterative process of decision steps continued until each SMP has been terminated (refer to decision-tree diagram for SMP termination criteria, Figure C-3).

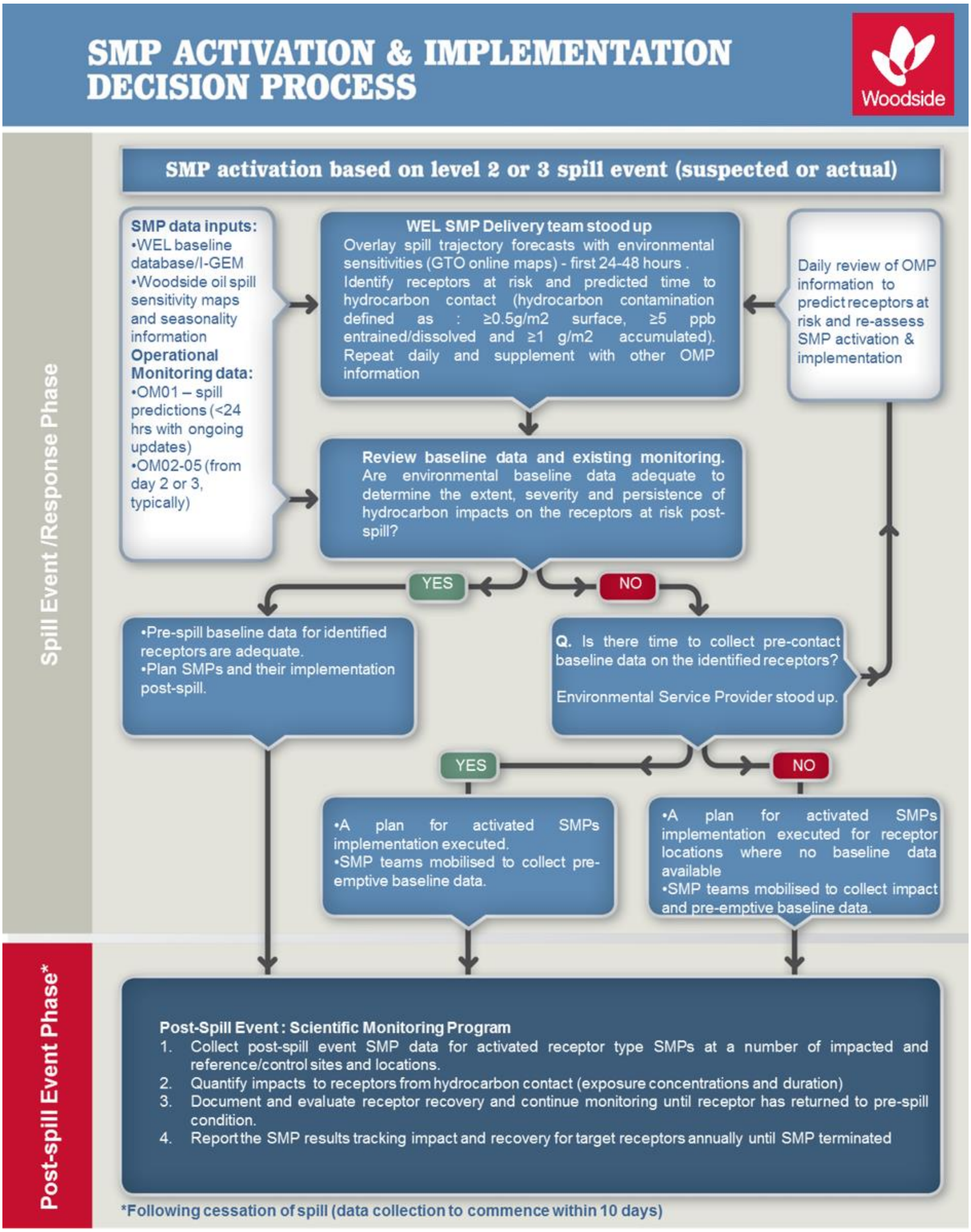

Figure C-2: Activation and implementation decision-tree for oil spill environmental monitoring

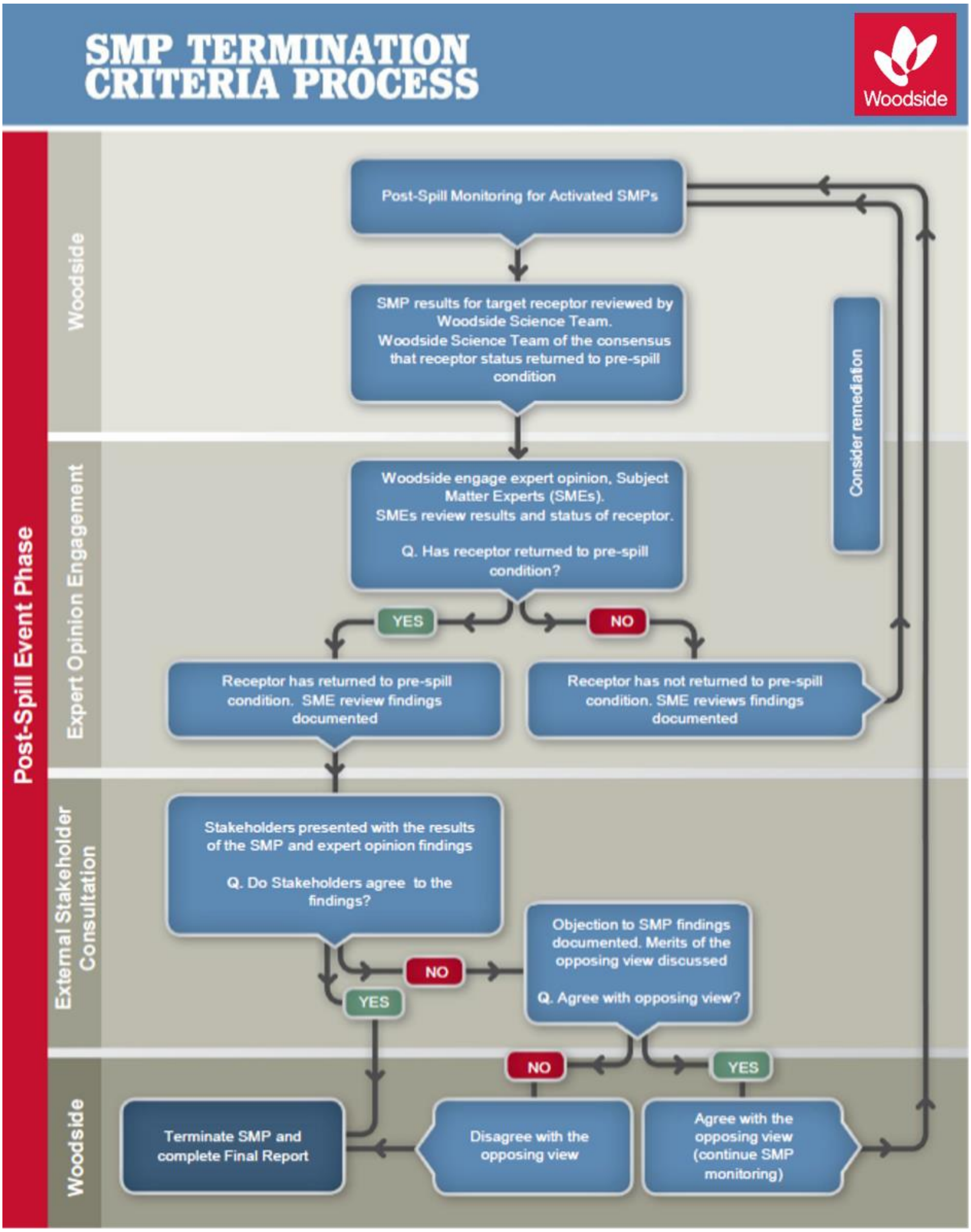

Figure C-3: Termination criteria decision-tree for oil spill environmental monitoring

Receptors at Risk and Baseline Knowledge

In order to assess the baseline studies available and suitability for oil spill scientific monitoring, Woodside maintains knowledge of environmental baseline studies through the upkeep and use of its Environmental Knowledge Management System.

Woodside's Environmental Knowledge Management System is a centralised platform for scientific information on the existing environment, marine biodiversity, Woodside environmental studies, key environmental impact topics, key literature and web-based resources. The system comprises a number of data directories and an environmental baseline database, as well as folders within the 'Corporate Environment' server space. The environmental baseline database was set up to support Woodside's SMP preparedness and as a SMP resource in the event of an unplanned hydrocarbon spill. The environmental baseline database is subject to updates including annual reviews completed as part of SMP standby contract. This database is accessed pre-PAP to identify Pre-emptive Baseline Areas (PBAs) where hydrocarbon contact is predicted to occur <10 days.

In addition to Woodside's Environmental Knowledge Management System, it is acknowledged that many relevant baseline datasets are held by other organisations (e.g. other oil and gas operators, government agencies, state and federal research institutions and non-governmental organisations). In order to understand the present status of environmental baseline studies a spatial environmental metadata database for Western Australia (Industry-Government Environmental Metadata, I-GEM) was established. IGEM is a collaboration comprising oil and gas operators (including Woodside), government and research agencies and other organisations. IGEM held data were integrated into the Department of Water and Environmental Regulation (WA) Index of Marine Surveys for Assessment (IMSA)[18] in 2020. The Index of Marine Surveys for Assessments (IMSA) is an online portal for information about marine-based environmental surveys in Western Australia. IMSA is a project of the Department of Water and Environmental Regulation (the department) for the systematic capture and sharing of marine data created as part of an environmental impact assessment (EIA).

In the event of an unplanned hydrocarbon release, Woodside intends to interrogate the information on baseline studies status as held by the various databases (e.g. Woodside Environmental Knowledge Management System, IMSA and other sources of existing baseline data) to identify Pre-emptive Baseline Areas (PBAs), i.e., receptors at risk where hydrocarbon contact is predicted to be >10 days, and baseline data can be collected before hydrocarbon contact.

Reporting

For the scientific monitoring program relevant regulators will be provided with:

- Annual reports summarising the SMPs deployed and active, data collection activities and available findings; and
- Final reports for each SMP summarising the quantitative assessment of environmental impacts and recovery of the receptor once returned to pre-spill condition and termination of the monitoring program.

The reporting requirements of the scientific monitoring program will be specific to the individual SMPs deployed and terms of responsibilities, report templates, schedule, Quality Assurance/Quality Control (QA/QC) and peer-review will be agreed with the contractors engaged to conduct the SMPs. Compliance and auditing mechanisms will be incorporated into the reporting terms.

[18] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

ANNEX D: SCIENTIFIC MONITORING PROGRAM AND BASELINE STUDIES FOR THE PETROLEUM ACTIVITIES PROGRAM

Table D-1: Oil Spill Environmental Monitoring – scientific monitoring program scope for the Petroleum Activities Program based on spill EMBA for CS-01 and CS-02

Receptors to be Monitored	Applicable SMP	Kimberley AMP	Agro-Rowley Terrace AMP	Montebello AMP	Dampier AMP	Carnarvon Canyon AMP	Ningaloo AMP	Gascoyne AMP	Shark Bay Open Ocean (including AMP)	Abrolhos AMP	Jurien AMP	Two Rocks AMP	Perth Canyon AMP	Geographe AMP	South-west Corner AMP	Ashmore Reef and AMP	Seringapatam Reef	Scott Reef (North and South)	Mermaid Reef and AMP	Clerke Reef and State Marine Park	Imperieuse Reef and State Marine Park	Rankin Bank	Glomar Shoals	Rowley Shoals (including Sate Maine Park)	Fantome Shoal	Adele Island	Lacepede Islands	Montebello Islands (including State Marine Park)	Lowendal Islands (including State Nature Reserves)	Barrow Island (including State Nature Reserves, State Marine Park and Marine Management Area)	Muiron Islands (WHA, Marine Management Area)	Pilbara Islands - Southern Island Group (Serrurier, Thevenard and Bessieres Islands - State Nature Reserves)	Pilbara Islands - Northern Island Group (Sandy Island Passage Islands - State nature reserves)	Abrolhos Islands	Kimberley Coast	Dampier Peninsula	Northern Pilbara Shoreline	Ningaloo Coast (North/North West Cape, Middle and South) (WHA, and State Marine Park)	Shark Bay - Open Ocean Coast	Shark Bay (WHA, State Marine Park)	Ngari Capes State Marine Park
Habitat																																									
Water Quality	SM01	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marine Sediment Quality	SM02	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Coral Reef	SM03	X		X												X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	
Seagrass / Macro-Algae	SM03	X									X					X	X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deeper Water Filter Feeders	SM03	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						X							X			
Mangroves and Saltmarsh	SM04																											X						X	X	X	X	X		X	
Species																																									
Sea Birds and Migratory Shorebirds (significant colonies / staging sites / coastal wetlands)	SM05	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marine Turtles (significant nesting beaches)	SM06	X	X	X	X		X	X	X							X	X	X	X	X	X						X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Pinnipeds (significant colonies / haul-out sites)	SM07									X	X	X			X																										X
Cetaceans - Migratory Whales	SM08	X	X	X	X		X	X	X	X	X	X	X	X	X			X									X	X	X	X	X			X	X	X		X		X	X
Oceanic and Coastal Cetaceans	SM08	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dugongs	SM08	X							X							X												X	X	X	X	X	X		X	X	X	X	X	X	
Sea Snakes	SM08	X		X	X			X	X	X						X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Whale Sharks	SM08			X			X	X										X										X	X	X	X							X			
Other Shark and Ray Populations	SM08, SM09	X	X	X	X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fish Assemblages	SM09	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Socio-economic																																									
Fisheries - Commercial	SM10		X	X	X	X	X	X	X	X	X	X										X	X	X	X			X	X	X		X	X	X	X	X	X	X	X	X	X
Fisheries - Traditional	SM10															X	X	X									X													X	
Tourism (incl. recreational fishing)	SM10	X		X			X	X	X		X			X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X

(dark red)	Receptor areas identified as Pre-emptive Baseline Areas (based on criteria of surface contact and/or entrained hydrocarbon contact ≤10 days (Offshore Australian Marine Parks contacted by hydrocarbons in this timeframe also noted)
(light pink)	Receptor areas identified as Pre-Emptive Basline Areas in the response phase >10 days (based on criteria of surface contact and/or entrained hydrocarbon contact >10 days)
(white)	Receptor areas that may be identified as impact or reference sites in the event of major hydrocarbon release and would be identified as part of the SMP planning process

Table D-2: Baseline Studies for the SMPs applicable to identified Pre-emptive Baseline Areas for the Petroleum Activities Program

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands	Rankin Bank & Glomar Shoal	Montebello AMP
Benthic Habitat (Coral Reef)	**SM03** Quantitative assessment using image capture using either diver held camera or towed video. Post analysis into broad groups based on taxonomy and morphology.	**Studies:**		
		1. DBCA LTM Ningaloo Reef program: 1991-ongoing. 2. AIMS/DBCA 2014 Baseline Ningaloo and Muiron Islands Survey – repeat and expansion on the LTM (Co-funded survey: Woodside and AIMS). 3. Pilbara Marine Conservation Partnership. 4. WAMSI LTM Study: Ningaloo Research node: 2009 -10 over the length of Ningaloo reef system (with a focus on coral and fish recruitment). 5. Ningaloo Outlook (CSIRO) - Shallow and Deep Reefs Program (2015-ongoing). 6. Ningaloo Collaboration Cluster: Habitats of the Ningaloo Reef and adjacent coastal areas determined through hyperspectral imagery 7. Allen Coral Atlas	1. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.	Coral Reefs & Filter Feeders 1. Montebello Marine Park, 2019, Identification and qualitative descriptions of benthic habitat. 2. Montebello Australian Marine Parks – 2019 – Baseline survey on benthic habitats. 3. Pluto Trunkline within Montebello Marine Park – Monitoring marine communities.
		Methods:		
		1. LTM transects, diver based (video) photo quadrats, specimen collection. 2. LTM sites, transects, diver-based video quadrat. 3. Diver video transects, still photography, video and in situ visual estimates from transects, quadrats, manta-tows, towed video and ROV. 4. Video point intercept transects recorded by towed video or diver hand-held video camera. 5. Video transects. 6. LTM transects, diver based (video) photo quadrat. 7. Combination of satellite imagery analysis and mapped/monitored areas.	1. Towed video transects, photo quadrats using towed video system. 2. Towed video transects, photo quadrats using towed video system. 3. Towed video transects, photo quadrats using towed video system. 4. Towed video transects, photo quadrats using towed video system.	1.ROV Transects 2. Benthic habitat mapping, multibeam acoustic swathing. 3. ROV video.
		References and Data:		
		1. DBCA unpublished data. DATAHOLDER: DBCA 2. AIMS 2015. DATAHOLDER: AIMS. 3. Pilbara Marine Conservation Partnership DATAHOLDER: CSIRO 4. Depczynski et al. 2011 DATAHOLDER: AIMS, DBCA and WAMSI. 5. CSIRO 2019 – Ningaloo Outlook Program 6. Murdoch University – HyVista Corporation – April and May 2006 (Kobryn et al 2022) 7. https://allencoralatlas.org/atlas/#7.58/-21.5563/114.9133 (accessed 18/05/2022)	1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3.Currey-Randall et. al., 2019. DATAHOLDER: AIMS 4. Currey-Randall et. al., 2019. DATAHOLDER: AIMS	1. Advisian 2019 2. Keesing 2019 3. McLean et al. 2019
Benthic Habitat (Seagrass and Macro-algae)	**SM03** Quantitative assessment using image capture using either diver held camera or towed video. Post analysis into broad groups based on taxonomy and morphology.	**Studies:**		
		1. Quantitative descriptions of Ningaloo sanctuary zones habitats types including lagoon and offshore areas – Cassata and Collins (2008). 2. CSIRO/BHP Ningaloo Outlook Program. 3. Ningaloo Collaboration Cluster: Habitats of the Ningaloo Reef and adjacent coastal areas determined through hyperspectral imagery. 4. Australian Institute of Marine Science – CReefs: Ningaloo Reef Biodiversity Expeditions (2008-2010).		N/A – see Table D-1
		Methods:		
		1. Video transects to ground truth aerial photographs and satellite imagery. 2. Diver video transects. 3. LTM transects, diver based (video) photo quadrat. 4. LTM transects, diver based (video) photo quadrats, specimen collection. 5.Satellite imagery, mapping and monitoring		
		References and Data:		

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands	Rankin Bank & Glomar Shoal	Montebello AMP
		1. Cassata and Collins 2008.DATAHOLDER: Curtin University – Applied Geology. 2. CSIRO – Ningaloo Outlook Program 3. AIMS - AIMS (2010) - http://www.aims.gov.au/creefs 4. Murdoch University - HyVista Corporation – April and May 2006 (Kobryn et al 2022) 5. https://allencoralatlas.org/atlas/#7.58/-21.5563/114.9133 (accessed 18/05/2022)		
Benthic Habitat (Deeper Water Filter Feeders)	**SM03** Quantitative assessment using image capture using towed video. Post analysis into broad groups based on taxonomy and morphology.	**Studies:**		
		1. WAMSI 2007 deep-water Ningaloo benthic communities' study, Colquhoun and Heyward (2008). 2. CSIRO/BHP Ningaloo Outlook Program - Deep reef themes 2020	As above (SM03 Coral Reefs)	As above (SM03 Coral Reefs)
		Methods:		
		1. Towed video and benthic sled (specimen sampling). 2. Side-scan sonar and AUV transects.		
		References and Data:		
		1. Colquhoun and Heyward (eds) 2008. DATAHOLDER: WAMSI, AIMS. 2. CSIRO – Ningaloo Outlook 2020		
Mangroves and Saltmarsh	**SM04** Aerial photography and satellite imagery will be used in conjunction with field surveys to map the range and distribution of mangrove communities.	**Studies:**		
		1. Atmospheric corrected land cover classification, NW Cape. 2. Woodside hold Rapid Eye imagery of the Ningaloo Reef and coastal area. 3. Hyperspectral survey (2006) of Ningaloo Reef and coastal area (not yet analysed for Mangroves). 4. North West Cape sensitivity mapping 2012 included Mangrove Bay. 5. Global mangrove distribution as mapped by the USGS and located on UNEP's Ocean Data viewer.	N/A – See Table D-1	N/A – see Table D-1
		Methods:		
		1. Modular Inversion Program. May 2017 2. Rapid Eye imagery – High resolution satellite imagery from October/November/December 2011 and 2017. 3. Remote sensing – acquisition of HyMap airborne hyperspectral imagery and ground truthing data collection. 4. Reconnaissance surveys of the shorelines of the North West Cape and Muiron Islands. 5. Remote sensing study of global mangrove coverage.		
		References and Data:		
		1. EOMAP 2017 DATAHOLDER: Woodside. 2. AAM 2014. Dataholder: Woodside 3. Kobryn et al. 2013. DATAHOLDER: Murdoch University, AIMS; Woodside. 4. Joint Carnarvon Basin Operators, 2012. DATAHOLDER: Woodside and Apache Energy Ltd. 5. http://data.unep-wcmc.org/		
Seabirds	**SM05** Visual counts of breeding seabirds, nest counts, intertidal bird counts at high tide.	**Studies:**		
		1. LTM Study of marine and shoreline birds: 1970-2011. 2. LTM of shorebirds within the Ningaloo coastline (Shorebirds 2020). 3. Exmouth Sub-basin Marine Avifauna Monitoring Program (Quadrant Energy/Santos). 4. Seabird and Shorebird baseline studies, Ningaloo Region – Report on January 2018 bird surveys. 5.Wedge-tailed shearwater foraging behaviour in the Exmouth Region – Final Report	N/A – See Table D-1	N/A – see Table D-1
		Methods:		

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands	Rankin Bank & Glomar Shoal	Montebello AMP
		1. Counts of nesting areas, counts of intertidal zone during high tide. 2. The Shorebirds 2020 database comprises the most complete shorebird count data available in Australia. The data have been collected by volunteer counters and BirdLife Australia staff for approximately 150 roosting and feeding sites, mainly in coastal Australia. The data go back as far as 1981 for key areas. 3. The Exmouth Sub-basin Marine Avifauna Monitoring Program undertook a detailed assessment of seabird and shorebird use in the Exmouth Sub-basin. Four aerial surveys and four island surveys were conducted between February 2013 and January 2015 for this Program, inclusive of the mainland coasts, of shore islands and a 2,500 km^2 area of ocean adjacent to the Exmouth Sub-basin. 4.Shorebird counts, Shearwater Burrow Density. 5. Telemetry (GPS & Satellite).		
		References and Data:		
		1. Johnstone et al. 2013. DATAHOLDER: WA MUSEUM. AMOSC/DBCA (DPaW) 2014. 2. BirdLife Australia DATAHOLDER: Woodside and BirdlLife Australia 3. Surman & Nicholson 2015. 4. BirdLife Australia: DATAHOLDER: Woodside 5. Cannel et al. 2019 DATAHOLDER: UWA and BirdLife Australia		
Turtles	**SM06** Beach surveys (recording species, nests, and false crawls).	**Studies:**		
		1. Exmouth Islands Turtle Monitoring Program. 2. Ningaloo Turtle Program 3. Turtle activity and nesting on the Muiron Islands and Ningaloo Coast (2018). 4. Spatial and temporal use of inter-nesting habitat by sea turtles along the Murion Islands and Ningaloo Coast – 2018-2019	N/A – See Table D-1	N/A – see Table D-1
		Methods:		
		1. Astron (on behalf of Santos) to address a gap in the knowledge of turtle numbers at key locations (offshore islands within the region) that are not currently part of an existing monitoring programs (e.g. the NTP). Field surveys were conducted in October 2013 and January 2014. Surveys were conducted on 12 islands, with each island surveyed once (with the exception of Beach 8 at North Muiron Island) and all tracks counted. 2. Long term trends in marine turtle populations, beach surveys, track counts, best location, mortality counts. 3. On-beach monitoring and aerial surveys. 4. Tagging (satellite transmitter), analysis of internesting, migration and foraging grounds movements and behaviour.		
		References/Data:		
		1.Santos – Report. 2. NTP Annual Reports DATAHOLDERS: DBCA. Reports available at http://www.ningalooturtles.org.au/media_reports.html 3.Rob et al. 2019 DATAHOLDER: DBCA 4.Tucker et al. 2019 DATAHOLDER: DBCA		
Fish	**SM09**	**Studies:**		

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands	Rankin Bank & Glomar Shoal	Montebello AMP
	Baited Remote Underwater Video Stations (BRUVS), Visual Underwater Counts (VUC), Diver Operated Video (DOV).	1. AIMS/DBCA 2014 Baseline Ningaloo Survey – repeat and expansion on the LTM (Co-funded survey: Woodside and AIMS). 2. Demersal fish populations – baseline assessment (AIMS/WAMSI). 3. DBCA study measured Species Richness, Community Composition, and Target Biomass, through UVC. BRUVS studies determining max N, Species Richness, and Biomass. 4. Pilbara Marine Conservation Partnership Stereo BRUVS in shallow water (~10m) in 2014 in northern region of the Ningaloo Marine Park, in shallow water (~10m) inside the lagoonal reef of the Ningaloo Marine Park in 2016, in deep water (~40m) across the length of the Ningaloo Marine Park in 2015, in shallow water outside of Ningaloo Reef from Waroora to Jurabi in 2015 and offshore of the Muiron Islands in 2015. 5. Elasmobranch faunal composition of Ningaloo Marine Park. 6. Juvenile fish recruitment surveys at Ningaloo reef. 7. Demersal fish assemblage sampling method comparison 8. Ningaloo Outlook (CSIRO) - Shallow and Deep Reefs Program	1. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.	1. CSIRO – Fish Diversity. 2. Fish species richness and abundance.
		Methods:		
		1. UVC surveys. 2. BRUVS Study with 304 video samples at three specific depth ranges (1-10 m, 10-30 m and 30-110m). 3. UVC surveys. 4. Stereo BRUVS 5. Snorkel and Scuba surveys. 5. Underwater visual census. 6. Diver operated video. 7. Diver UVC. 8. Diver UVC, stereo BRUVs	1. BRUVs. 2. BRUVs. 3. BRUVs. 4. BRUVs.	1. Semi V Wing trawl net or an epibenthic sled. 2. ROV Video.
		References/Data:		
		1. AIMS 2014. DATAHOLDER: AIMS/Woodside. 2. Fitzpatrick et al. 2012. DATAHOLDERS: WAMSI, AIMS. 3. DBCA unpublished data. DATAHOLDER: DBCA/AIMS. 4. CSIRO Data DATAHOLDER: CSIRO Data Centre ([redacted]). 5. Stevens, J.D., P.R., White, W.T., McAuley, R.B., Meekan, M.G. 2009. 6. WAMSI unpublished data DATAHOLDER: AIMS ([redacted]). 7. DATAHOLDER: WAMSI 8. CSIRO – Ningaloo Outlook 2020.	1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3. Currey-Randall et. al., 2019. DATAHOLDER: AIMS 4. Currey-Randall et. al., 2019. DATAHOLDER: AIMS	1. Keesing 2019. 2. McLean et al. 2019.

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ANNEX E: TACTICAL RESPONSE PLANS

TACTICAL RESPONSE PLANS
Exmouth
Mangrove Bay
Turquoise Bay
Yardie Creek
Muiron Islands
Jurabi to Lighthouse Beaches Exmouth
Ningaloo Reef - Refer to Mangrove/ Turquoise Bay and Yardie Creek
Exmouth Gulf
Shark Bay Area 1: Carnarvon to Wooramel
Shark Bay Area 2: Wooramel to Petite Point
Shark Bay Area 3: Petite Point to Dubaut Point
Shark Bay Area 4: Dubaut Point to Herald Bight
Shark Bay Area 5: Herald Bight to Eagle Bluff
Shark Bay Area 6: Eagle Bluff to Useless Loop
Shark Bay Area 7: Useless Loop to Cape Bellefin
Shark Bay Area 8: Cape Bellefin to Steep Point
Shark Bay Area 9: Western Shores of Edel Land
Shark Bay Area 10: Dirk Hartog Island
Shark Bay Area 11: Bernier and Dorre Islands
Abrohlos Islands: Pelseart Group
Abrohlos Islands: Wallabi Group
Abrohlos Islands: Easter Group
Dampier
Rankin Bank & Glomar Shoals
Barrow and Lowendal Islands
Pilbara Islands – Southern Island Group
Montebello Island – Stephenson Channel Nth TRP
Montebello Island – Champagne Bay and Chippendale channel TRP
Montebello Island – Claret Bay TRP
Montebello Island – Hermite/Delta Island Channel TRP
Montebello Island – Hock Bay TRP
Montebello Island – North and Kelvin Channel TRP
Montebello Island – Sherry Lagoon Entrance TRP
Withnell Bay
Holden Bay
King Bay
No Name Bay / No Name Beach
Enderby Island – Dampier
Rosemary Island – Dampier
Legendre Island – Dampier
Karratha Gas Plant

KGP to Whitnell Creek
KGP to Northern Shore
KGP Fire Pond & Estuary
KGP to No Name Creek
Broome
Sahul Shelf Submerged Banks and Shoals
Clerke Reef (Rowley Shoals)
Imperieuse Island (Rowley Shoals)
Mermaid Reef (Rowley Shoals)
Scott Reef
Oiled Wildlife Response
Exmouth
Dampier region
Shark Bay

APPENDIX E NOPSEMA REPORTING FORMS

NOPSEMA Recordable Environmental Incident monthly Reporting Form
https://www.nopsema.gov.au/assets/Forms/A198750.doc

Report of an accident, dangerous occurrence or environmental incident
https://www.nopsema.gov.au/assets/Forms/N-03000-FM0831-Report-of-an-Accident-Dangerous-Occurrence-or-Environmental-Incident-Rev-8-Jan-2015-MS-Word-2010.docx

APPENDIX F STAKEHOLDER CONSULTATION

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1. Consultation

1.1 Email sent to ABF, DISER, DBCA, DMIRS, DoT and APPEA (22 June 2022)

Dear Stakeholder

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
Approx. Water Depth (m):	~113 m
Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Feedback:

If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.2 Email sent to Australian Fisheries Management Authority (AFMA) (22 June 2022)

Dear AFMA

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A 1 km radius Operational Area will be applied around the TPA03 drill centre.
A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
Approx. Water Depth (m):	~113 m
Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Commercial fishing implications:

Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are three overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Skipjack Fishery

Woodside has provided information to the fishery's representative organisation 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.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure	Physical presence of infrastructure on seafloor causing interference or displacement	Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and, government departments and agencies to inform decision making for

		the proposed activity and development of the EP Notification to relevant stakeholders prior to the commencement of activities TPA03 well to continue to be marked on navigational charts
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements
Seabed disturbance	Disturbance to the seabed from removal activities	No anchoring of vessels Attempted retrieval of dropped objects
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users Notification to relevant fishery stakeholders and Government maritime safety agencies of specific start and end dates, specific vessel-on-location and any exclusion zones prior to commencement of the activity A 1 km radius Operational Area will be applied around the TPA03 drill centre A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment

Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.3 Email sent to Australian Hydrographic Office (AHO) and Australian Maritime Safety Authority (AMSA) – Maritime Safety (22 June 2022)

Dear AHO / AMSA

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website), and shipping lane map is attached.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
Approx. Water Depth (m):	~113 m
Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.4 Email sent to Department of Transport (30 June 2022)

Dear [redacted]

As part of Woodside's ongoing consultation for its current and planned activities, I would like to advise WA Department of Transport (DoT) that Woodside is preparing the TPA03 Well Intervention Environment Plan. The planned well intervention activities will be undertaken on the TPA03 production well (within Production Licence WA-5-L) to remediate a down-hole valve and continue production from the lower reservoir.

Woodside would like to offer DoT the opportunity to review or provide comment on the activity.

Information is presented as follows:

- A Consultation Information Sheet is available on our website here, providing information on the proposed activities.

- The *TPA03 Well Intervention First Strike Plan* is attached. This will form part of the approval submission in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

- In the table below, as requested in the *Offshore Petroleum Industry Guidance Note* (July 2020) and from recent engagement activities between DoT and Woodside, responses to the information requirements in a succinct summary and source of information.

Woodside proposes to submit an EP on 29 July 2022 to support these activities. Whilst we appreciate that this is earlier than DoT's required six-week review period, the TPA03 oil spill assessment uses the same loss of well containment and diesel scenarios that were previously assessed by DoT in 2021 for the Goodwyn Alpha Operations EP five-year revision. Should you require additional information or have a comment to make about the proposed activity, please contact me by close of business 22 July 2022 to allow incorporation of any amendments prior to the assessment period closing.

If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Many thanks,

[redacted]

Information Requested in the Offshore Petroleum Industry Guidance Note (July 2020)	Information Provided & Reference
Description of activity, including the intended schedule, location (including coordinates), distance to nearest landfall and map.	Included in the consultation information sheet
Worst case spill volumes.	Included in Appendix A of the First Strike Plan
Known or indicative oil type/properties.	Included in Appendix A of the First Strike Plan
Amenability of oil to dispersants and window of opportunity for dispersant efficacy.	Dispersant is not deemed to be suitable for marine diesel spill.

Description of existing environment and protection priorities.	Included in Section 3 of the First Strike Plan	
Details of the environmental risk assessment related to marine oil pollution - describe the process and key outcomes around risk identification, risk analysis, risk evaluation and risk treatment. For further information see the Oil Pollution Risk Management Information Paper (NOPSEMA 2021).	Unplanned loss of containment events from the Petroleum Activities Program have been identified during the risk assessment process (presented in 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. Two unplanned events or credible spill scenario for the Petroleum Activities Program have been selected as representative across types, sources and incident/response levels, up to and including the WCCS. Table 2-1 of the OSPRMA presents the credible scenarios for the Petroleum Activities Program. Two worst-case credible scenarios (CS-01 and CS-02) have been used for response planning purposes for the activity as all other scenarios are of a lesser scale and extent. By demonstrating capability to meet and manage an event of this size and timescale, Woodside assumes relevant scenarios that are smaller in nature and scale can also be managed by the same capability. Response performance outcomes have been defined based on a response to the WCCS.	
Outcomes of oil spill trajectory modelling, including predicted times to enter State waters and contact shorelines.	**Credible Scenario-01 – Unplanned hydrocarbon release of condensate – loss of well containment during well intervention** 108,843 m^3 release of condensate over 71 days. 0.8% residual component of 870.7 m^3 or 12.2 m^3 per day	**Credible Scenario-02 – Surface release of Marine Diesel Oil after a vessel fuel tank rupture near the well** Instantaneous release of 1000 m^3. 5% residue of 50 m^3
	Minimum time to shoreline contact (above 100 g/m^2) in days	Minimum time to shoreline contact (above 100 g/m^2) in days
	No contact at response thresholds	*No contact at response thresholds*
Details on initial response actions and key activation timeframes.	Included in Section 2 of the First Strike Plan	
Potential Incident Control Centre arrangements.	Included in Appendix D and E of the First Strike Plan	
Potential staging areas / Forward Operating Base.	A Forward Operating Base can be established at Exmouth and/ or Dampier.	
Details on response strategies.	Included in Section of the First Strike Plan	
Use of DoT equipment resources	Woodside has access to its own and contracted stockpiles of response equipment and acknowledges	

	that potential use of DoT resources cannot be assumed and is at the discretion of DoT.
Details and diagrams on proposed IMT structure including integration of DoT arrangements as per this IGN.	Included in Appendix D and E of the First Strike Plan
Details on testing of arrangements of OPEP/OSCP.	• Level 1 Response – one Level 1 First Strike drill must be conducted during the activity. For campaigns with an operational duration of greater than one month this will occur within the first two weeks of commencing the activity and then at least every 6 month hire period thereafter. • Level 2 Response – Level 2 Emergency Management exercises are relevant to activities with an operational duration of one month or greater. At least one Emergency Management exercise per MODU/vessel per campaign must be conducted within the first month of commencing the activity and then at every 6 month hire period thereafter, where applicable based on duration. • Level 3 Response – 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. **Testing of Oil Spill Response Arrangements** 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. 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.

	The hydrocarbon spill arrangements included within 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. 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 within the schedule, up to eight formal exercises are planned annually, across Woodside, to specifically test arrangements for responding to a hydrocarbon spill to the marine environment. 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).
Additional comments	Please note some of the links in the document are still being finalised, and as such may show a reference error in the attached version.

1.5 Email sent to Australian Maritime Safety Authority (AMSA) – Marine Pollution (30 June 2022)

Dear [redacted]

As part of Woodside's ongoing consultation for its current and planned activities, I would like to advise the Australian Maritime Safety Authority (AMSA) that Woodside is preparing the TPA03 Well Intervention Environment Plan. The planned well intervention activities will be undertaken on the TPA03 production well (within Production Licence WA-5-L) to remediate a down-hole valve and continue production from the lower reservoir.

Woodside would like to offer AMSA the opportunity to review or provide comment on the activity.

Information is presented as follows:

- A Consultation Information Sheet is available on our website here, providing information on the proposed activities.

- The *TPA03 Well Intervention First Strike Plan* is attached. This will form part of the approval submission in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please note that the TPA03 oil spill assessment uses the same loss of well containment and diesel scenarios that were previously assessed in 2021 for the Goodwyn Alpha Operations EP five-year revision.

Woodside proposes to submit an EP on 29 July 2022 to support these activities. Should you require additional information or have a comment to make about the proposed activity, please contact me by close of business 22 July 2022 to allow incorporation of any amendments prior to the assessment period closing.

If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Many thanks,

1.6 Email sent to Department of Climate Change, Energy, the Environment and Water Agriculture (DCCEEW) (formerly the Department of Agriculture, Water and the Environment (DAWE)) (22 June 2022)

Dear DAWE

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A 1 km radius Operational Area will be applied around the TPA03 drill centre.
A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
Approx. Water Depth (m):	~113 m
Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Commercial fishing implications:

Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are three overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Skipjack Fishery

Woodside has provided information to the fishery's representative organisation 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.

Biosecurity:

With respect to the biosecurity matters, please note the following information below:

Environment description:	
The Operational Area is located in water depths of approximately 115 m and traverses the Northwest Shelf Province. The Operational Area lies on the outer continental shelf and the seabed is relatively flat with a gentle slope seaward. The seabed is comprised of soft sediment and is relatively featureless.	
Potential IMS risk	***IMS mitigation management***
Accidental introduction and establishment of invasive marine species	Vessels are required to comply with the Australian Biosecurity Act 2015, specifically the Australian Ballast Water Management Requirements (as defined under the Biosecurity Act 2015) (aligned with the International Convention for the Control and Management of Ships' Ballast Water and Sediments) to prevent introducing IMS. Vessels will be assessed and managed to prevent the introduction of invasive marine species in accordance with Woodside's Invasive Marine Species Management Plan. Woodside's Invasive Marine Species Management Plan includes a risk assessment process that is applied to vessels undertaking Activities. Based on the outcomes of each IMS risk assessment, Management measures commensurate with the risk (such as the treatment of internal systems, IMS inspections or cleaning) will be implemented to minimise the likelihood of IMS being introduced.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	**Risk Description**	**Mitigation And / Or Management Measures**
Planned		
Physical presence of infrastructure	Physical presence of infrastructure on seafloor causing interference or displacement	Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and, government departments and agencies to inform decision making for the proposed activity and development of the EP Notification to relevant stakeholders prior to the commencement of activities TPA03 well to continue to be marked on navigational charts
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result	All routine marine discharges will be managed according to legislative and regulatory requirements

	in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	
Seabed disturbance	Disturbance to the seabed from removal activities	No anchoring of vessels Attempted retrieval of dropped objects
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users Notification to relevant fishery stakeholders and Government maritime safety agencies of specific start and end dates, specific vessel-on-location and any exclusion zones prior to commencement of the activity A 1 km radius Operational Area will be applied around the TPA03 drill centre A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.7 Email sent to Director of National Parks (22 June 2022)

Dear Director of National Parks

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

We note Australian Government Guidance on consultation activities and confirm that:

- The proposed activities are outside the boundaries of a proclaimed Australian Marine Parks, with the Operational Area located approximately 33 km north of the Montebello Marine Park Multiple Use Zone (Cwlth)
- We have assessed potential risks to Australian Marine Parks (AMPs) in the development of the proposed Environment Plan and believe that there are no credible risks as part of planned activities that have potential to impact the values of the Marine Parks.
- In the unlikely event of a loss of hydrocarbons, the worst case credible spill scenario assessed for this activity a loss of well integrity. For this consequence to occur, there must be a failure of multiple physical and procedural barriers within the well relevant to the activity. Given the controls in place to prevent and control loss of well control events and mitigate their consequences, it is considered that the risk associated with a loss of well integrity is managed to as low as reasonably practical. In the unlikely event of a loss of well integrity, there is a risk of condensate entering the:
    - Abrolhos Marine Park
    - Argo-Rowley Terrace Marine Park
    - Carnarvon Canyon Marine Park
    - Gascoyne Marine Park
    - Montebello Marine Park
    - Ningaloo Marine Park
    - Shark Bay Marine Park
- A Commonwealth Government-approved oil spill response plan will be in place for the duration of the activities, which will include notification to relevant agencies and organisations as to the nature and scale of the event, as soon as practicable

following an occurrence. The Director of National Parks will be advised if an environmental incident occurs that may impact on the values of the Marine Park.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
Approx. Water Depth (m):	~113 m
Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Feedback:
If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.8 Email sent to Department of Primary Industries and Regional Development (DPIRD) (22 June 2022)

Dear [redacted]

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
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Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery

Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure	Physical presence of infrastructure on seafloor causing interference or displacement	Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and, government departments and agencies to inform decision making for the proposed activity and development of the EP Notification to relevant stakeholders prior to the commencement of activities TPA03 well to continue to be marked on navigational charts
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements
Seabed disturbance	Disturbance to the seabed from removal activities	No anchoring of vessels Attempted retrieval of dropped objects
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users Notification to relevant fishery stakeholders and Government maritime safety agencies of specific start and end dates, specific

		vessel-on-location and any exclusion zones prior to commencement of the activity A 1 km radius Operational Area will be applied around the TPA03 drill centre A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:
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Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.9 Letter sent to Mackerel Managed Fishery (Area 2) (22 June 2022)

Woodside

Woodside Energy Ltd.
ACN 005 482 986
Mia Yellagonga
11 Mount Street
Perth WA 6000
Australia
T +61 8 9348 4000
F +61 8 9214 2777
www.woodside.com.au

Please direct all responses/queries to:
Woodside Feedback
T: 1800 442 977
E: Feedback@woodside.com.au

22 June 2022

Dear Mackerel Managed Fishery

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A 1 km radius Operational Area will be applied around the TPA03 drill centre.
A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
Approx. Water Depth (m):	~113 m

Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
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Physical presence of infrastructure	Physical presence of infrastructure on seafloor causing interference or displacement	Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and, government departments and agencies to inform decision making for the proposed activity and development of the EP Notification to relevant stakeholders prior to the commencement of activities TPA03 well to continue to be marked on navigational charts
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements
Seabed disturbance	Disturbance to the seabed from removal activities	No anchoring of vessels Attempted retrieval of dropped objects
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users

		Notification to relevant fishery stakeholders and Government maritime safety agencies of specific start and end dates, specific vessel-on-location and any exclusion zones prior to commencement of the activity A 1 km radius Operational Area will be applied around the TPA03 drill centre A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:
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Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

Woodside Feedback

Woodside Energy
Mia Yellagonga
Karlak, 11 Mount Street
Perth WA 6000
Australia

T: 1800 442 977
E: feedback@woodside.com.au
www.woodside.com

Attached: Consultation Information Sheet and fisheries map

1.10 Email sent to Pilbara Line Fishery, Pilbara Trap Fishery (22 June 2022)

Dear Fisheries Stakeholder

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A 1 km radius Operational Area will be applied around the TPA03 drill centre.
A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
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Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.

Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
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Physical presence of infrastructure	Physical presence of infrastructure on seafloor causing interference or displacement	Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and, government departments and agencies to inform decision making for the proposed activity and development of the EP Notification to relevant stakeholders prior to the commencement of activities TPA03 well to continue to be marked on navigational charts
Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements
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Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
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Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.11 Email sent to BP Developments Australia (23 June)

Dear [redacted]

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

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The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and titleholder map is attached.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier
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Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.12 Email sent to Commonwealth Fisheries Association (CFA), Australian Southern Bluefin Tuna Industry Association (ASBTIA) and Tuna Australia (22 June 2022)

Dear Fisheries Stakeholder

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

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A 1 km radius Operational Area will be applied around the TPA03 drill centre.
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We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

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Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Commercial fishing implications:

Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are three overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Skipjack Fishery

Woodside has provided information to the fishery's representative organisation 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.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure	Physical presence of infrastructure on seafloor causing interference or displacement	Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and, government departments and agencies to inform decision making for the proposed activity and development of the EP Notification to relevant stakeholders prior to the commencement of activities TPA03 well to continue to be marked on navigational charts

Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements
Seabed disturbance	Disturbance to the seabed from removal activities	No anchoring of vessels Attempted retrieval of dropped objects
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users Notification to relevant fishery stakeholders and Government maritime safety agencies of specific start and end dates, specific vessel-on-location and any exclusion zones prior to commencement of the activity A 1 km radius Operational Area will be applied around the TPA03 drill centre A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
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Feedback:

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Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.13 Email sent to Pearl Producers Australia (PPA) (22 June 2022)

Dear [redacted]

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An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

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Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery
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Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:
If you have any feedback on these activities, please respond to Woodside at:
Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.14 Email sent to Western Australian Fishing Industry Association (WAFIC) (22 June 2022)

Dear [redacted]

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A 1 km radius Operational Area will be applied around the TPA03 drill centre.
A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Please provide your views by **22 July 2022**.

Activity:

Summary:	Well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.
Location:	~138 km north west of Dampier

Approx. Water Depth (m):	~113 m
Schedule:	Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Duration:	Well intervention activities are expected to take approximately 2 weeks to complete.
Relevant Fisheries:	**Commonwealth:** None **State:** Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery, Pilbara Line Fishery
Exclusionary/Cautionary Zone:	A 1 km radius Operational Area will be applied around the TPA03 drill centre. A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Vessels:	Heavy Well Intervention Vessel (HWIV) General supply/support vessels

Commercial fishing implications:

Woodside has assessed potential impacts for commercial fisheries based on Fishcube, ABARES/AFMA data, fishing methods and water depth. We note there are three overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Skipjack Fishery

Woodside has provided information to the fishery's representative organisation 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.

Potential risks to commercial fishing and proposed mitigation measures:

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure	Physical presence of infrastructure on seafloor causing interference or displacement	Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and, government departments and agencies to inform decision making for the proposed activity and development of the EP Notification to relevant stakeholders prior to the commencement of activities TPA03 well to continue to be marked on navigational charts

Marine discharges	Discharges from the operation of project vessels may include sewage, grey water, drain and bilge water, cooling water and brine. These discharges may result in a localised short-term reduction in water quality however they will be rapidly diluted and dispersed in the water column	All routine marine discharges will be managed according to legislative and regulatory requirements
Seabed disturbance	Disturbance to the seabed from removal activities	No anchoring of vessels Attempted retrieval of dropped objects
Vessel interaction	The presence of vessels may preclude other marine users from access to the area	Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users Notification to relevant fishery stakeholders and Government maritime safety agencies of specific start and end dates, specific vessel-on-location and any exclusion zones prior to commencement of the activity A 1 km radius Operational Area will be applied around the TPA03 drill centre A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area
Unplanned Risks		
Hydrocarbon release	Loss of hydrocarbons to the marine environment from a well or vessel collision resulting in a tank rupture	Appropriate spill response plans, equipment and materials will be in place and maintained Appropriate refuelling procedures and equipment will be used to prevent spills to the marine environment
Invasive Marine Species	Introduction or translocation and establishment of invasive marine species to the area via vessels ballast water or biofouling	All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species Compliance with Australian biosecurity requirements and guidance

Feedback:

If you have any feedback on these activities, please respond to Woodside at: Feedback@woodside.com.au or 1800 442 977.

Your feedback and our response will be included in our Environment Plan which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by **22 July 2022**.

1.15 Woodside Consultation Information Sheet (sent to all relevant persons)

Woodside Energy

STAKEHOLDER CONSULTATION

INFORMATION SHEET

June 2022

TPA03 WELL INTERVENTION ENVIRONMENT PLAN

CARNARVON BASIN, NORTH-WEST AUSTRALIA

Proposed activity

Woodside is planning to undertake well intervention activities on the TPA03 production well to remediate a down-hole valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

Project Vessels

The proposed TPA03 well intervention activities will be performed by a Heavy Well Intervention Vessel (HWIV). The project may be supported by general support vessels. The project vessels will operate on dynamic positioning (DP) and will not anchor/moor on the seabed.

Well intervention activities for the TPA03 well are currently expected to take approximately 2 weeks to complete. It is anticipated that vessels will operate 24 hours per day for the duration of the activities.

Communications with mariners

A 1 km radius Operational Area will be applied around the TPA03 drill centre.

A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.

Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area and remain clear of the Exclusion zone. The TPA03 well will continue to be marked on navigational charts.

Background

During routine testing of the TPA03 production well, the valve controlling production from the lower reservoir zone, was closed to test the reservoirs. The well intervention activities will enable access to the well's lower reservoir to be restored so as to continue production (the purpose of this Environment Plan (EP)). All other petroleum activities within the scope of the accepted GWA Facility Operations EP, have been or will be, completed in accordance with that EP, and are not included in the scope of this EP.

Assessment

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant persons, considering timing, duration, location and potential impacts arising from the planned activities. A number of mitigation and management measures will be implemented and are summarised in **Table 2**. Further details will be provided in the EP.

In preparing the Environment Plan, our intent is to minimise environmental and social impacts associated with the proposed activities, and we are seeking any interest or comments you may have to inform our decision making.

Joint Venture

Woodside Energy Ltd is operator on behalf of the North West Shelf joint venture, consisting of BHP Petroleum (North West Shelf) Pty Ltd*, BP Developments Australia Pty Ltd, Chevron Australia Pty Ltd, Japan Australia LNG (MIMI) Pty Ltd, Shell Developments (Australia) Pty Ltd and Woodside Energy Ltd.

** BHP Petroleum (North West Shelf) Pty Ltd became a member of the Woodside group of companies on the completion of the merger between Woodside Energy Group Ltd and the petroleum business of BHP Group Limited on 1 June 2022 and plans to change its name in July 2022.*

We welcome your feedback by 22 July 2022.

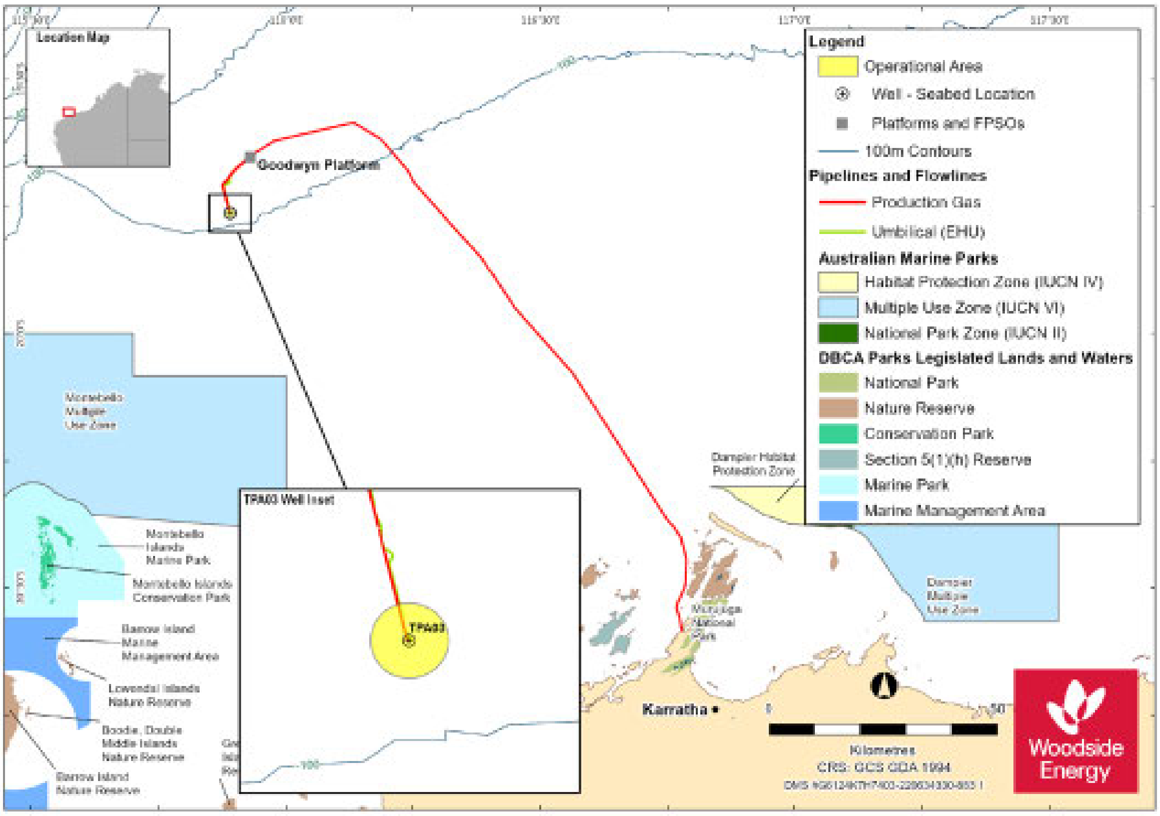


Figure 1. Petroleum Activity Program Operational Areas

Table 1. Activity summary

TPA03 Well Intervention Environment Plan	
Permit Area	• WA-5-L
Approximate location	• 19° 45' 43.618" S | 115° 53' 23.986" E
Approximate water depth	• ~113 m
Commencement date	• Planned well intervention activities will commence around Q4 2022 – Q1 2023, subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.
Approximate estimated duration	• Well intervention activities are expected to take approximately 2 weeks to complete.
Approximate location	• 19° 45' 43.618" S | 115° 53' 23.986" E
Vessels	• Heavy Well Intervention Vessel (HWIV) • General supply/support vessels
Exclusion zones	• A 1 km radius Operational Area will be applied around the TPA03 drill centre. • A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements.
Distance to nearest town	• ~138 km north west of Dampier
Distance to nearest marine park/nature reserve	• ~70 km north west of the Montebello Islands Marine Park (WA) • ~33 km north of the Montebello Marine Park – Multiple Use Zone (Cwlth)

Mitigation and Management Measures

Woodside has undertaken an assessment to identify potential impacts and risks to the marine environment arising from the activities considering timing, duration, location.

A number of mitigation and management measures for the TPA03 well intervention activities are outlined in **Table 2**. Further details will be provided in the EP.

Table 2. Summary of key risks and/or impacts and management measures during well intervention activities.

Potential Risk and/or Impact	Mitigation and/or Management Measure
Planned	
Physical presence of infrastructure on seafloor causing interference or displacement	• Consultation with relevant persons. For example, commercial fishers and their representative organisations, petroleum titleholders and government departments and agencies to inform decision making for the proposed activity and development of the EP. • Notification to relevant persons prior to the commencement of activities.
Chemical use	• Chemical use will be managed in accordance with Woodside and contractor chemical selection and approval procedures.
Marine discharges	• All routine marine discharges will be managed according to legislative and regulatory requirements.
Seabed disturbance	• No anchoring of project vessels. • Attempted retrieval of dropped objects and temporary installation equipment.
Vessel interaction	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • A 1 km radius Operational Area will be applied around the TPA03 drill centre. • A temporary 500 m safety exclusion zone will apply around the HWIV to manage vessel movements. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area. • Stakeholder engagement activities will be conducted as part of the EP.
Waste generation	• Waste generated on the vessels will be managed in accordance with legislative requirements and a Waste Management Plan. • Wastes will be managed and disposed of in a safe and environmentally responsible manner that prevents accidental loss to the environment. • Wastes transported onshore will be sent to appropriate recycling or disposal facilities by a licensed waste contractor.
Emissions to atmosphere	• Standard vessel operations.
Unplanned	
Hydrocarbon release	• Appropriate spill response plans, equipment and materials will be in place and maintained. • Appropriate procedures and equipment will be used to prevent spills to the marine environment.
Marine fauna interactions	• Vessel masters will implement interaction management actions in accordance with the *Environment Protection and Biodiversity Conservation Regulations 2000 (Cth)*.
Introduction of invasive marine species	• All vessels will be assessed and managed as appropriate to prevent the introduction of invasive marine species. • Compliance with Australian biosecurity requirements and guidance.

Feedback

Woodside consults relevant persons in the course of preparing Environment Plans to ensure relevant feedback informs its planning for proposed petroleum activities and builds upon Woodside's relevant person consultation for its offshore petroleum activities in the region.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before **22 July 2022** via:

E: Feedback@woodside.com.au

Toll free: 1800 442 977

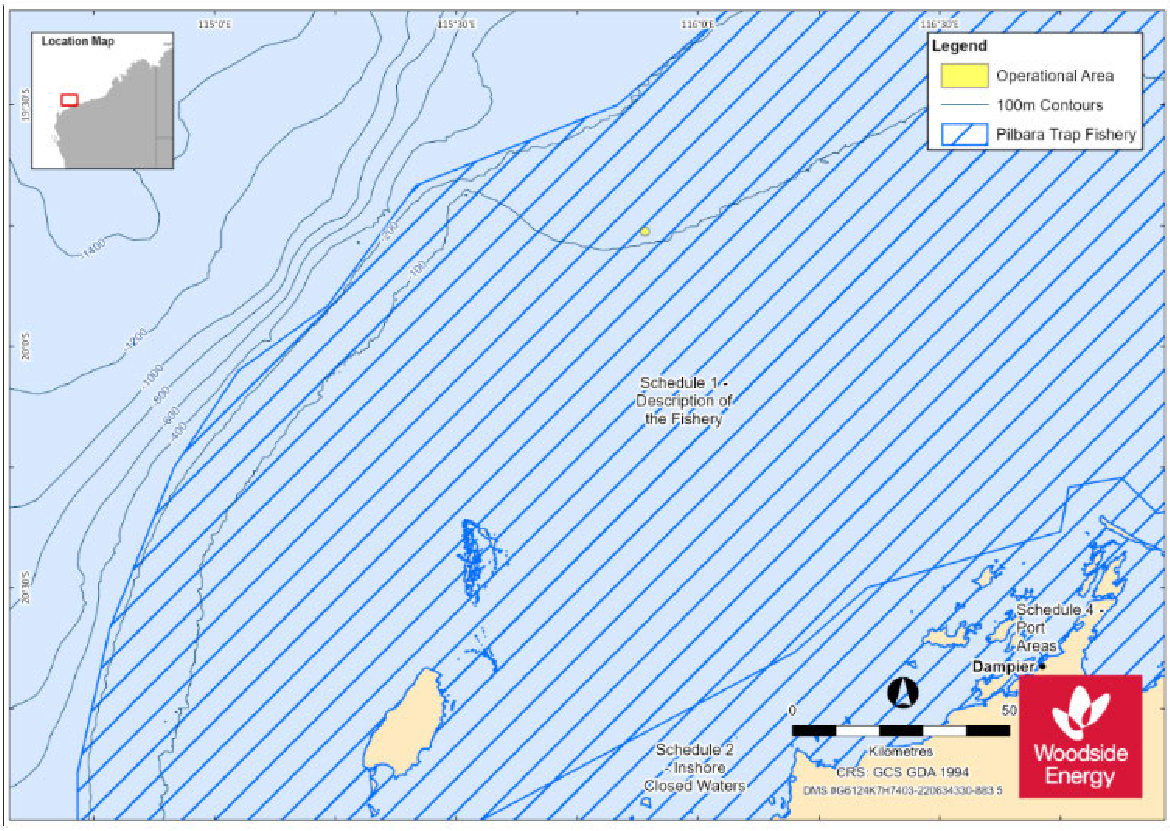
You can subscribe on our website to receive Consultation Information Sheets for proposed activities: www.woodside.com.au.

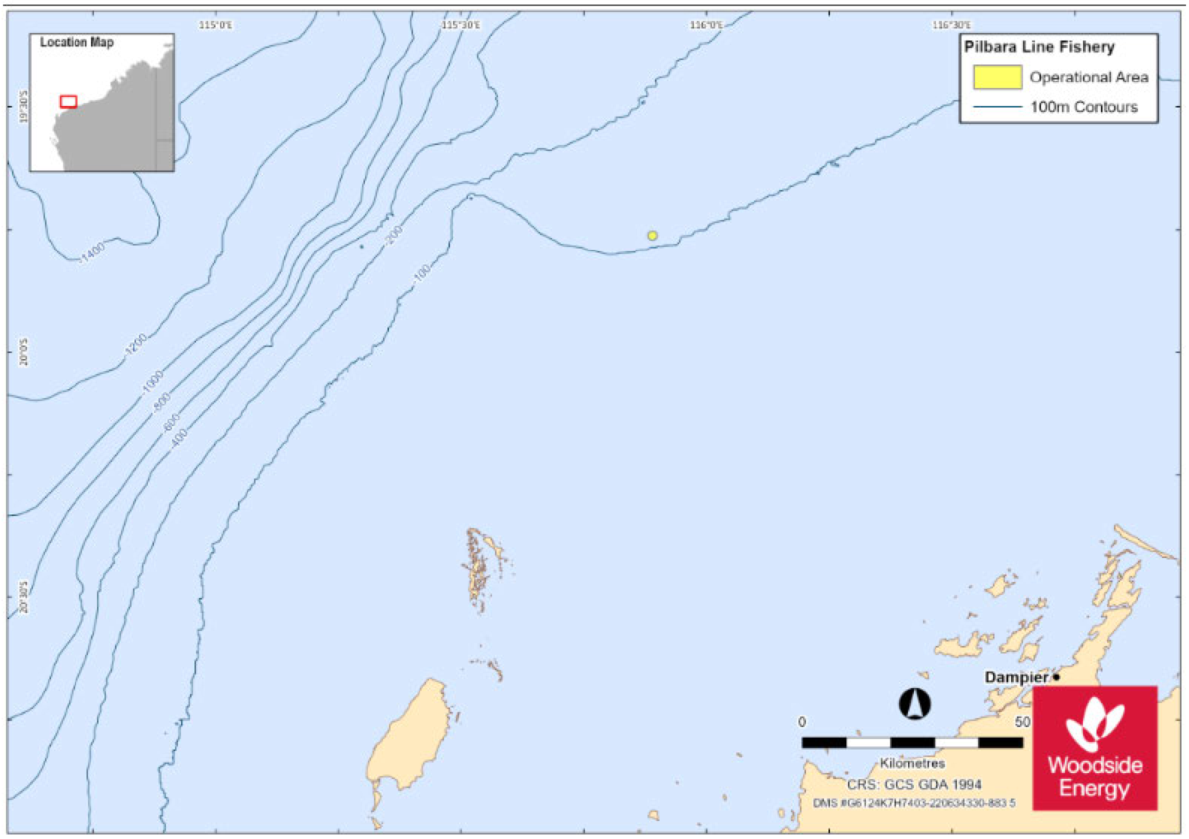
Please note that stakeholder feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) required under legislation. Woodside will communicate any material changes to the proposed activity to affected stakeholders as they arise.

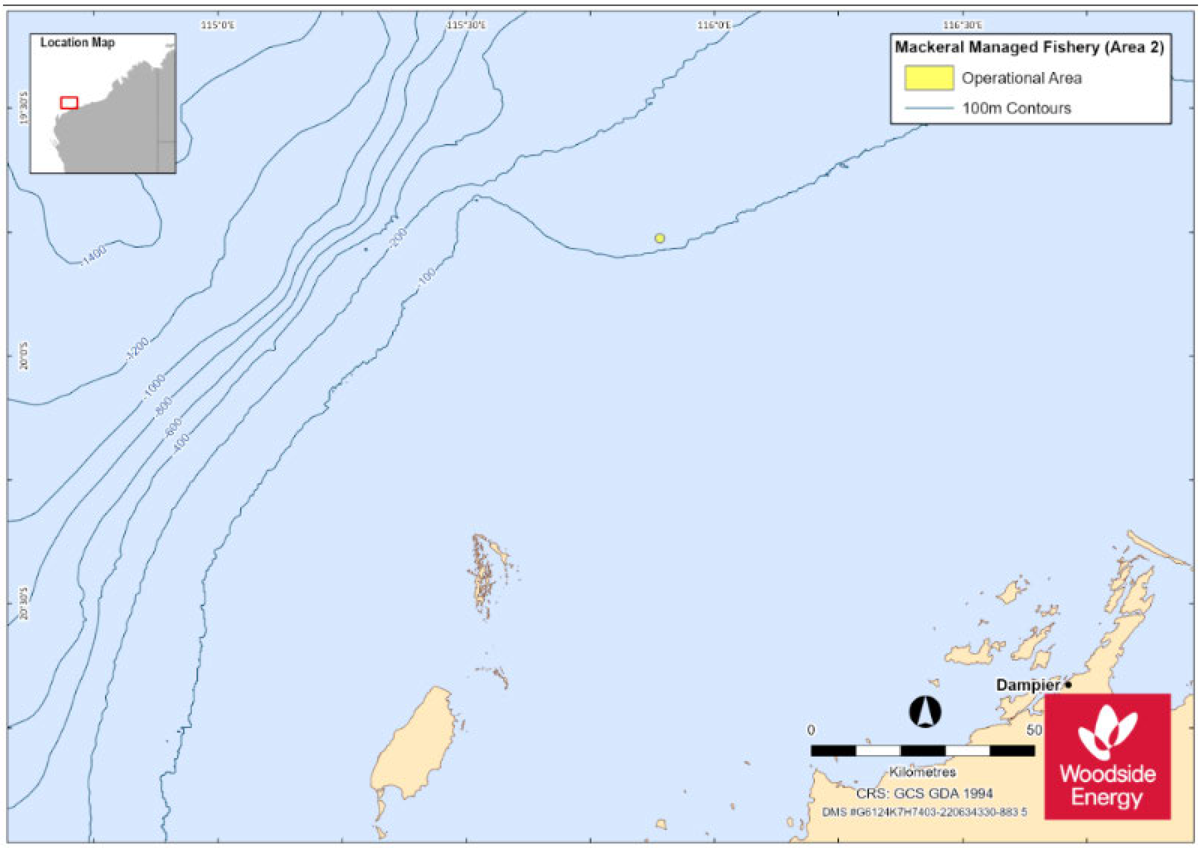
Please note that your feedback and our response will be included in our Environment Plan for the proposed activity, which will be submitted to the NOPSEMA for acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

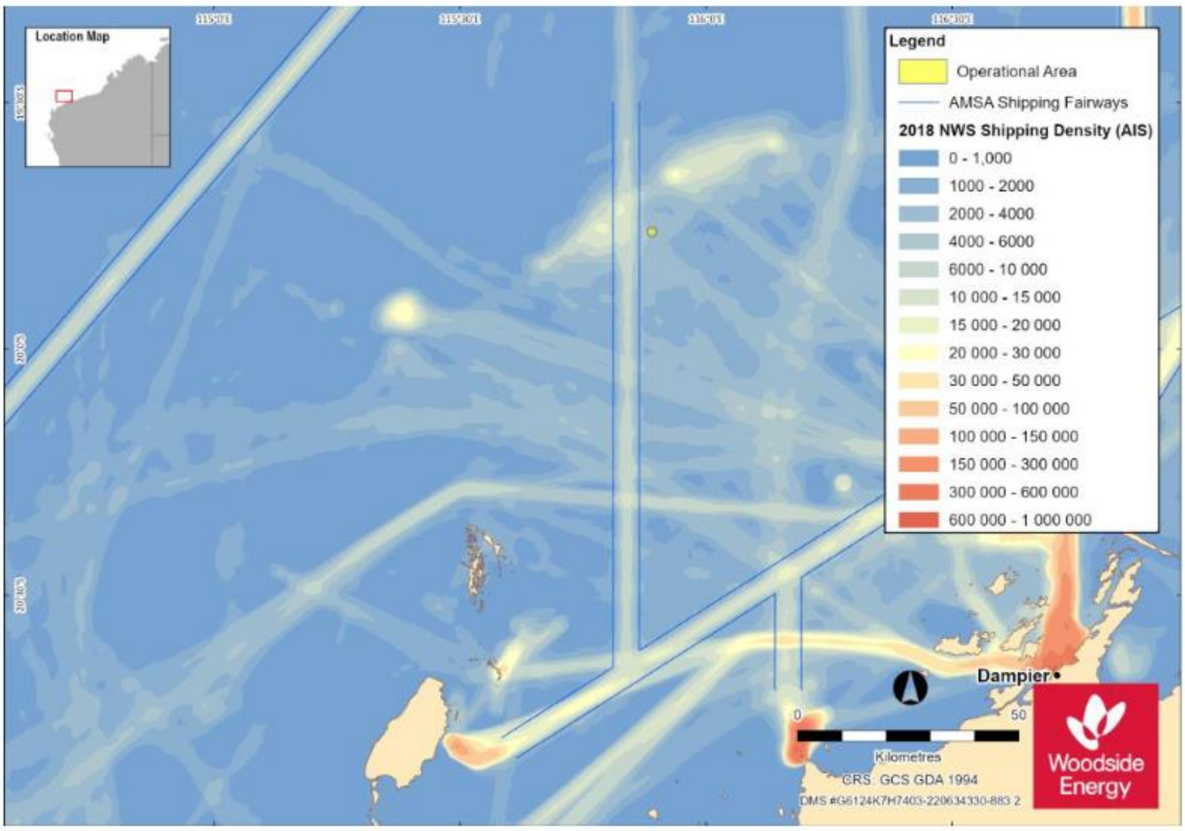
1.16 State fisheries map sent to DPIRD, WAFIC, PPA, Mackerel Managed Fishery (Area 2), Pilbara Trap Fishery and Pilbara Line Fishery (22 June 2022)



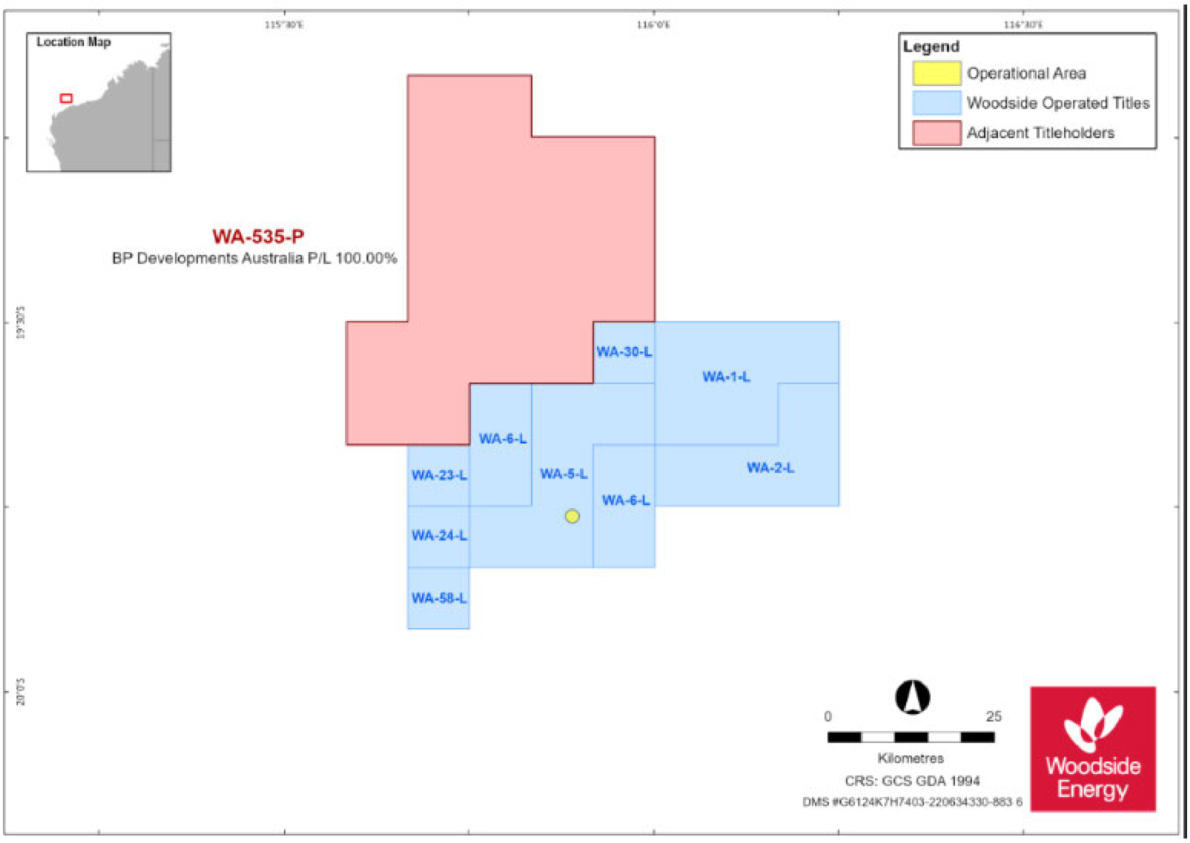




1.17 Shipping lane map sent to AHO and AMSA – Maritime Safety (22 June 2022)



1.18 Titleholder map sent to BP Development Australia (22 June 2022)



2. Additional consultation

2.1 Email sent to Director of National Parks (11 July 2022)

Dear Director of National Parks

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.2 Email sent to DPIRD (11 July 2022)

Dear [redacted]

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and relevant fisheries map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.3 Letter sent to Mackerel Managed Fishery (Area 2) (11 July 2022)

Woodside Energy Group Ltd
ACN 004 898 962
Mia Yellagonga
11 Mount Street
Perth WA 6000
Australia
T: +61 8 9348 4000
www.woodside.com

Please direct all responses/queries to:
Woodside Feedback
T: 1800 442 977
E: Feedback@woodside.com.au

11 July 2022

Dear Mackerel Managed Fishery

Woodside previously consulted you (letter attached) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and relevant fisheries map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

Woodside Feedback

Woodside Energy
Mia Yellagonga
Karlak, 11 Mount Street
Perth WA 6000
Australia

T: 1800 442 977
E: feedback@woodside.com.au
www.woodside.com

Attached: Consultation letter (22 June 2022), Consultation Information Sheet and fisheries map

2.4 Email sent to Pilbara Trap Fishery and Pilbara Line Fishery (11 July 2022)

Dear Fishery Stakeholder

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and relevant fisheries map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.5 Email sent to WAFIC (11 July 2022)

Dear [redacted]

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and relevant fisheries map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.6 Email sent to ABF, DISER, DMIRS, DoT and APPEA (12 July 2022)

Dear Stakeholder

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.7 Email sent to AFMA (12 July 2022)

Dear AFMA

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and relevant fisheries map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.8 Email sent to AMSA – Marine Safety (12 July 2022)

Dear AMSA

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and shipping lane map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.9 Email sent to DCCEEW *(formerly DAWE)* (12 July 2022)

Dear DAWE

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.10 Email sent to BP Developments Australia (12 July 2022)

Dear [redacted]

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and Titleholder map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.11 Email sent to CFA, ASBTIA and Tuna Australia (12 July 2022)

Dear Fisheries Stakeholder

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and relevant fisheries map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

2.12 Email sent to PPA (12 July 2022)

Dear [redacted]

Woodside previously consulted you (email below) on its plans to undertake well intervention activities on the TPA03 production well to remediate a down-hold valve and continue production from the lower reservoir.

The TPA03 production well is a dual zone well connected to the Tidepole manifold and forms part of the subsea production infrastructure for the Goodwyn Alpha Platform. Once the TPA03 well intervention has been completed, the well will be shut-in until production is required. The shut-in and subsequent return to production of the well will be managed under the accepted Goodwyn Alpha (GWA) Facility Operations Environment Plan (March 2022).

The activities will be undertaken in Commonwealth waters around 138 km north-west of Dampier in permit area WA-5-L. The TPA03 well is located in approximately 113 m water depth.

Activities are currently anticipated to be completed around Q4 2022 – Q1 2023. The timing and direction of the proposed activities is subject to change due to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

An information sheet (also on our website) and relevant fisheries map is attached.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **22 July 2022**.

Regards,

APPENDIX G DEPARTMENT OF PLANNING LAND, HERITAGE AND ABORIGINAL ENQUIRY SYSTEM RESULTS

Aboriginal Heritage Inquiry System

List of Other Heritage Places

Search Criteria

No Other Heritage Places in Shapefile - TPA03_OA

Disclaimer

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Map of Other Heritage Places

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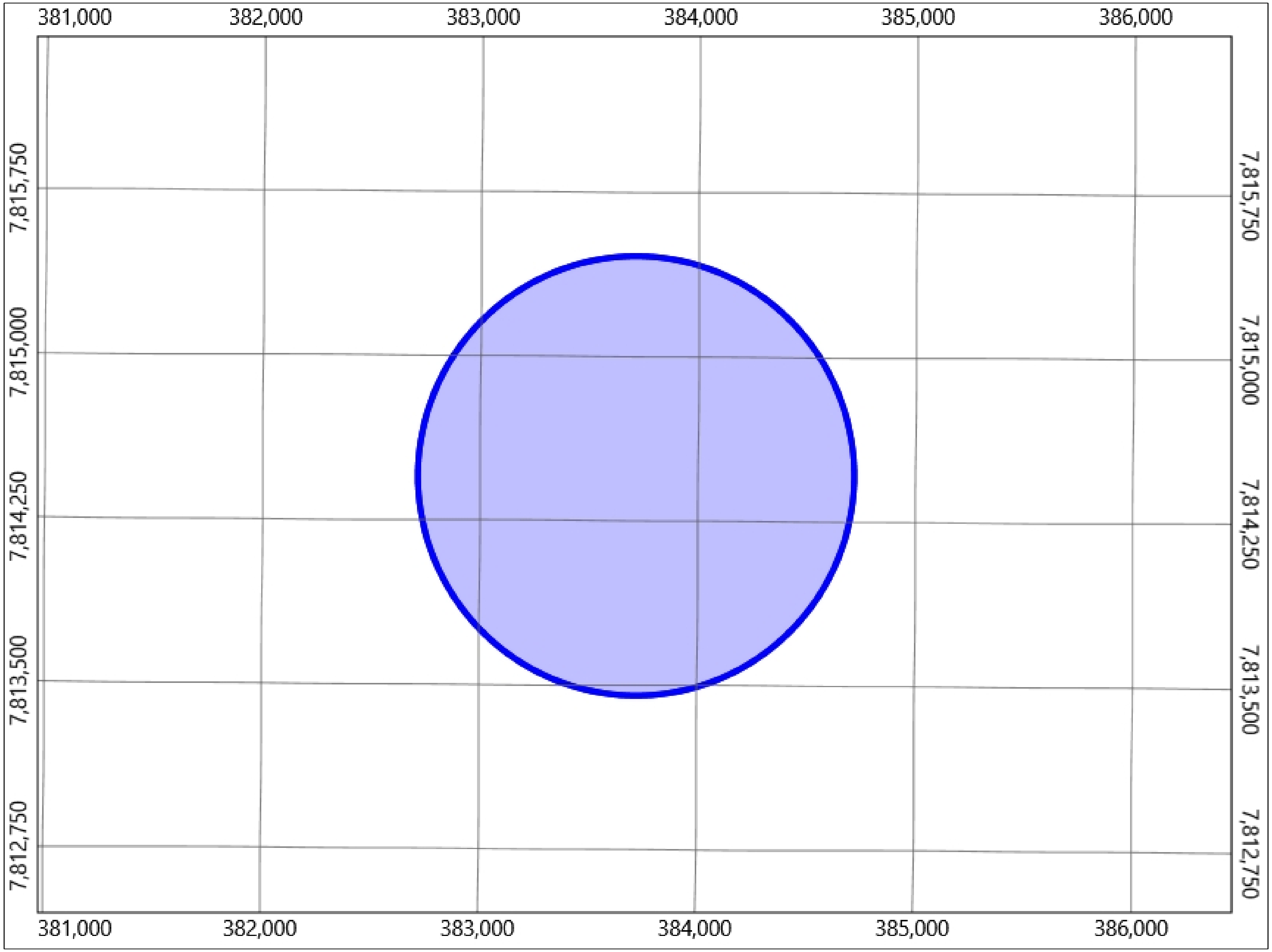


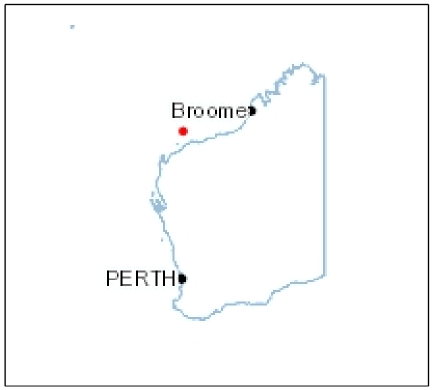
Legend

- Other Heritage Place
- Search Area
- Town
- Road
- River
- Local Government Authority

0.93 kilometres

Map Scale 1 : 28,200

MGA Zone 50 (GDA94)



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Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

Search Criteria

No Registered Aboriginal Sites in Shapefile - TPA03_OA

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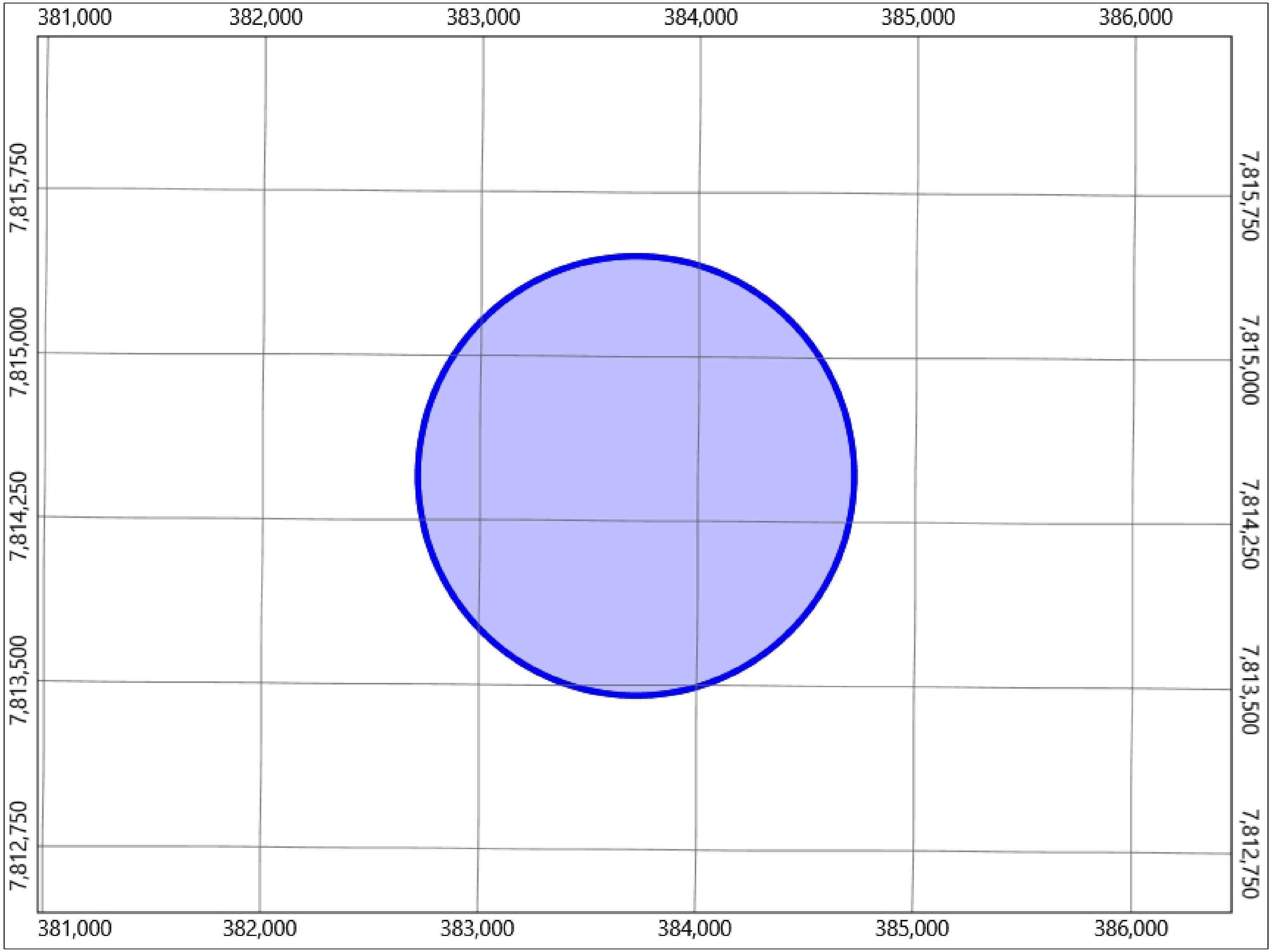


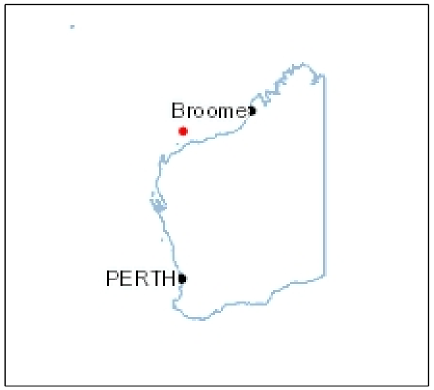
Legend

- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

0.93 kilometres

Map Scale 1 : 28,200

MGA Zone 50 (GDA94)



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Identifier: 625427

Aboriginal Heritage Inquiry System

List of Other Heritage Places

Search Criteria

6 Other Heritage Places in Shapefile - EMBA, 20220608_TPA03_EMBA/EMBA

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  - Female Access Only: Only females can view restricted information.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place. This has been replaced by the Place ID / Site ID.

Basemap Copyright

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
6786	LAKESIDE COASTAL PLAIN	No	No	No Gender Restrictions	Lodged	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	801642mE 7560649mN Zone 49 [Unreliable]	P06144
6789	TURQUOISE BAY NORTH	No	No	No Gender Restrictions	Lodged	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	798642mE 7554649mN Zone 49 [Unreliable]	P06147
7208	MILYERING ROCKS.	No	No	No Gender Restrictions	Lodged	Hunting Place	*Registered Knowledge Holder names available from DPL	800842mE 7560649mN Zone 49 [Reliable]	P05712
8951	BARROW ISLAND	No	No	No Gender Restrictions	Stored Data / Not a Site	Artefacts / Scatter	*Registered Knowledge Holder names available from DPL	335137mE 7705156mN Zone 50 [Unreliable]	P03542
11403	THEVENARD ISLAND	No	No	No Gender Restrictions	Stored Data / Not a Site	Midden / Scatter	*Registered Knowledge Holder names available from DPL	292638mE 7625655mN Zone 50 [Unreliable]	P00753
11801	COASTAL MIDDEN, 5 MILE	No	No	No Gender Restrictions	Lodged	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	195638mE 7582655mN Zone 50 [Unreliable]	P00345

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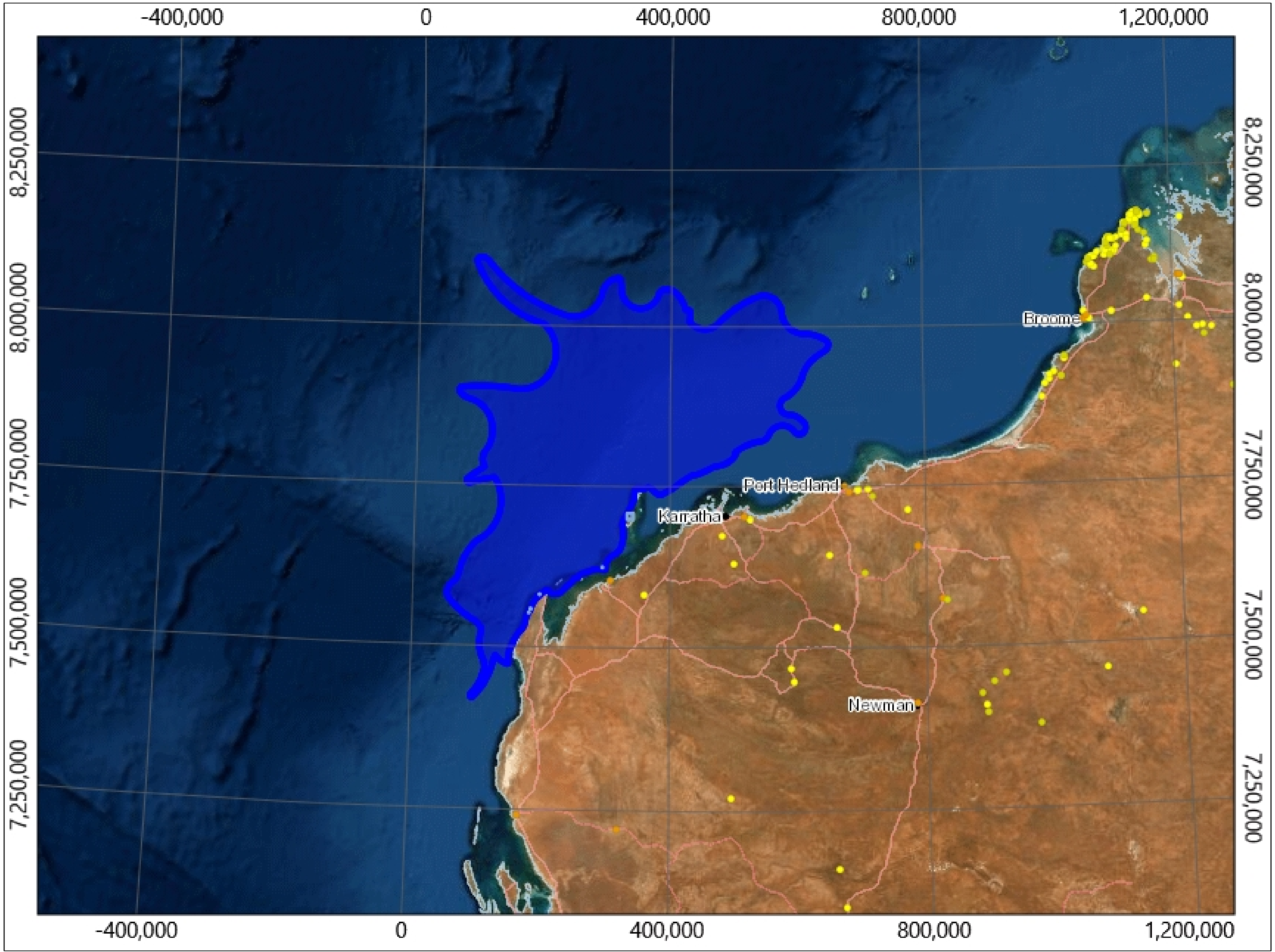

Legend

- Other Heritage Place
- Search Area
- Town
- Road
- River
- Local Government Authority

319.92 kilometres

Map Scale 1 : 9,690,000

MGA Zone 50 (GDA94)

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

Search Criteria

14 Registered Aboriginal Sites in Shapefile - EMBA, 20220608_TPA03_EMBA/EMBA. Warning: Search area complex so results may be inaccurate. Contact DPLH for assistance.

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ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
628	CAMP THIRTEEN BURIAL	No	No	No Gender Restrictions	Registered Site	Skeletal Material / Burial	*Registered Knowledge Holder names available from DPL	800392mE 7559449mN Zone 49 [Reliable]	P07434
6017	YARDIE CREEK CARAVAN BURIAL	No	No	No Gender Restrictions	Registered Site	Skeletal Material / Burial	*Registered Knowledge Holder names available from DPL	191538mE 7576555mN Zone 50 [Unreliable]	P07115
6761	LOW POINT MIDDEN	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	802992mE 7566299mN Zone 49 [Reliable]	P06172
6762	MILYERING MIDDEN	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	801342mE 7561449mN Zone 49 [Reliable]	P06173
6764	CAMP 17 SOUTH MIDDENS	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	799042mE 7555649mN Zone 49 [Unreliable]	P06175
6765	CAMP 17 NORTH MIDDENS	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	799042mE 7555849mN Zone 49 [Unreliable]	P06176
6801	NORTH T-BONE BAY	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	801666mE 7562059mN Zone 49 [Reliable]	P06159
7126	MESA CAMP	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	798442mE 7554749mN Zone 49 [Unreliable]	P05792
7265	LAKE SIDE VIEW	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DPL	800942mE 7560549mN Zone 49 [Reliable]	P05664
7305	MANGROVE BAY.	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter, Skeletal Material / Burial, Hunting Place	*Registered Knowledge Holder names available from DPL	804142mE 7568149mN Zone 49 [Reliable]	P05651
10381	VLAMING HEAD	Yes	Yes	No Gender Restrictions	Registered Site	Ceremonial, Mythological	*Registered Knowledge Holder names available from DPL	Not available when location is restricted	P01799
11400	YARDIE CREEK STATION	No	No	No Gender Restrictions	Registered Site	Engraving	*Registered Knowledge Holder names available from DPL	191638mE 7576655mN Zone 50 [Unreliable]	P00750

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
11401	5 Mile Well (Cape Range)	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Engraving, Painting, Quarry, Arch Deposit	*Registered Knowledge Holder names available from DPL	198638mE 7583655mN Zone 50 [Unreliable]	P00751
17448	CHUGORI ROCKHOLE	No	No	No Gender Restrictions	Registered Site	Ceremonial, Grinding Patches / Grooves, Man-Made Structure, Mythological, Water Source	*Registered Knowledge Holder names available from DPL	193492mE 7579323mN Zone 50 [Reliable]	

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

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Map of Registered Aboriginal Sites

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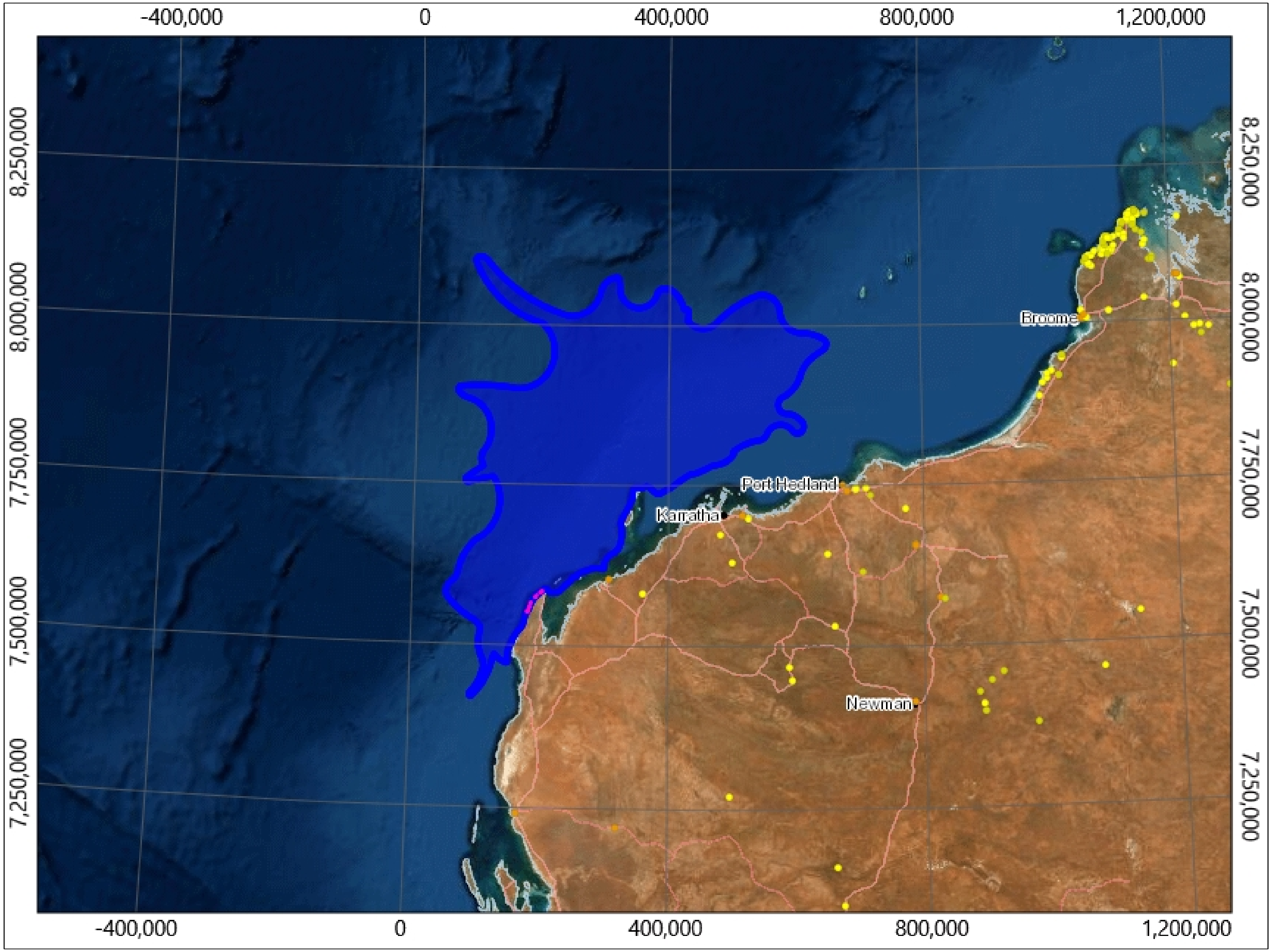


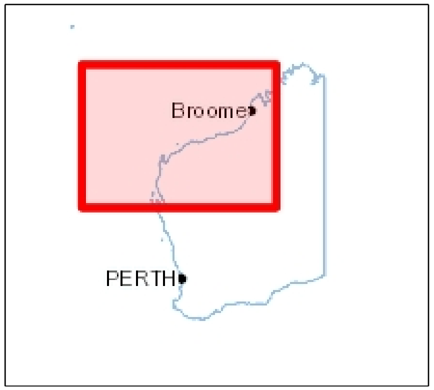
Legend

- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

319.92 kilometres

Map Scale 1 : 9,690,000

MGA Zone 50 (GDA94)



Map created: 16/06/2022 11:51:53 AM by: GIS_NET_USER

Identifier: 625420

APPENDIX H FIRST STRIKE PLAN

TPA03 Well Intervention – Oil Pollution First Strike Plan

Security & Emergency Management

Hydrocarbon Spill Preparedness

August 2022
Revision 0

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CONTROL AGENCIES AND INCIDENT CONTROLLERS

Source	Location	Level	Control Agency	Incident Controller
Spill from facility including subsea infrastructure Note: pipe laying and accommodation vessels are considered a "facility" under Australian regulations	Commonwealth waters	1	Woodside	Person In Charge (PIC) with support from Onshore Team Leader (OTL)
		2/3	Woodside	Corporate Incident Coordination Centre (CICC) Duty Manager
	State waters	1	Woodside	CICC Duty Manager
		2/3	Department of Transport (DoT)	DoT Incident Controller
	Within port limits	1	Woodside	CICC Duty Manager
		2/3	DoT	DoT Incident Controller
Spill from vessel Note: SOPEP should be implemented in conjunction with this document	Commonwealth waters	1	Australian Marine Safety Authority (AMSA)	Vessel Master
		2/3	AMSA	AMSA (with response assistance from Woodside)
	State waters	1	DoT	DoT Incident Controller
		2/3	DoT	DoT Incident Controller
	Within port limits	1	Port Authority	Port Harbour Master
		2/3	Port Authority/ DoT	Port Harbour Master/ DoT Incident Controller

SPILLS IN STATE/PORT WATERS

As detailed in the table above, in the event of a hydrocarbon spill (hereafter 'spill') where Woodside Energy Ltd ('Woodside') is the responsible party and the spill may impact State waters and shorelines, Woodside (or the Vessel Master) will commence the initial response actions and notify the Western Australian Department of Transport (DoT). If Woodside is the responsible party for a spill that occurs within port limits, Woodside will notify the Port Authority for all spills, and also notify DoT for Level 2 and 3 spills.

Initially Woodside will be required to make available an appropriate number of suitably qualified persons to work in the DoT IMT (APPENDIX F – Woodside Liaison Officer Resources to DoT). DoT/ PPA's role as the Controlling Agency in State waters/ within port limits does not negate the requirement for Woodside to have appropriate plans and resources in place to adequately respond to a marine hydrocarbon spill incident in State Waters/ within port limits or to commence the initial response actions to a spill prior to DoT establishing incident control in line with DoT *Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements* (July 2020). Cost recovery arrangements for offshore marine pollution incidents (MOP) are in accordance with Section 9 of the Guidance Note:

https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_Westplan_MOP_OffshorePetroleumIndGuidance.pdf

Woodside's Incident Management Structure for a hydrocarbon spill, including Woodside Liaison Officer's command structure within DoT can be seen at APPENDIX E – Woodside Incident Management Structure.

The coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/ shorelines is shown in APPENDIX D – Coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/ shorelines.

RESPONSE PROCESS OVERVIEW

For guidance on credible scenarios and hydrocarbon characteristics, refer to APPENDIX A		
ALL INCIDENTS	Notify the Woodside Communication Centre (WCC) on: [redacted]	
	Incident Controller or delegate to make relevant notifications in **Table 1-1** of this Oil Pollution First Strike Plan.	
LEVEL 1	**FACILITY INCIDENT**	**VESSEL INCIDENT**
	Coordinate pre-identified tactics in **Table 2-1** of this Oil Pollution First Strike Plan. Remember to download each Operational Plan.	Notify AMSA or Port Authority (if within port limits) and coordinate pre-identified tactics in **Table 2-1** of this Oil Pollution First Strike Plan Remember to download each Operational Plan.
	If the spill escalates such that the site cannot manage the incident, inform the WCC on: [redacted] and escalate to a level 2/3 incident.	
LEVEL 2/3	**FACILITY INCIDENT**	**VESSEL INCIDENT**
	Handover control to CICC and notify DoT or Port Authority (if within port limits)	Handover control to AMSA or Port Authority (if within port limits) and stand up CICC to assist.
	Commence quick revalidation of the recommended strategies on **Table 2-1** taking into consideration seasonal sensitivities and current situational awareness. Commence validated strategies.	If requested by AMSA/Port Authority: Commence quick revalidation of the recommended strategies on **Table 2-1** taking into consideration seasonal sensitivities and current situational awareness. Commence validated strategies.
	Create an Incident Action Plan (IAP) for all ongoing operational periods The content of the IAP should reflect the selected response strategies based on current situational awareness. For the full detailed pre-operational Net Environmental Benefit Analysis (NEBA) see the OSPRMA Appendix A	If requested by AMSA/Port Authority: Create an IAP for all ongoing operational periods The content of the IAP should reflect the selected response strategies based on current situational awareness. For the full detailed pre-operational NEBA see the OSPRMA Appendix A

1. NOTIFICATIONS

The Incident Controller or delegate must ensure the below notifications (Table 1-1) are completed within the designated timeframes.

For spills from a vessel, relevant notifications must be undertaken by a WEL representative.

Table 1-1: Notifications

In the event of an incident between campaign vessels, also activate relevant vessel Emergency Response Plans and/or Bridging Documents

In the event of an incident impacting Goodwyn Alpha (GWA) Operations live well infrastructure, also activate GWA Operations Oil Pollution First Strike Plan

Timing	By	To	Name	Contact	Instruction	Form	Complete? (✓)
NOTIFICATIONS FOR ALL LEVELS OF SPILL							
Immediately	Offshore Installation Manager (OIM) or Vessel Master	Woodside Communication Centre (WCC)	Duty Manager	[redacted] [redacted] [redacted]	Verbally notify WCC of event and estimated volume and hydrocarbon type.	Verbal	
Within 2 hours	Woodside Site Rep (WSR), Corporate Incident Coordination Centre Duty Manager (CICC DM) or Delegate	National Offshore Petroleum Safety Environmental Management Authority (NOPSEMA[1])	Incident notification office	[redacted]	Verbally notify NOPSEMA for spills >80L. Record notification using Initial Verbal Notification Form or equivalent and send to NOPSEMA as soon as practicable (cc to NOPTA and DMIRS).	Link	
Within 3 days	WSR, CICC DM or Delegate				Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DMIRS) NOPSEMA [redacted] NOPTA [redacted] DMIRS [redacted]	Link	
As soon as practicable	CICC DM or Delegate	Woodside	Environment Duty Manager	As per roster	Verbally notify Duty Environment of event and seek advice on relevant performance standards from EP	Verbal	
Within 2 hours of becoming aware of a marine oil pollution (MOP) incident that occurs in or may impact state waters	CICC DM or Delegate	WA Department of Transport (DoT)	DoT Maritime Environmental Emergency Response Unit (MEER) Duty Officer	[redacted]	Verbally notify DoT MEER Duty Officer that a spill has occurred and, if required, request use of equipment stored in [Karratha/Fremantle/]. Follow up with a written POLREP as soon as practicable following verbal notification. Additionally, DoT to be notified if spill is likely to extend into WA State waters. Request DoT to provide Liaison to WEL IMT.	Link	
As soon as practicable	CICC DM or Delegate	Department of Climate Change, Energy, the Environment and Water (DCCEEW) Director of National Parks	Marine Park Compliance Duty Officer	[redacted]	The Marine Park Compliance Duty Officer is notified in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken. This notification should include: • titleholder details • time and location of the incident • proposed response arrangements and locations as per the OPEP • contact details for the response coordinator • confirmation of access to relevant monitoring and evaluation reports when available.	Verbal	
As soon as practicable if there is potential for oiled wildlife or the spill is expected to contact land or waters managed by WA Department of	CICC DM or Delegate	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Duty Officer	[redacted]	Phone call notification	Verbal	

[1] Notification to NOPSEMA must be from a Woodside Representative.

Timing	By	To	Name	Contact	Instruction	Form	Complete? (✓)
Biodiversity, Conservation and Attractions							
ADDITIONAL NOTIFICATIONS TO BE MADE ONLY IF SPILL IS FROM A VESSEL							
Without delay as per Protection of the Sea Act, part II, section 11(1)	Vessel Master	Australian Maritime Safety Authority (AMSA)	Response Coordination Centre (RCC)	[redacted] [redacted]	Verbally notify AMSA RCC of the hydrocarbon spill. Follow up with a written Marine Pollution Report (POLREP) as soon as practicable following verbal notification.	Link	
ADDITIONAL LEVEL 2/3 NOTIFICATIONS							
As soon as practicable	CICC DM or Delegate	AMOSC	AMOSC Duty Manager	[redacted]	Notify AMOSC that a spill has occurred and follow-up with an email from the **CICC Leader/ CICC Deputy Leader/ IMT IC/ CMT Adviser/ CMT Leader** to formally activate AMOSC. Determine what resources are required consistent with the AMOS Plan and detail in a Service Contract that will be sent to Woodside from AMOSC upon activation.	Link	
As soon as practicable	CICC DM or Delegate	Oil Spill Response Limited (OSRL)	OSRL Duty Manager	[redacted]	Contact OSRL duty manager and request assistance from technical advisor in Perth. Send the completed notification form to OSRL as soon as practicable.	Link	
					For mobilisation of resources, send the Mobilisation Form to OSRL as soon as practicable. The mobilisation form must be signed by a nominated callout authority from Woodside. OSRL can advise the names on the call out authority list, if required.	Link	
As soon as practicable if extra personnel are required for incident support	CICC DM or Delegate	Marine Spill Response Corporation (MSRC)	MSRC Response Manager	[redacted] [redacted]	Activate the contract with MSRC (in full) for the provision of up to 30 personnel depending on what skills are required. Please note that provision of these personnel from MSRC are on a best endeavours basis and are not guaranteed.	Verbal	

2. RESPONSE TECHNIQUES

Table 2-1: Response techniques

Technique	Spill type: Vessel – Marine Diesel Oil (MDO)	Spill type: Loss of well containment (LOWC) – GWA Cond.	Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
Operational monitoring – tracking buoy (OM02)	Yes	Yes	**ALL**	If a vessel is on location, consider the need to deploy the oil spill tracking buoy. If no vessel is on location, consider the need to mobilise oil spill tracking buoys from the King Bay Supply Base (KBSB) Stockpile. If a surface sheen is visible from the facility, deploy the satellite tracking buoy within two hours.	Operations	**DAY 1:** Tracking buoy deployed within 2 hours.	Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02) of The Operational Monitoring Operational Plan. Deploy tracking buoy in accordance with Link.
Operational monitoring – predictive modelling (OM01)	Yes	Yes	**ALL**	Undertake initial modelling using the Rapid Assessment Oil Spill Tool and weathering fate analysis using Automated Data Inquiry for Oil Spills (ADIOS) or refer to the hydrocarbon information in **Appendix A.**	Intelligence or Environment	**DAY 1:** Initial modelling within 6 hours using the Rapid Assessment Tool.	Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01 of The Operational Monitoring Operational Plan). *Planning to download immediately and follow steps*
	Yes	Yes	**ALL**	Send Oil Spill Trajectory Modelling (OSTM) form (Appendix B, Form 7) to RPS Response ([redacted]).	Intelligence	**DAY 1:** Detailed modelling within 4 hours of RPS Response receiving information from Woodside.	
Operational monitoring – aerial surveillance (OM02)	Yes	Yes	**ALL**	Instruct Aviation Duty Manager to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in Appendix B Form 8.	Logistics – Aviation	**DAY 1:** 2 trained aerial observers. 1 aircraft available. Report made available to the IMT within 2 hours of landing after each sortie.	Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan). *Planning to download immediately and follow steps*
Operational monitoring – satellite tracking (OM02)	Yes	Yes	**ALL**	The Intelligence duty manager should be instructed to stand up Kongsberg Satellite Services (KSAT) to provide satellite imagery of the spill ([redacted]).	Intelligence	**DAY 1:** Service provider will confirm availability of an initial acquisition within 2 hours. Data received to be uploaded into Woodside Common Operating Picture.	
Operational monitoring – monitoring hydrocarbons in water (OM03)	Yes	Yes	**ALL**	Consider the need to mobilise resources to undertake water quality monitoring (OM03).	Planning or Environment	**DAY 3:** Water quality assessment access and capability Daily fluorometry reports will be provided to IMT.	Detecting and Monitoring for the Presence and Properties of Hydrocarbons in the Marine Environment (OM03 of The Operational Monitoring Operational Plan). *Planning to download immediately and follow steps*
Operational monitoring – pre-emptive assessment of receptors at risk (OM04)	Yes	Yes	**ALL**	Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04).	Planning or Environment	10 days prior to any predicted impact and in agreement with WA DoT, deployment of 2 specialists for each of the Response Protection Areas (RPA) with predicted impacts.	Pre-emptive Assessment of Sensitive Receptors (OM04 of The Operational Monitoring Operational Plan). *Planning to download immediately and follow steps*
Operational monitoring – shoreline assessment (OM05)	Yes	Yes	**ALL**	Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	10 days prior to any predicted impact and in agreement with WA DoT, deployment of 1 specialist trained in Shoreline Clean-up Assessment Technique (SCAT) for each of the RPAs with predicted impacts.	Shoreline Assessment (OM05 of The Operational Monitoring Operational Plan). *Planning to download immediately and follow steps*

Technique	Spill type		Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
	Vessel – Marine Diesel Oil (MDO)	Loss of well containment (LOWC) – GWA Cond.					
Surface dispersant	No	No	N/A	This response strategy is not recommended given the limited surface oil, low residue and highly volatile nature of GWA Condensate. This technique is also not recommended for marine diesel. Dispersant is therefore not considered to have a net environmental benefit.			
Containment and recovery	No	No	N/A	Highly volatile hydrocarbons such as GWA Condensate and MDO are likely to weather, spread and evaporate quickly and lead to unsafe conditions in the vicinity of fresh hydrocarbon. Corralling low flash point substances also poses a safety risk and thus should be avoided. This response technique is therefore not feasible for either scenario.			
Mechanical dispersion	No	No	N/A	This technique is not recommended. Although feasible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly and lead to unsafe conditions in the vicinity of fresh hydrocarbon. Additionally, vessels used for mechanical dispersion would be contaminated by the hydrocarbon and could cause secondary contamination of unimpacted areas.			
In-situ burning	No	No	N/A	This technique is not recommended. Requires calm sea state conditions which limits its feasibility in the region. Furthermore, modelling predicts that floating oil will not reach response thresholds or slick thickness to required for effective in situ burning operations. There are health and safety risks for response personnel associated with the containment and subsequent burning of hydrocarbons and the residue from attempts to burn would sink, posing a risk to the environment.			
Shoreline protection and deflection	No	No	N/A	Modelling does not predict any shoreline contact at response thresholds for either scenario.			
Shoreline clean-up	No	No	N/A	Modelling does not predict any shoreline contact at response thresholds for either scenario.			
Oiled wildlife response	Yes	Yes	ALL	If oiled wildlife is a potential impact, request AMOSC to mobilise containerised oiled wildlife first strike kits and relevant personnel. Refer to relevant Tactical Response Plan for potential wildlife at risk. Mobilise AMOSC Oiled Wildlife Containers. Consider whether additional equipment is required from local suppliers.	Logistics and Planning		Oiled Wildlife Response Operational Plan

Technique	Spill type		Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
	Vessel – Marine Diesel Oil (MDO)	Loss of well containment (LOWC) – GWA Cond.					
Scientific monitoring (type II)	Yes	Yes	**ALL**	Notify Woodside science team of spill event.	Environment		Oil Spill Scientific Monitoring Programme – Operational Plan
SOURCE CONTROL TECNIQUES							
Subsea First Response Toolkit	No	Yes	**L2/3**	Debris clearance equipment may require mobilisation prior to the undertaking of any further source control activities. Source control via ROV intervention using the intervention riser system (IRS) or subsea tree may be feasible.	Operations – Source Control Unit	**DAY 2:** Remotely Operated Vehicle (ROV) on Mobile Offshore Drilling Unit (MODU) ready for deployment within 48 hours	• Source Control Emergency Response Planning Guideline • Activity-specific Source Control Emergency Response Plan
Subsea Dispersant	No	No	**N/A**	This response strategy is not recommended given the limited surface oil, low residue and highly volatile nature of GWA Condensate. Subsea dispersant is therefore not considered to provide a net environmental benefit.			
Capping Stack	No	Yes	**L2/3**	Conventional/vertical capping stack deployment with a heavy lift vessel will be attempted at the discretion of the vessel master on the day, giving due regard to the safety of the vessel and crew and consideration to the factors that may influence a safe deployment such as: a plume radius, wind speed, wave height, and current. **N.B. A capping stack will only be a feasible response option once the vertical Xmas Tree has been removed during intervention activities and a MODU BOP installed. A capping stack can then be directly installed onto the MODU BOP or wellhead, once plume conditions allow.**	Operations – Source Control Unit	**DAY 1:** Identify source control vessel availability within 24 hours. Capping stack on suitable vessel mobilised to site within 16 days.	
Relief Well	No	Yes	**L2/3**	As per Activity Source Control Emergency Response Plan (SCERP).	Operations – Source Control Unit	**DAY 1:** Identify source control vessel availability within 24 hours. ROV on MODU ready for deployment within 48 hours. Mobile Offshore Drilling Unit (MODU) mobilised to location for relief well drilling	

3. RESPONSE PROTECTION AREAS

Action: Provide relevant Control Agency with applicable Tactical Response Plans for any Response Protection Areas (RPAs) identified during operational monitoring.

Based on hydrocarbon spill modelling results, the sensitive receptors outlined in **Table 3-1** are identified as priority protection areas, as they have the potential to be contacted by hydrocarbon at or above impact threshold levels within 48 hours of a spill.

Table 3-1: Receptors for Priority Protection with Potential Impact within 48 Hours

Receptor and scenario	Distance and Direction from Operational Area (km)	Minimum time to shoreline contact (above 100 g/m^2) in days	Maximum shoreline accumulation (above 100 g/m^2) in m^3	Threshold triggered and recommended strategy	Tactical Response Plans
Open ocean (LOWC – GWA condensate)	~1 km from spill location	N/A	N/A	Floating at 50 g/m^2 • Operational monitoring • Source control *N.B. Due to the volatile nature of GWA Condensate and very low residue, together with no predicted floating oil >10 g/m^2 at any RPA and minimal shoreline impact, subsea and surface dispersant are not deemed appropriate response techniques as they would not provide a net environmental benefit.* *Containment and recovery of volatile condensates poses significant safety risks due to low flash points and thus corralling such hydrocarbons should be avoided.*	N/A – open ocean

Hydrocarbon spill modelling results indicate that no additional sensitive receptors are predicted to be contacted by hydrocarbons at response thresholds beyond 48 hours of a spill.

Tactical Response plans for other locations can be accessed via the Oil Spill Portal - Tactical Response Plans and include the details of potential forward operating bases and staging areas.

Oil Spill Trajectory Modelling specific to the spill event will be required to determine the regional sensitive receptors to be contacted beyond 48 hours of a spill.

Figure 3-1 illustrates the location of regional sensitive receptors in relation to the TPA03 Well Intervention Operational Area and identifies priority protection areas.

Consideration should be given to other assets and/or stakeholders (including mariners) in the vicinity of the spill location. **Table 3-2** indicates the assets within the vicinity of the TPA03 Well Intervention Operational Area.

Table 3-2: Assets in the vicinity of the TPA03 Well Intervention Operational Area

Asset	Distance and Direction from Operational Area	Operator
Goodwyn Platform	12 km north-east	Woodside
North Rankin Complex	31 km north-east	Woodside

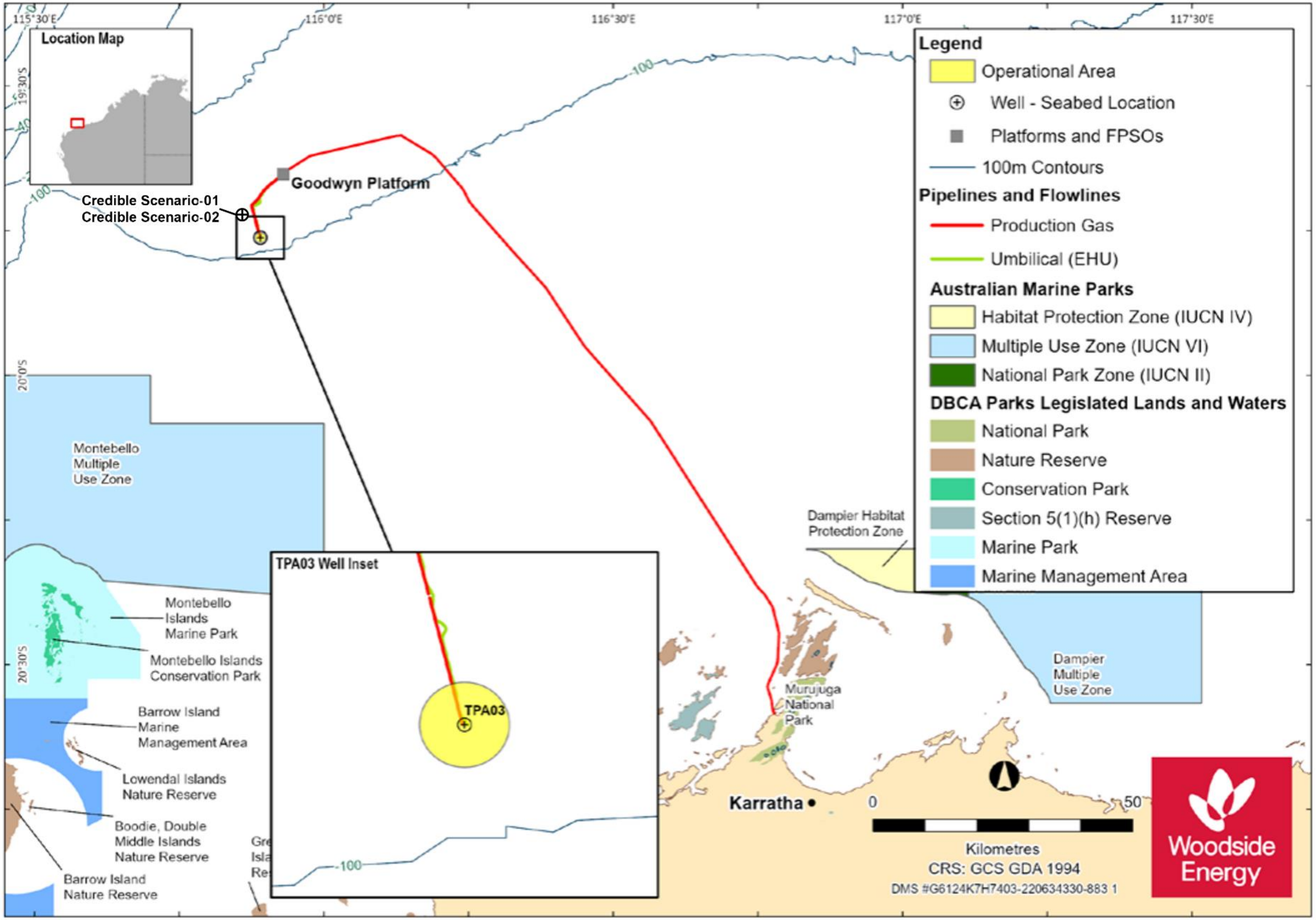


Figure 3-1: Location of Operational Area

4. DISPERSANT APPLICATION

Dispersant is not considered an appropriate response strategy for this activity as described in the TPA03 Well Intervention Environment Plan Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment).

APPENDIX A – CREDIBLE SPILL SCENARIOS AND HYDROCARBON INFORMATION

Table A - 1: Credible spill scenarios and hydrocarbon information

Scenario	Product	API gravity	Volume	Residue	Weathering rate		Suggested ADIOS2 Analogue[2]
CS-01 (WCCS) **Unplanned hydrocarbon release of condensate – loss of well containment (LOWC) from TPA03 during well intervention [3]**	GWA Condensate	47.5°	56,441 m^3	0.8% (451 m^3 or 6.4 m^3 per day)	12 hours (BP < 180 °C)	65.9%	NWS Condensate
					24 hours (180 °C < BP < 265 °C)	22.5%	
					Several days (265 °C < BP < 380 °C)	10.8%	
CS-02 **Surface release of MDO after a vessel fuel tank rupture near the well [4]**	MDO	37.2°	492 m^3	5% (24.6 m^3)	12 hours (BP < 180 °C)	6%	Diesel Fuel Oil – Southern USA 1 (API 37.2°)
					24 hours (180 °C < BP < 265 °C)	35%	
					Several days (265 °C < BP < 380 °C)	54%	

[2] Initial screening of possible ADIOS2 analogues considered hydrocarbons with similar APIs. Suggested selection is based on the closest distillation cut to the Woodside hydrocarbon. Only hydrocarbons with >380°C distillation cuts were included in selection process.

[3] Modelling for GDA05 LOWC, 6 km from TPA03 well and within the same title (WA-5-L), was undertaken in 2021 using NOPSEMA’s contemporary modelling thresholds. TPA03 Well Intervention LOWC is expected to be circa 50% smaller (56,441 m^3) than the GDA05 LOWC volume (108,843 m^3), has the same residue (0.8%), occurs in similar water depths and both over a 71-day release period. Given that TPA03 spill parameters and geographic location fall within the envelope of GDA05, the existing modelling is an appropriate surrogate and therefore additional modelling was not required.

[4] Loss of marine vessel separation MDO modelling of 1000 m^3 was available for the GDA05 well location, 6 km from TPA03 and within the same title (WA-5-L). It was originally undertaken in 2019 and reprocessed in 2021 using NOPSEMA’s contemporary modelling thresholds. The largest tank of the vessel proposed for the TPA03 Well Intervention activity is circa 50% smaller (492 m^3) than the modelled MDO volume (1000 m^3). Given that spill parameters and geographic location fall within the envelope of the existing MDO modelling, it is an appropriate surrogate and therefore additional modelling was not required.

APPENDIX B – NOTIFICATION FORMS

Table B - 1: Notification forms

No.	Form Name	Link
1	Record of initial verbal notification to NOPSEMA template	[redacted]
2	NOPSEMA Incident Report Form	[redacted]
3	Marine Pollution Report (POLREP – AMSA)	[redacted]
4	AMOSC Service Contract	[redacted]
5	Marine Pollution Report (POLREP – DoT)	[redacted]
6a	OSRL Initial Notification Form	[redacted]
6b	OSRL Mobilisation Activation Form	[redacted]
7	RPS Response Oil Spill Trajectory Modelling Request	[redacted]
8	Aerial Surveillance Observer Log	[redacted]
9	Tracking buoy deployment instructions	[redacted]

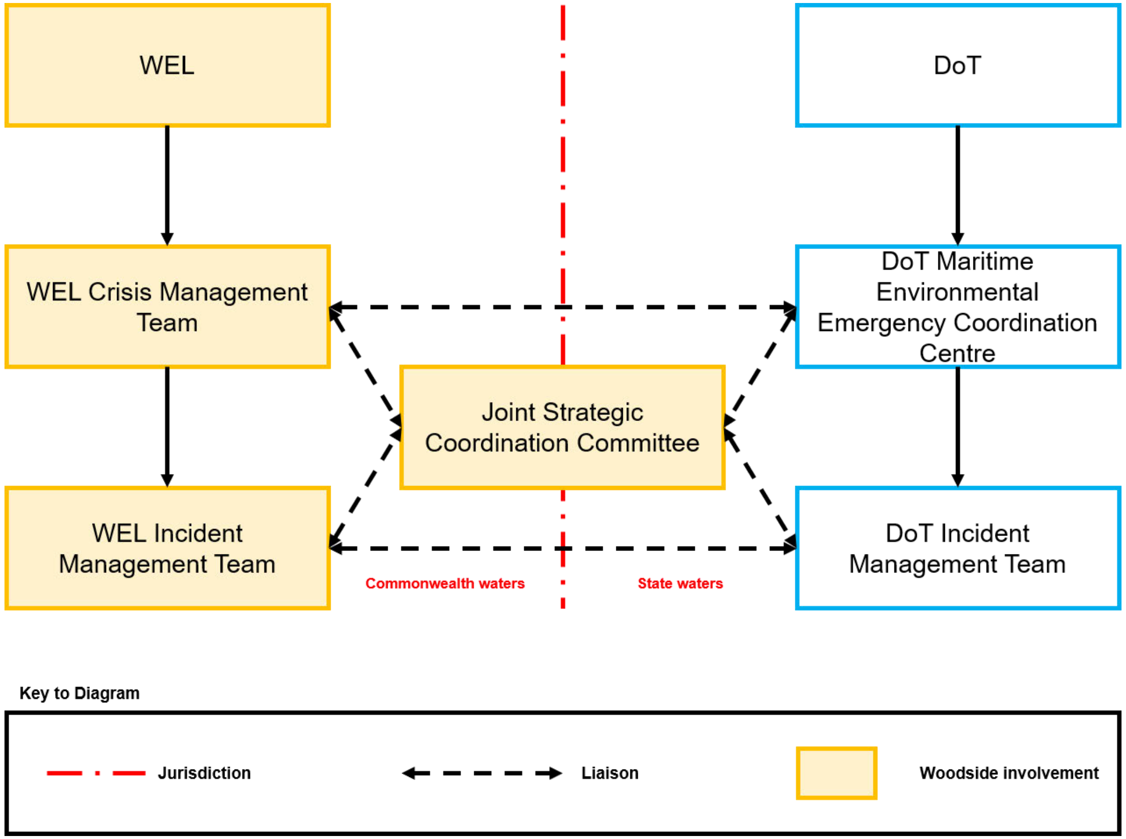
FORM 1 – RECORD OF INITIAL VERBAL NOTIFICATION TO NOPSEMA

NOPSEMA phone:		
Date of call		
Time of call		
Call made by		
Call made to		
Information to be provided to NOPSEMA:		
Date and time of incident/ time caller became aware of incident		
Details of incident	**1. Location**	
	2. Title	
	3. Source	□ **Platform**
		□ **Pipeline**
		□ **FPSO**
		□ **Exploration drilling**
		□ **Well**
		□ **Other (please specify)**
	4. Hydrocarbon type	
	5. Estimated volume	
	6. Has the discharge ceased?	
	7. Fire, explosion or collision?	
	8. Environment Plan(s)	
	9. Other Details	
Actions taken to avoid or mitigate environmental impacts		
Corrective actions taken or proposed to stop, control or remedy the incident		
After the initial call is made to NOPSEMA, please send this record as soon as practicable to:		
NOPSEMA	[redacted]	
NOPTA	[redacted]	
DMIRS	[redacted]	

APPENDIX C – SPILL ASSESSMENT QUESTIONS

What has happened?		
Date/time		
Spill source		
Spill cause		
Safety situation		
What is it?		
Oil type and name		
Oil properties	Specific gravity	
	Viscosity	
	Pour point	
	Asphaltenes	
	Wax content	
	Boiling point	
Where is it?		
Latitude and longitude		
Distance and bearing		
Affected area	☐ Offshore	
	☐ Subsea	
	☐ Shoreline	
	☐ Estuary	
	☐ Port	
	☐ Harbour	
	☐ Inland	
	☐ River	
	☐ Other (please detail):	
Water depth		
How big is it?		
Area		
Release type	☐ Instantaneous	Estimated volume:
	☐ Continuous release	Estimated release rate:
Where it is going?		
Metocean conditions		
Currents and tides		
What is in the way?		
Resources at risk		
Time until resource contact		
What's happening to it?		
Weathering processes		
Response actions underway		

APPENDIX D – COORDINATION STRUCTURE FOR A CONCURRENT HYDROCARBON SPILL IN BOTH COMMONWEALTH AND STATE WATERS/ SHORELINES[5]



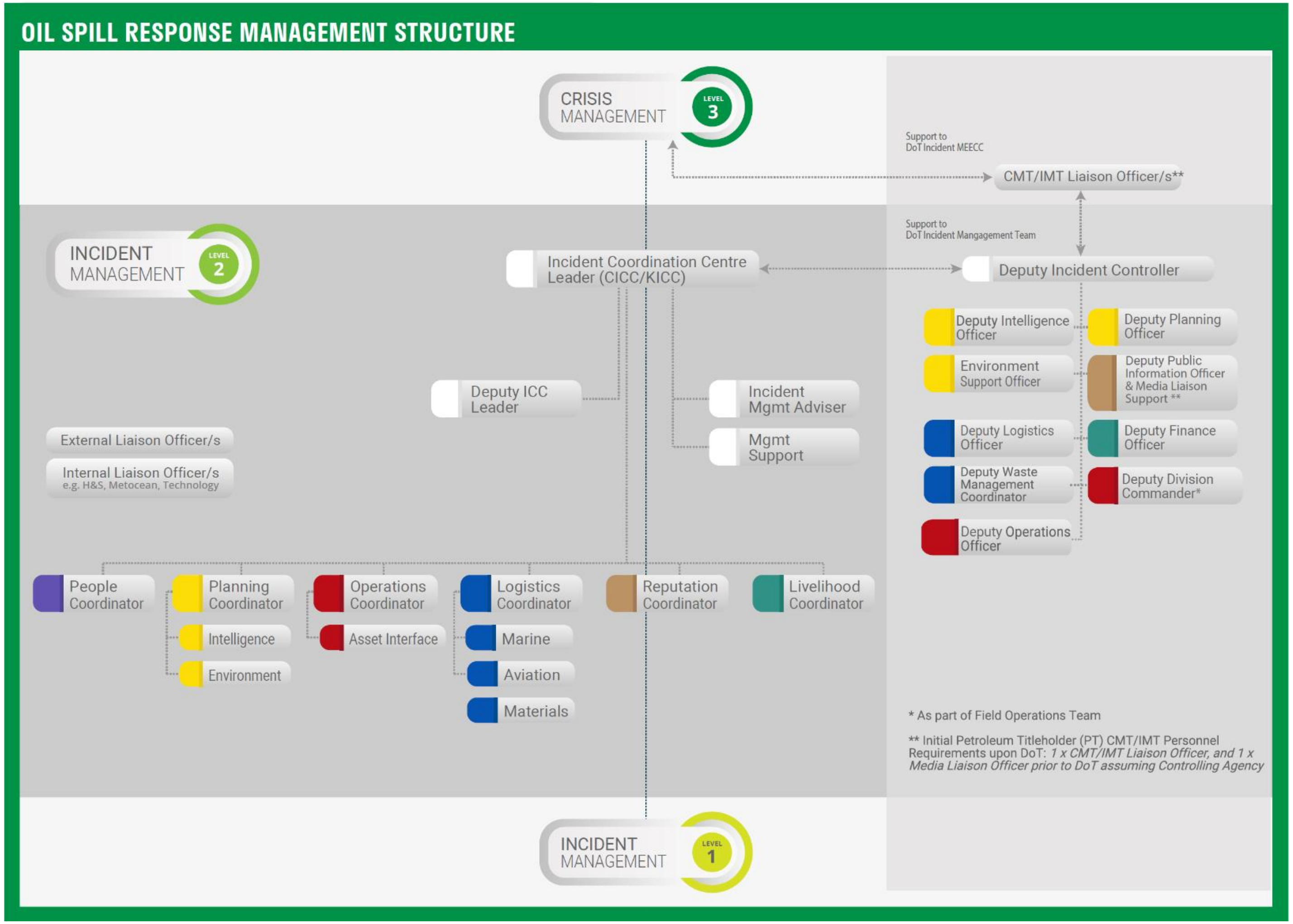
The Control Agency for a hydrocarbon spill in Commonwealth waters resulting from an offshore petroleum activity is Woodside (the Petroleum Titleholder).

The Control Agency/HMA for a hydrocarbon spill in State waters/shorelines resulting from an offshore petroleum activity is DoT. DoT will appoint an Incident Controller and form a separate IMT to only manage the spill within State waters/shorelines.

[5] Adapted from DoT Offshore Petroleum Industry Guidance Note, Marine Oil Pollution: Response and Consultation Arrangements July 2020. Note: For full structure up to Commonwealth Cabinet/Minister refer to Marine Oil Pollution: Response and Consultation Arrangements Section 6.5, Figure 4.

APPENDIX E – WOODSIDE INCIDENT MANAGEMENT STRUCTURE

Woodside Incident Management Structure for hydrocarbon spill (including Woodside Liaison Officers Command Structure within DoT IMT if required).



APPENDIX F – WOODSIDE LIAISON OFFICER RESOURCES TO DOT

In the event that DoT is required to establish an IMT, Woodside will make available an appropriate number of appropriately qualified persons to work within the DoT IMT. In the event the PPA is the Control Agency within the Dampier Port Limits, Woodside will make available similar roles as requested.

It is an expectation that Woodside’s nominated CMT Liaison Officer and the Deputy Incident Controller attend the DoT Fremantle ICC as soon as possible after the formal request has been made by the SMEEC, and no later than 8am on the day following the request being formally made. For Woodside personnel designated to serve in DoT’s Forward Operating Base (FOB), it is expected that they arrive at the FOB no later than 24 hours from the formal request being made by the SMEEC.

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
DoT Maritime Environmental Emergency Coordination Centre (MEECC)	CMT Liaison Officer	CMT Leader Roster	• Provide a direct liaison between the CMT and the MEECC. • Facilitate effective communications and coordination between the CMT Leader and State Marine Pollution Coordinator (SMPC). • Offer advice to SMPC on matters pertaining to PT crisis management policies and procedures.	1
DoT IMT Incident Control	WEL Deputy Incident Controller	CICC Leader Reserve List Roster	• Provide a direct liaison between the PT IMT and DoT IMT. • Facilitate effective communications and coordination between the PT IC and the DoT IC. • Offer advice to the DoT IC on matters pertaining to PT incident response policies and procedures. • Offer advice to the Safety Coordinator on matters pertaining to PT safety policies and procedures, particularly as they relate to PT employees or contractors operating under the control of the DoT IMT.	1
DoT IMT Intelligence	Intelligence Support Officer/ Deputy Intelligence Officer	AMOSC Staff Member or AMOSC Core Group	• As part of the Intelligence Team, assist the Intelligence Officer in the performance of their duties in relation to situation and awareness. • Facilitate the provision of relevant modelling and predications from the PT IMT. • Assist in the interpretation of modelling and predictions originating from the PT IMT. • Facilitate the provision of relevant situation and awareness information originating from the DoT IMT to the PT IMT. • Facilitate the provision of relevant mapping from the PT IMT. • Assist in the interpretation of mapping originating from the PT IMT.	1

[6] For KIMC and CICC roster arrangements, contact the WCC and for AMOSC activation, see [redacted]

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
			• Facilitate the provision of relevant mapping originating from the DoT IMT to the PT IMT.	
DoT IMT Intelligence – Environment	Environment Support Officer	CMT Environmental FST Duty Managers Roster	• As part of the Intelligence Team, assist the Environment Coordinator in the performance of their duties in relation to the provision of environmental support into the planning process. • Assist in the interpretation of the PT OPEP and relevant TRP plans. • Facilitate in requesting, obtaining and interpreting environmental monitoring data originating from the PT IMT. • Facilitate the provision of relevant environmental information and advice originating from the DoT IMT to the PT IMT.	1
DoT IMT Planning-Plans/ Resources	Deputy Planning Officer	AMOSC Core Group/CICC Planning Coordinator Reserve List and Planning Group 3	• As part of the Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub plans. • Facilitate the provision of relevant IAP and sub plans from the PT IMT. • Assist in the interpretation of the PT OPEP from the PT. • Assist in the interpretation of the PT IAP and sub plans from the PT IMT. • Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the PT IMT. • Assist in the interpretation of the PT existing resource plans. • Facilitate the provision of relevant components of the resource sub plan originating from the DoT IMT to the PT IMT. **(Note this individual must have intimate knowledge of the relevant PT OPEP and planning processes)**	1
DoT IMT Public Information-Media/ Community Engagement	Public Information Support and Media Liaison Officer/ Deputy Public Information Officer	Reputation (Media) FST Duty Manager Roster	• As part of the Public Information Team, provide a direct liaison between the PT Media team and DoT IMT Media team. • Facilitate effective communications and coordination between the PT and DoT media teams. • Assist in the release of joint media statements and conduct of joint media briefings. • Assist in the release of joint information and warnings through the DoT Information and Warnings team. • Offer advice to the DoT Media Coordinator on matters pertaining to PT media policies and procedures. • Facilitate effective communications and coordination between the PT and DoT Community Liaison teams.	1

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
			• Assist in the conduct of joint community briefings and events. • Offer advice to the DoT Community Liaison Coordinator on matters pertaining to the PT community liaison policies and procedures. • Facilitate the effective transfer of relevant information obtained from through the Contact Centre to the PT IMT.	
DoT IMT Logistics	Deputy Logistic Officer	Services FST Logistics Team 2 Roster	• As part of the Logistics Team, assist the Logistics Officer in the performance of their duties in relation to the provision of supplies to sustain the response effort. • Facilitate the acquisition of appropriate supplies through the PTs existing OSRL, AMOSC and private contract arrangements. • Collects Request Forms from DoT to action via PT IMT. **(Note this individual must have intimate knowledge of the relevant PT logistics processes and contracts)**	1
DoT IMT Finance-Accounts/ Financial Monitoring	Deputy Finance Officer	CICC Finance Coordinator Roster	• As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through the PTs existing OSRL, AMOSC and private contract arrangements. • Facilitate the communication of financial monitoring information to the PT to allow them to track the overall cost of the response. • Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DoT and to be charged back to the PT.	1
DoT IMT Operations	Deputy Operations Officer	CICC Operations Coordinator Roster	• As part of the Operations Team, assist the Operations Officer in the performance of their duties in relation to the implementation and management of operational activities undertaken to resolve an incident. • Facilitate effective communications and coordination between the PT Operations Section and the DoT Operations Section. • Offer advice to the DoT Operations Officer on matters pertaining to PT incident response procedures and requirements. • Identify efficiencies and assist to resolve potential conflicts around resource allocation and simultaneous operations of PT and DoT response efforts.	1

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
DoT IMT Operations – Waste Management	Facilities Support Officer/ Deputy Waste Management Coordinator	Services FST Logistics Team 2 and WEL Waste Contractor Roster	• As part of the Operations Team, assist the Waste Management Coordinator in the performance of their duties in relation to the provision of the management and disposal of waste collected in State waters. • Facilitate the disposal of waste through the PT's existing private contract arrangements related to waste management and in line with legislative and regulatory requirements. • Collects Request Forms from DoT to action via PT IMT.	1
DoT FOB Operations Command	Deputy On-Scene Commander/ Deputy Division Commander	AMOSC Core Group	• As part of the Field Operations Team, assist the Division Commander in the performance of their duties in relation to the oversight and coordination of field operational activities undertaken in line with the IMT Operations Section's direction. • Provide a direct liaison between the PT FOB and DoT FOB. • Facilitate effective communications and coordination between the PT Division Commander and the DoT Division Commander. • Offer advice to the DoT Division Commander on matters pertaining to PT incident response policies and procedures. • Assist the Safety Coordinator deployed in the FOB in the performance of their duties, particularly as they relate to PT employees or contractors. • Offer advice to the Safety Coordinator deployed in the FOB on matters pertaining to PT safety policies and procedures.	1
			Total Woodside personnel initially required in DoT IMT	11

APPENDIX G – DOT LIAISON OFFICER RESOURCES TO WOODSIDE

Once DoT activates a State waters/shorelines IMT, DoT will make available the following roles to Woodside.

Area	DoT Liaison Role	Personnel Sourced from[7]:	Key Duties	#
WEL CMT	DoT Liaison Officer (prior to DoT assuming Controlling Agency) / Deputy Incident Controller – State waters (after DoT assumes Controlling Agency)	DoT	• Facilitate effective communications between DoT’s SMPC/ Incident Controller and the Petroleum Titleholder’s appointed CMT Leader / Incident Controller. • Provide enhanced situational awareness to DoT of the incident and the potential impact on State waters. • Assist in the provision of support from DoT to the Petroleum Titleholder. • Facilitate the provision technical advice from DoT to the Petroleum Titleholder Incident Controller as required.	1
WEL Reputation FST (Media Room)/ Public Information – Media	DoT Media Liaison Officer	DoT	• Provide a direct liaison between the PT Media team and DoT IMT Media team. • Facilitate effective communications and coordination between the PT and DoT media teams. • Assist in the release of joint media statements and conduct of joint media briefings. • Assist in the release of joint information and warnings through the DoT Information & Warnings team. • Offer advice to the PT Media Coordinator on matters pertaining to DoT and wider Government media policies and procedures.	1
			Total DoT Personnel Initial Requirement to Woodside	2

[7] For KIMC and CICC roster arrangements, contact the WCC and for AMOSC activation, see [redacted]