Enfield Subsea Infrastructure Decommissioning (WA-28-L) Environment Plan

Revision 1
March 10 2022

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1 Overview

Woodside Energy Ltd. (Woodside), as Titleholder under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Commonwealth) (referred to as the Environment Regulations), proposes to undertake the following petroleum activities within Permit Area WA-28-L:

- removal of infrastructure above the mudline including manifolds, flowlines, umbilicals, mooring lines, and spools
- in situ decommissioning of buried anchors and attached buried sections of mooring lines, as well as contingency (if required) partial leave in situ of manifold suction piles.

These activities will hereafter be referred to as the Petroleum Activities Program and form the scope of this Environment Plan (EP). A detailed description of the activities is provided in **Section 3**. Subsea infrastructure covered by this EP is defined in **Section 3.2**.

Once accepted, this EP will cover ongoing management of the Enfield subsea infrastructure until decommissioning activities are complete, including inspection, maintenance and repair (IMR) activities. The presence of the subsea infrastructure was previously covered under the Nganhurra Operations Cessation Environment Plan, accepted by NOPSEMA on 5 February 2021. Plug and abandonment (P&A) of the Enfield wells and decommissioning of the riser turret mooring (RTM) are subject to separate EPs, as described in **Section 1.10.1.1**.

This EP has been prepared to meet the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Commonwealth) 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 performed in Permit Title WA-28-L comprises the removal of subsea infrastructure above the mudline. These are considered petroleum activities as defined in Regulation 4 of the Environment Regulations. As such, this EP is required.

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

1.4 Scope of the Environment Plan

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in **Section 3**. The spatial boundary of the Petroleum Activities Program has been described and assessed using the Operational Area. The Operational Area defines the spatial boundary of the Petroleum Activities Program and is further described in **Section 3.4**.

This EP addresses potential environmental impacts from planned activities and any potential unplanned risks that originate from within the Operational Area. Transit to and from the Operational Area by vessels associated with the Petroleum Activities Program and support vessels, as well as port activities associated with these vessels, are not within the scope of this EP. Vessels supporting the Petroleum Activities Program operating outside the Operational Area (e.g. transiting to and from port) are subject to applicable maritime regulations and other requirements and are not managed by this EP.

1.5 Environment Plan Summary

An EP summary has been prepared from material provided in this EP (**Table 1-1**), as required by Regulation 11(4).

Table 1-1: EP summary

EP Summary material requirement	Section of EP
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*	The principle of 'nature and scale' applies throughout the EP	**Section 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 7**
	Regulation 14: *Implementation strategy for the environment plan*		
	Regulation 16: *Other information in the environment plan*		
Regulation 10A(b):	Regulation 13(1)–13(7):		**Section 1**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable Regulation 10A(c): *demonstrates that the environmental impacts and risks of the activity will be of an acceptable level*	*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 2** **Section 3** **Section 4** **Section 5** **Section 6** **Section 7**
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 Outcomes (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 – refer **Table 7-5**) 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;*	No activity, or part of the activity, undertaken in any part of a declared World Heritage property	**Section 3** **Section 4** **Section 6**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
	(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.*		
Regulation 10A(g): *(i) the titleholder has carried out the consultations 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*	Regulation 11A: *Consultation with relevant authorities, persons and organisations, etc.* Regulation 16(b): *A report on all consultations between the titleholder and any relevant person*	Consultation in preparation of the EP	**Section 5**
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 Offshore Petroleum and Greenhouse Gas Storage Act 2006 and the Environment Regulations	**Section 1.6** **Section 7.8**

1.7 Description of the Titleholder

Woodside is Titleholder for this activity, on behalf of Woodside and Mitsui & Co. Ltd.

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 Limited

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

ACN: 63 005 482 986

1.8.2 Nominated Liaison Person

Shannen Wilkinson

Senior Corporate Affairs Adviser

11 Mount Street

Perth, Western Australia

Telephone: 08 9348 4000

Email: feedback@woodside.com.au

1.8.3 Arrangements for Notifying Change

Should the titleholder, titleholder's nominated liaison person, or the contact details for either change, NOPSEMA will be notified 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 transform 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.

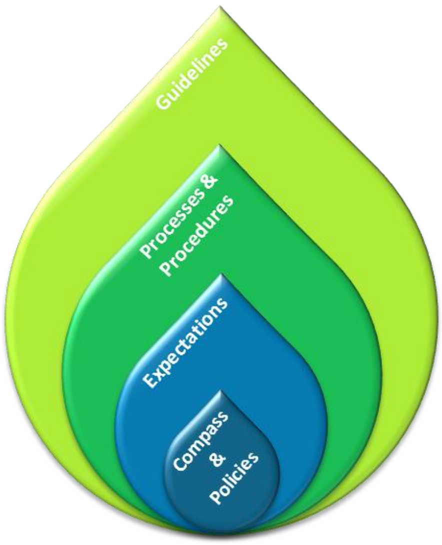


Figure 1-1: The four major elements of the WMS Seed

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 1-1**. 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.

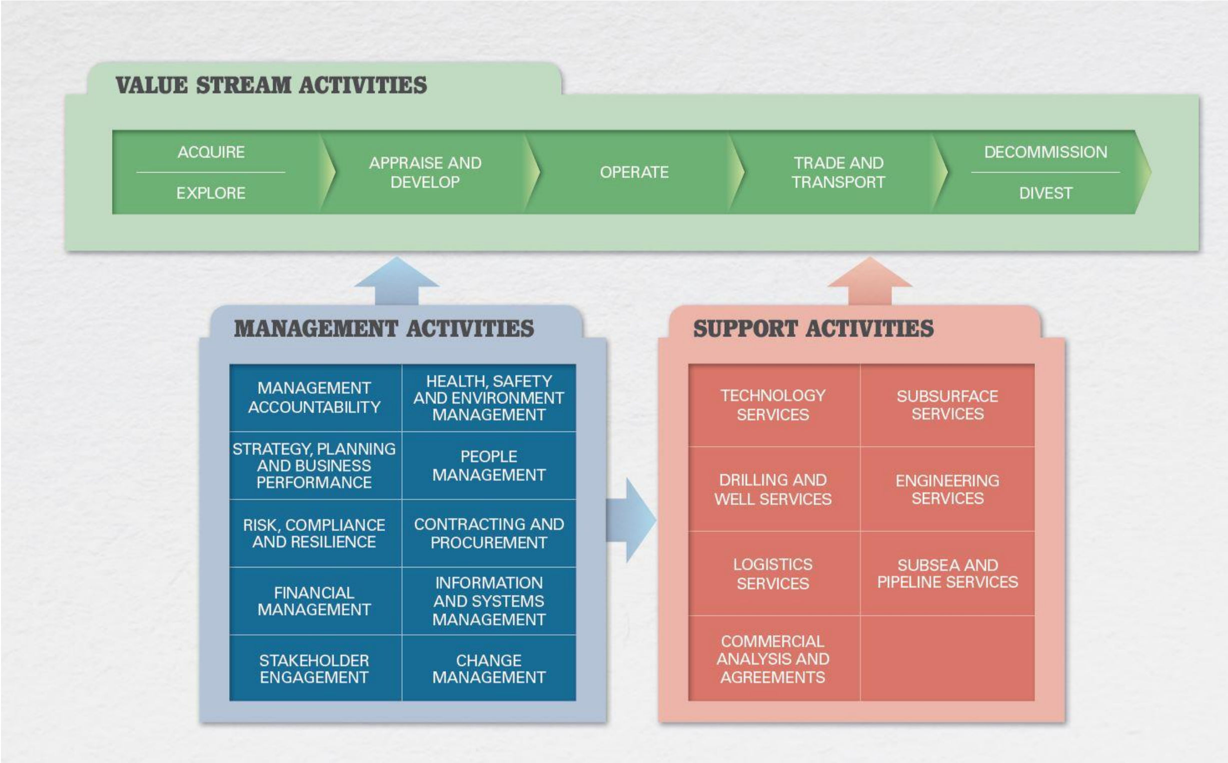


Figure 1-2: The WMS business process hierarchy

1.9.1 Health, Safety and Environment Policy

In accordance with Regulation 16(a) of the Environment Regulations, Woodside's Corporate Health, Safety and Environment 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 managing 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 Applicable Environmental Legislation

1.10.1.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

The *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) regulates petroleum exploration and recovery activities beyond three nautical miles (nm) of the mainland (and islands) to the outer extent of the Australian Exclusive Economic Zone at 200 nm.

Under subsection 572(3) of the Act, a titleholder must remove from the title area all structures that are no longer used in conjunction with operations. Under subsection 572(7), property removal requirements are subject to any other provision of the OPGGS Act, the regulations, directions given by NOPSEMA or the responsible Commonwealth Minister, and any other law. Under subsection 270(3), before consent to surrender title is given, all property brought into the surrender area must be removed to the satisfaction of NOPSEMA, or arrangements that are satisfactory to NOPSEMA must be made relating to the property. As this is the final EP for the Enfield Development, the relevant requirements in Section 270 and 572 of the Act are set out in **Table 1-3**.

Table 1-3: Relevant requirements of the OPGGS Act 2006

Section Number	Relevant Requirement	Relevant Section of the EP
Section 270 – Consent to surrender title[1]		
3	The Joint Authority may consent to the surrender sought by the application only if the registered holder of the permit, lease or licence:	
	c) has: (i) to the satisfaction of NOPSEMA, removed or caused to be removed from the surrender area (defined by subsection (7)) all property brought into the surrender area by any person engaged or concerned in the operations authorised by the permit, lease or licence; or (ii) arrangements that are satisfactory to NOPSEMA in relation to that property; and	**Section 3.12.4**
	e) has provided, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the surrender area; and	Not applicable[1.]
	f) has, to the satisfaction of NOPSEMA, made good any damage to the seabed or subsoil in the surrender area caused by any person engaged or concerned in the operations authorised by the permit, lease or licence;	
Section 572 - Maintenance and removal of property etc. by titleholder		
2	A titleholder must maintain in good condition and repair all structures that are, and all equipment and other property that is: (a) in the title area; and (b) used in connection with the operations authorised by the permit, lease, licence or authority.	**Section 3.11**
3	A titleholder must remove from the title area all structures that are, and all equipment and other property that is, neither used nor to be used in connection with the operations: (a) in the title area; and (b) used in connection with the operations authorised by the permit, lease, licence or authority.	**Section 3.12.4**
7	This section has effect subject to: (a) any other provision of this Act; and (b) the regulations; and (c) a direction given by NOPSEMA or the responsible Commonwealth Minister under: (i) Chapter 3; or (ii) this Chapter; and (d) any other law.	**Section 3.12.5** and **Section 6.8.1**

1. Enfield is one of a number of petroleum activities in the WA-28-L title area. This EP (see **Table 1-4**) is intended to inform the requirements under s270 in relation to the Enfield Development to enable consent to be granted for application to surrender the title, once all petroleum activities have ceased for all petroleum activities in the future.

In February 2021, Woodside received a General Direction from NOPSEMA under Section 574 of the OPGGS Act related to decommissioning of infrastructure within WA-28-L. **Table 1-4** outlines where requirements under this direction related to infrastructure covered under this EP have been addressed. Requirements relating to the RTM, and well P&A are covered under the following separate EPs:

- Nganhurra Operations Cessation EP, Revision 7, accepted by NOPSEMA on 5 February 2021.
- Nganhurra Operations Cessation EP, Revision 9, currently under assessment by NOPSEMA (submitted 8 November 2021) – this will supersede Revision 7 once accepted.
- Enfield Plug and Abandonment EP, Revision 1, accepted by NOPSEMA on 14 October 2021.

Potential simultaneous operations (SIMOPs) between the different Enfield decommissioning work scopes covered by these different EPs have been outlined in **Section 3.8** and considered in **Section 6**.

Table 1-4: Relevant requirements under NOPSEMA General Direction

Direction	Requirement	Relevant Section of the EP
1	To plug or close off, to the satisfaction of NOPSEMA, all wells listed in Schedule 2 of this Direction on or before 30 June 2024.	Included in the accepted Enfield Plug and Abandonment EP.
2	To remove, or cause to be removed, from the title area all property brought into that area by any person engaged or concerned in the Nganhurra operations authorised by the WA-28-L licence, including but not limited to property listed in Schedule 3 of this direction, on or before 31 December 2024.	Relevant to subsea infrastructure above mudline: **Section 3.5** and **Section 3.12.4**, as well as Performance Standard **2.1** Well infrastructure and the RTM are included in separate EPs.
3	To provide, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the licence area on or before 31 December 2025.	A description of how these directions will be met is included in **Sections 3.12.6**, **3.12.7** and **7.8.2.4**.
4	To make good, to the satisfaction of NOPSEMA, any damage to the seabed or subsoil in the licence area caused by any person engaged or concerned in those operations on or before 31 December 2025.	

1.10.1.2 Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009

The Environment Regulations apply to petroleum activities in Commonwealth waters and are administered by NOPSEMA.

The objective of the Environment Regulations is to ensure petroleum activities are:

- carried out in a manner consistent with the principles of ecologically sustainable development
- 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.

1.10.1.3 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act aims to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places in Australia. These are defined in the Act as Matters of National Environmental Significance (MNES). In respect to offshore petroleum activities in Commonwealth waters, these requirements are implemented by NOPSEMA through the Streamlining Offshore Petroleum Environmental Approvals Program (the Program). The Program provides for the protection of the environment by requiring all offshore petroleum activities authorised by the OPGGS Act to be conducted in accordance with an accepted EP, consistent with the principles of Ecological Sustainable Development (ESD).

Impacts on the environment include those matters protected under Part 3 of the EPBC Act. The definition of 'environment' in the Program is consistent with that used in the EPBC Act - this enables the Program to encompass all matters protected under Part 3 of the EPBC Act. 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.

Woodside referred the Enfield full field (Enfield – WA-271-P) development proposal under the EPBC Act in April 2001 (EPBC 2001/257). The activity was determined to be a ‘controlled action’ under the EPBC Act and set the level of assessment at ‘Environmental Impact Statement’ in June 2001. The development was approved with conditions in July 2003 (EPBC Approval 2001/257). Conditions in relation to the referral (EPBC 2001/257) that are considered to be relevant to this EP are provided in **Table 1-5**. The relevance of each referral condition to this EP is described as follows:

- conditions 1, 2, 3, 4, 6 and 8 are not relevant, as drilling, construction, installation, subsea tie-in and operation activities are not covered under this EP. For this reason, condition 11A is also not applicable
- conditions 7, 9 and 10 have been revoked
- condition 5 is relevant; this EP, and any future EP(s), in relation to the decommissioning of the Enfield Development subsea infrastructure, will meet the requirements of condition 5 of the referral (EPBC 2001/257) (as modified by condition 11 and 11B of the referral).

Table 1-5: Conditions from Enfield Full Field Development referral (EPBC 2001/257) relevant to Enfield subsea infrastructure decommissioning

Condition Number	Condition
5	The person taking the action must submit a decommissioning plan (or plans) for approval by the Minister one year prior to decommissioning of the floating production storage and offtake vessel, and three months prior to decommissioning any subsea wells, flowlines, or any associated infrastructure. The plan (or plans) must consider the complete removal of all structures and components above the sea floor. The approved plan must be implemented.
11	A plan required by condition 1, 2, 3, 4, 5 or 8 is automatically deemed to have been submitted to, and approved by, the Minister if the measures (as specified in the relevant condition) are included in an environment plan (or environment plans) relating to the taking of the action that: a) was submitted to NOPSEMA after 27 February 2014; and b) either: i. is in force under the OPGGS Environment Regulations; or ii. has ended in accordance with regulation 25A of the OPGGS Environment Regulations.
11B	Where an environment plan, which includes measures specified in the conditions referred to in conditions 11 and 11A above, is in force under the OPGGS Environment Regulations that relates to the taking of the action, the person taking the action must comply with those measures as specified in that environment plan.

Recovery Plans and Threat Abatement Plans

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

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

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

- 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.

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 Australian Government must not perform functions or exercise powers relating to these parks that are inconsistent with management plans (s362 of the EPBC Act). Relevant AMPs are described in **Section 4.8**. The North-west Marine Parks Network Management Plan (DNP, 2018a) and the South West Marine Parks Network Management Plan (DNP, 2018b) describe the requirements for managing the marine parks that are relevant to this EP.

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

- Special Purpose Zone (IUCN category VI) – managed to allow specific activities 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.

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 1-6**.

Table 1-6: 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 and 3.02: Assessment of significant impact on World

Number	Principle	Relevant Section of the EP
	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 (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.	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**. 3.03 (c): Relevant stakeholder consultation and feedback received in relation to impacts and risks to the Ningaloo Coast and Shark Bay World Heritage Properties (which are both within the scope of this EP) 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 that Woodside follows to prepare the EP once an activity has been defined as a petroleum activity (refer **Section 1.2**). This includes a description of the environmental risk management methodology that is used to identify, analyse and evaluate risks to meet ALARP and acceptability requirements and to develop EPOs and EPSs. This section also describes Woodside's risk management methodologies applicable to implementation strategies applied during the activity.

Regulation 13(5) of the Environment Regulations requires environmental impacts and risks of the Petroleum Activities program to be detailed, and evaluated appropriate to the nature and scale of each impact and risk associated with the Petroleum Activities Program and potential emergency conditions. The objective of the risk assessment process, described in this section, is to identify the risks and associated impacts of an activity so they can be assessed, appropriate control measures applied to eliminate, control or mitigate the impact or risk to ALARP, then 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. This may include environment impacts and risk that are a result of the proposed activity but are not within Woodside's control.

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

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

2.2 Identification of property associated with Petroleum Activity

At the commencement of a decommissioning project, a list of infrastructure for decommissioning is collated using as left data. All wet stored, redundant subsea infrastructure items and locations are maintained in a database. If during the operational lifecycle, equipment is degraded, damaged, or has deteriorated to a level outside acceptance limits for use to the point where replacement is required, the redundant equipment may be wet stored on the sea floor until end of field life decommissioning. Records of redundant equipment are maintained in Woodside's Component Orientated Anomaly Based Inspection System (COABIS).

2.3 Environmental Risk Management Methodology

Woodside recognises that risk is inherent to its business and effectively managing risk is vital to delivering on company objectives, success and continued growth. Woodside is committed to managing risks proactively and effectively. The objective of Woodside's risk management system is to provide a consistent process for recognising and managing risks across its business. Achieving this objective includes ensuring risks consider impacts across the 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 31000:2009. The WMS risk management procedure, guidelines and tools provide guidance on 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 the 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**. Each step and how it is applied to the scopes of this activity is described in **Sections 2.4 to 2.12.**

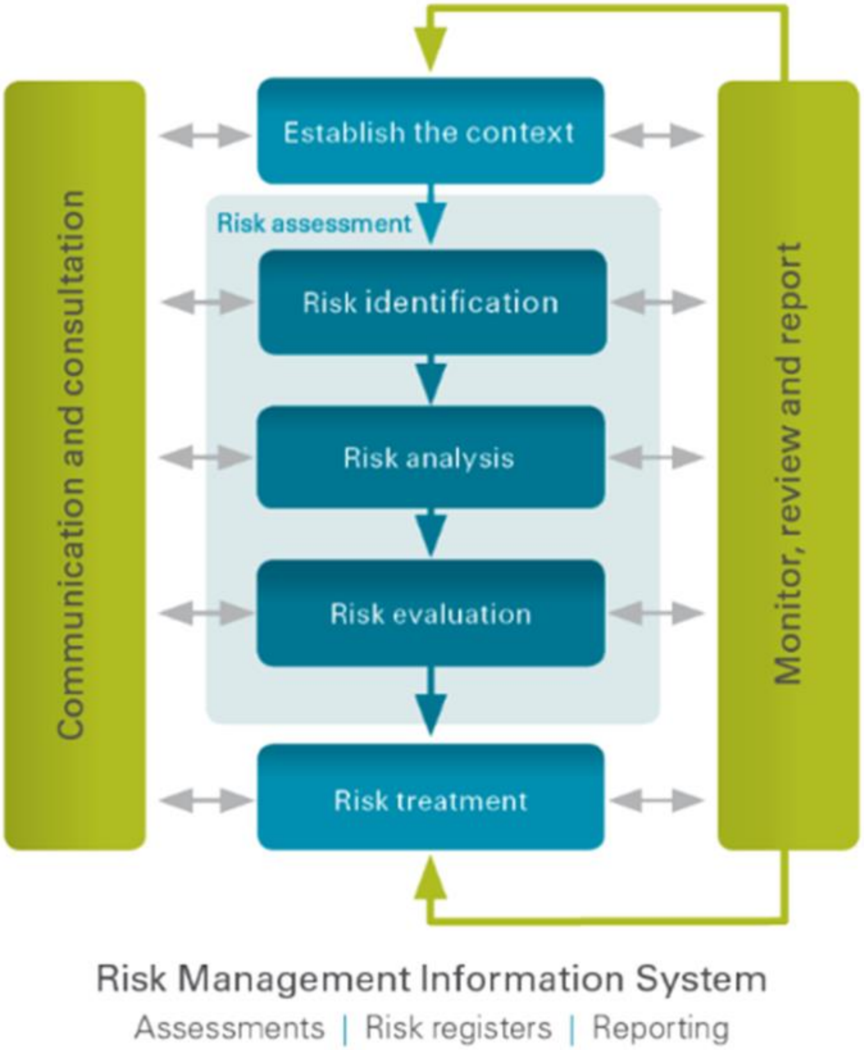


Figure 2-1: Woodside's risk management process

2.3.1 Healthy, Safety and Environment Management Procedure

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

2.3.2 Impact Assessment Procedure

To support effective environmental risk assessment, Woodside's Impact Assessment Procedure (**Figure 2-2**) provides the steps needed to meet required environment, health and social standards by ensuring impacts are assessed 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.

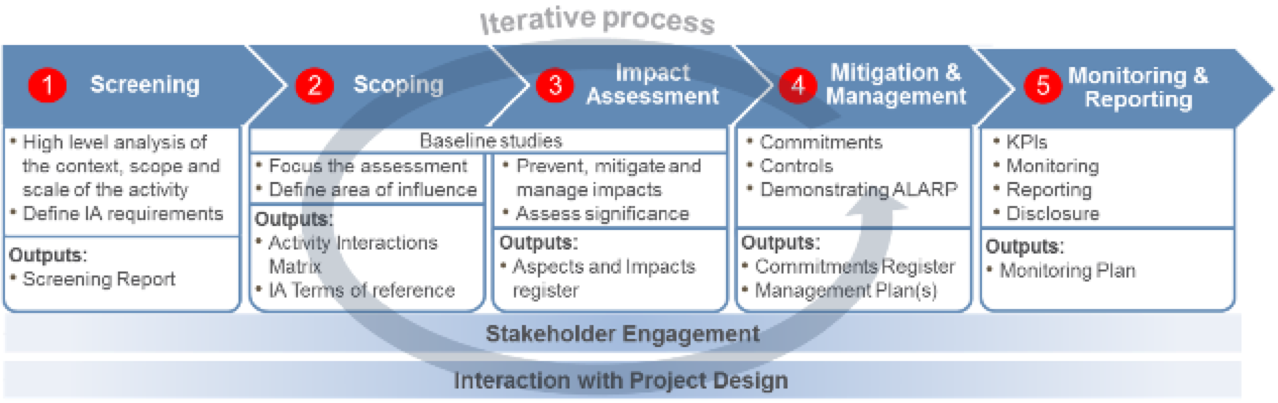


Figure 2-2: Woodside's impact assessment process

2.4 Environmental Plan Process

Figure 2-3 illustrates the EP development process. Each element of this process is discussed further in **Sections 2.4** to **2.12**.

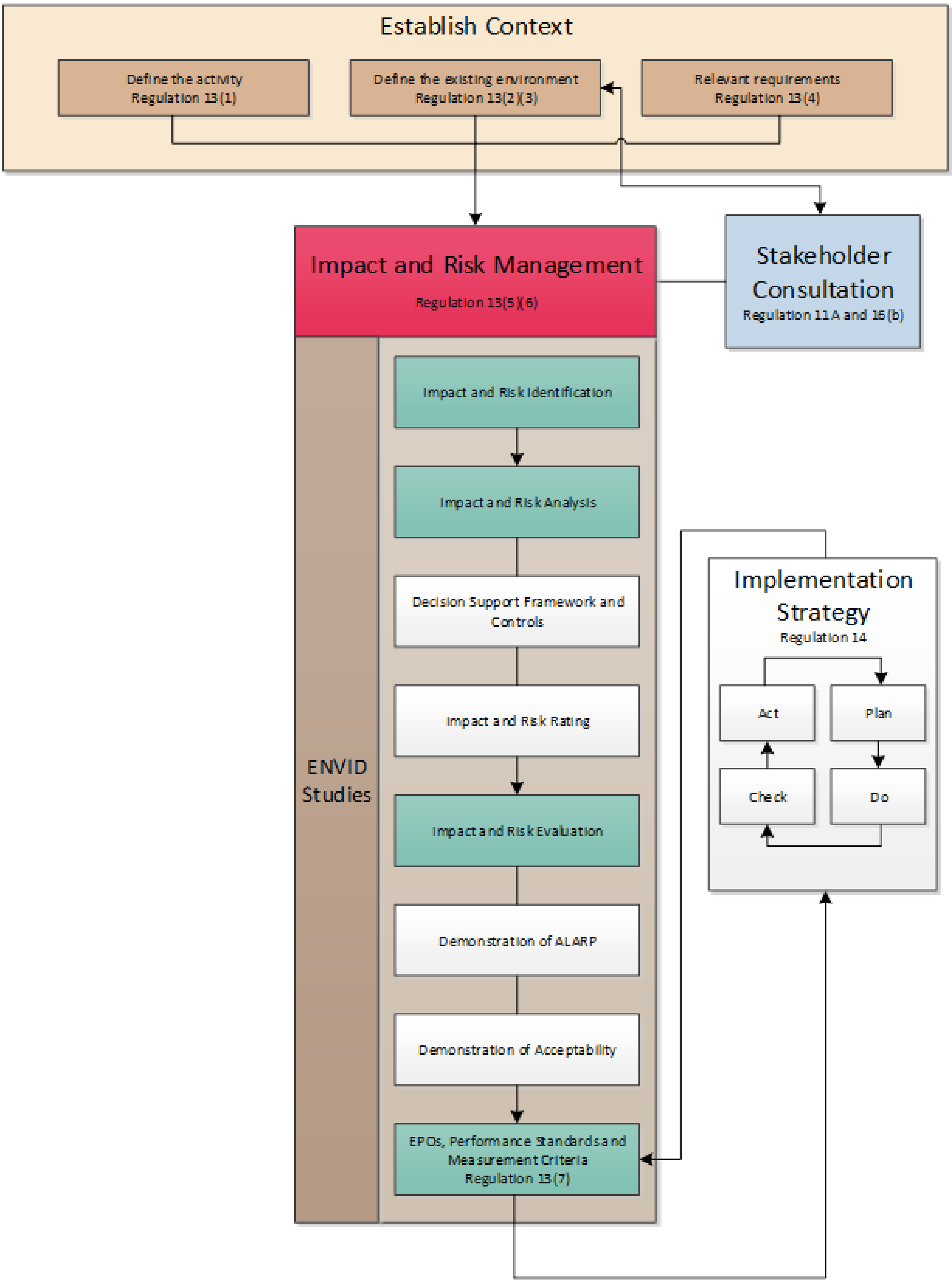


Figure 2-3: Environment Plan development process

2.5 Establish the Context

2.5.1 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 then described in relation to:

- the location
- what is to be performed
- how it is planned to be performed, including outlining operational details of the activity, and proposed timeframes.

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

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

2.5.2 Defining 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 H in the Enfield Plug and Abandonment EP (hereafter referred to as the Master Existing Environment) have been made throughout this EP. The accepted EP (NOPSEMA EP No: 5632, ID: A803388) is available on the NOPSEMA website: Enfield Plug and Abandonment EP » NOPSEMA. The purpose is to describe the existing environment that may be impacted by the activity, directly or indirectly, by planned or unplanned events.

The existing environment section (**Section 4**) is structured to define the physical, biological, socio economic and cultural attributes of the area of interest, in accordance with the definition of 'environment' in Regulation 4(a) of the Environment Regulations. These sub-sections 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 2.7.2**) and rated for all planned and unplanned activities. Additional detail is provided for evaluating unplanned hydrocarbon spill risk.
- EPBC Act Matters of National Environmental Significance (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 6.9**. MNES, as defined within the EPBC Act, are addressed through Woodside's impact and risk assessment (**Section 6**).
- Relevant values and sensitivities, which may include world or national Heritage Listed areas, Ramsar wetlands, listed threatened species or ecological communities, listed migratory species, and sensitive values that exist in or in relation to Commonwealth marine area or land.
- In categorising the environmental values potentially impacted by the Petroleum Activities Program (as presented in **Table 2-1**), there is standardisation of information relevant to understanding the receiving environment. Potential impacts to these environmental values are evaluated in the risk analysis (refer **Section 2.8**), and risk-rated for all planned and unplanned

activities. This provides a robust approach to the overall environmental risk evaluation and its documentation in the EP.

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: Environmental values potentially impacted by the Petroleum Activities Program which are assessed within the EP

Environmental Value Potentially Impacted Regulations 13(2) and 13(3)					
Marine Sediment	*Water Quality*	*Air Quality*	*Ecosystems/ Habitats*	*Species*	*Socio-Economic*

2.5.3 Relevant Requirements

The relevant requirements in the context of legislation, other environmental approval requirements, conditions and standards that apply to the Petroleum Activities Program have been identified and reviewed. Relevant requirements are presented in **Appendix B** and **Section 1**.

Woodside's Corporate Health, Safety and Environment Policy is presented in **Appendix A**.

2.6 Impact and Risk Identification

Relevant environmental aspects and hazards have been identified to 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 identification studies and workshops (e.g. HAZID/Environmental Hazard Identification [ENVID]), Process Safety Risk Assessment processes, reviews and associated desktop studies associated with the Petroleum Activities Program. Risks are identified based on planned and potential interaction with the activity (based on the description in Section 3), the existing environment (Section 3) 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' hereafter in this EP.

An ENVID workshop was conducted for the Enfield subsea infrastructure decommissioning on 2nd September 2021. Participants included project environmental advisors, environmental engineers, development coordinator, subsea engineer and drilling engineers. The participants' breadth of knowledge, training and experience was sufficient to reasonably assure that the hazards that may arise in connection with the Petroleum Activities Program in this EP were identified.

Impacts and risks were identified during the ENVID for both planned (routine and non-routine) activities and unplanned (accidents, incidents and emergency conditions) events. During this process, risks that are identified as not applicable (not credible) are removed from the assessment. This is done by defining the activity and identifying that an aspect is not applicable.

The impact and risk information are then classified, evaluated and tabulated for each planned activity and unplanned event. Environmental impacts and risks are recorded in an environmental impacts and risk register. The output of the ENVID is used to present the risk assessment and forms the basis to develop performance outcomes, standards and MC. This information is presented in **Section 6**, using the format presented in **Table 2-2**.

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

Source of Impact/Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	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 impact/risk													

2.7 Impact and Risk Analysis

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

The key steps performed for each risk identified during the risk assessment were:

1. Identify the decision type in accordance with the decision support framework.
2. Identify appropriate control measures (preventative and mitigative) aligned with the decision type.
3. Assess the risk rating or impact.

2.7.1 Decision Support Framework

To support the risk assessment process and Woodside's determination of acceptability (**Section 2.9.2**), Woodside's HSE risk management procedures include using a decision support framework based on principles set out in the Guidance on Risk Related Decision Making (Oil and Gas UK, 2014). This concept is applied during the ENVID, or equivalent preceding processes during historical design decisions, to determine the level of supporting evidence that may be required to draw sound conclusions about risk level and whether the risk is ALARP and acceptable (**Table 2-4**). This is to confirm:

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

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

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

Decision Type A

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

Decision Type B

Risks classified as Decision Type B typically involve greater uncertainty and complexity (and can include potential higher order impacts/risks). These risks may deviate from established practice or have some lifecycle implications, and therefore require further engineering risk assessment to support the decision and ensure the risk is ALARP. Engineering risk assessment tools may include:

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

Decision Type C

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

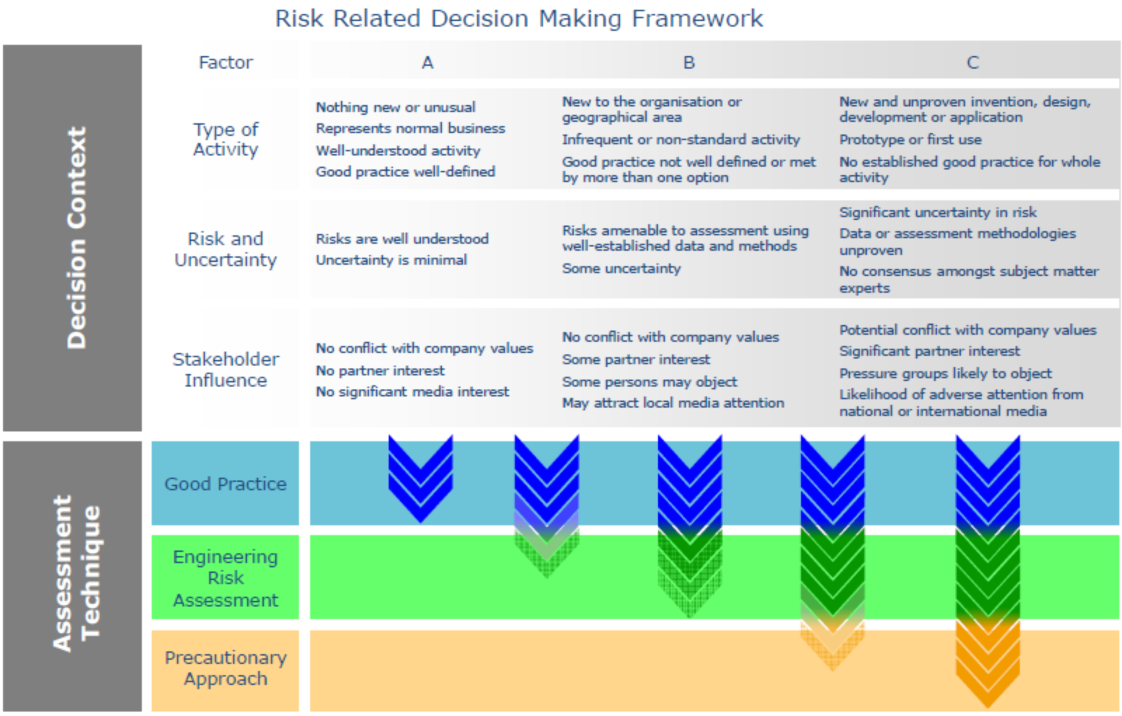


Figure 2-4: Risk-related decision-making framework (Oil and Gas UK 2014)

2.7.2 Decision Support Framework Tools

The following 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 which must be complied with for the activity.
- **Good Industry Practice (GP)** – identifies further engineering control standards and guidelines that may be applied by Woodside above those 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.

2.7.3 Decision Calibration

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

- **Legislation, Codes and Standards/Verification of Predictions –** verification of compliance with applicable LCS and/or good industry practice.
- **Peer Review** – independent peer review of PJs, supported by risk based analysis, where appropriate.
- **Benchmarking** – where appropriate, benchmarking against a similar facility or activity type or situation that has been accepted to represent acceptable risk.
- **Internal Stakeholder Consultation** – consultation performed within Woodside to inform the decision and verify CVs are met.
- **External Stakeholder Consultation –** consultation performed 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.

2.7.3.1 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).

2.7.4 Impact and Risk Classification

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

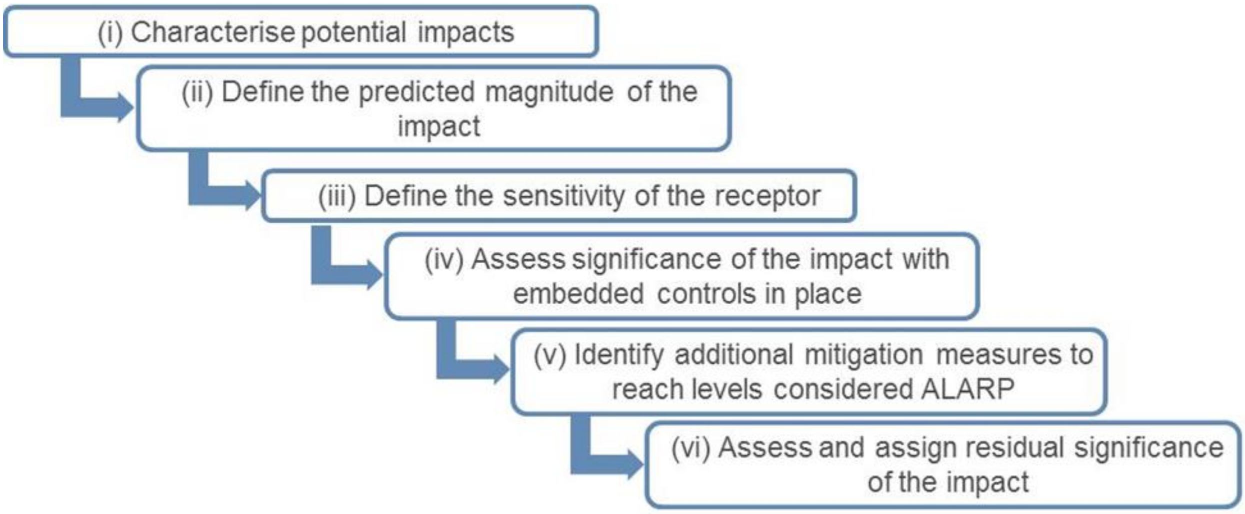


Figure 2-5: Environmental impact and risk analysis

Impacts are classified in accordance with the consequence (**Section 2.5**) outlined in the Woodside Risk Management Procedure and Risk Matrix.

Risks are assessed qualitatively and/or quantitatively in terms of both likelihood and consequence in accordance with the Woodside Risk Management Procedure and Risk Matrix.

The impact and risk information are summarised, including classification, and evaluation information, as shown in the example in **Table 2-2**, evaluated 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 (more than 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes	Catastrophic, long-term impact (more than 20 years) to a community, social infrastructure or highly valued areas/items of international cultural significance	*A*
Major, long-term impact (ten to 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes	Major, long-term impact (five to 20 years) to a community, social infrastructure or highly valued areas/items of national cultural significance	*B*
Moderate, medium-term impact (two to ten years) on ecosystems, species, habitat or physical or biological attributes	Moderate, medium term Impact (two to five years) to a community, social infrastructure or highly valued areas/items of national cultural significance	*C*

Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems function), physical or biological attributes	Minor, short-term impact (one to two years) to a community or highly valued areas/items of cultural significance	***D***
Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes	Slight, short-term impact (less than one year) to a community or areas/items of cultural significance	***E***
No lasting effect (less than one month); localised impact not significant to environmental receptors	No lasting effect (less than one month); localised impact not significant to areas/items of cultural significance	***F***

2.7.5 Risk Rating Process

The risk rating process is performed to assign a level of risk to each risk event, measured in terms of consequence and likelihood. The assigned risk level is therefore 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 performed using the following steps:

2.7.5.1 Select the Consequence Level

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

2.7.5.2 Select the Likelihood Level

Determine the description that best fits the chance of the selected consequence occurring, assuming reasonable effectiveness of the preventative and mitigative 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 1000–10,000 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**

2.7.5.3 Calculate the Risk Rating

The risk level is derived from the consequence and likelihood levels determined above in accordance with the risk matrix shown in **Figure 2-6**. A likelihood and risk rating are only applied to environmental risks using the Woodside risk matrix.

This risk level 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.

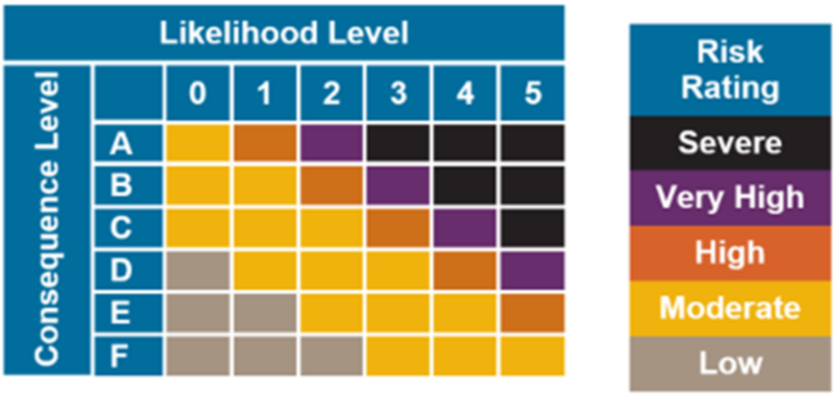


Figure 2-6: Woodside risk matrix – risk level

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

2.8 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 6** and **Appendix A**).
- External context – the environment consequence (**Section 6**) and stakeholder acceptability (**Section 4.9.7**).
- 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.

2.8.1 Demonstration of ALARP

Descriptions have been provided in **Table 2-5** to 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

<table>
<tr><th>Risk</th><th>Impact</th><th>Decision Type</th></tr>
<tr><td>Low and Moderate
(below C level consequences)</td><td>Negligible, Slight, or Minor
(D, E or F)</td><td>A</td></tr>
<tr><td colspan="3">Woodside demonstrates these risks, impacts and decision types are reduced to ALARP if:
• controls identified meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines
• further effort towards impact/risk reduction (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.</td></tr>
<tr><td>High, Very High or Severe
(C+ consequence risks)</td><td>Moderate and above
(A, B or C)</td><td>B and C</td></tr>
<tr><td colspan="3">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.</td></tr>
</table>

2.8.2 Demonstration of Acceptability

Descriptions have been provided in **Table 2-6** to articulate how Woodside demonstrates that different risks, impacts and Decision Types identified within the EP are Acceptable.

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

<table>
<tr><th>Risk</th><th>Impact</th><th>Decision type</th></tr>
<tr><td>Low and moderate</td><td>Negligible, slight, or minor
(D, E or F)</td><td>A</td></tr>
<tr><td colspan="3">Woodside demonstrates these lower order risks, impacts and decision types are 'Broadly Acceptable' if they meet:
• legislative requirements
• industry codes and standards
• applicable company requirements
and where further effort towards reducing risk (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.</td></tr>
<tr><td>High, very high or severe</td><td>Moderate and above (A, B or C)</td><td>B and C</td></tr>
<tr><td colspan="3">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), and
• meet the following criteria, appropriate to the nature and scale of each impact and risk:
– Impact/risk does not contravene relevant principles of ESD, as defined under the EPBC Act.
– Internal context – the proposed controls and consequence/risk level are consistent with Woodside policies, procedures and standards.
– External context – stakeholder expectations and feedback have been considered (Section 4.9.7).
– Other requirements – the proposed controls and consequence/risk level are consistent with national and international industry standards, laws and policies, and applicable plans for management and conservation advices, conventions, and significant impact guidelines (e.g. for MNES) have been considered.
Where there are significant complexities in assessing and managing impacts to different receptors and for demonstrating how these impacts are acceptable (e.g. significant stakeholder concern for specific receptors, lack of consensus of appropriate controls or standards), acceptability may be demonstrated 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.</td></tr>
</table>

2.9 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 1.10.1.3**). 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 3.2 of the Master Existing Environment).
- 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 6.10**).
- 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 6.10**).

2.10 Environmental Performance Objectives/Outcomes, Standards and Measurement Criteria

EPOs, EPSs and MC have been defined to address the potential environmental impacts and risks and are presented in **Section 6**.

2.11 Implementation, Monitoring, 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 Petroleum Activities Program. The implementation 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 standards set out in the EP are met through monitoring, recording, audit, management of non-conformance and review.
- 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 to respond to and monitor impacts from oil pollution emergencies.
- Environmental reporting requirements, including ‘reportable incidents’, are met.
- Appropriate stakeholder consultation is performed throughout the activity.

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

2.12 Stakeholder Consultation

Woodside conducts an assessment to identify relevant persons (as defined under Regulation 11A of the Environment regulations) prior to commencing stakeholder engagement. The assessment is included in **Section 5** and consultation material issued to stakeholders for their feedback is included in **Appendix F**. A summary of all consultation and feedback received from stakeholders is summarised in **Table 5-2**.

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 performed as part of the Petroleum Activities Program under this EP.

3.2 Project Overview

The Enfield field started producing crude oil in 2006 via a network of subsea wells tied back to the Nganhurra FPSO. Oil from the Enfield reservoir was produced through six horizontal production wells and two deviated production wells, and supported by eight water injection wells and two gas injection wells. The field has reached the end of its economic life, with the 18 wells shut-in in Q4 2018 and subsea infrastructure currently in a state of preservation.

Decommissioning of other Enfield infrastructure will be managed under separate EPs as outlined in **Section 1.10.1.1**. The Petroleum Activities Program for this EP will involve the removal of subsea infrastructure above mudline. An overview of the Petroleum Activities Program is provided in **Table 3-1**.

Table 3-1: Petroleum Activities Program overview

Item	Description
Title area	WA-28-L
Location	Exmouth Sub-basin
Water depth	Operational Area: ~400–600 m
Infrastructure	• 4 x manifolds • 4 x manifold foundation suction piles • 7 x flexible flowlines and risers (including 10 x Uraduct stabilisation) • 7 x riser bases (including 4 x riser holdback anchors) • 8 x umbilicals • 6 x jumpers (production, gas lift, electrical/hydraulic) • 15 x rigid well tie-in spools • 9 x drag anchors and mooring lines • 1 x debris anchor and mooring line • ~120 x sand/aggregate bags
Vessels	• Project vessels including offshore support vessels and general support vessels.
Key activities	• as-found ROV survey (as required) • disconnection of manifold from foundations and recovery of manifold • reverse installation of manifold foundation suction piles, with contingency to cut above mudline and recover top section and leave remainder in situ • cutting and recovery of rigid spools • respool or cut flexible flowlines and risers (including Uraduct stabilisation and riser bases) • respool or cut umbilicals • cut and recover jumpers • recover riser holdback anchors • cut and recover mooring lines (as close to mudline as possible) • leave in situ anchors located below the mudline, including approximately 100 m of mooring line per anchor • recovery of sand/aggregate bags, with contents released to seabed

Item	Description
	• as-left ROV survey • IMR activities

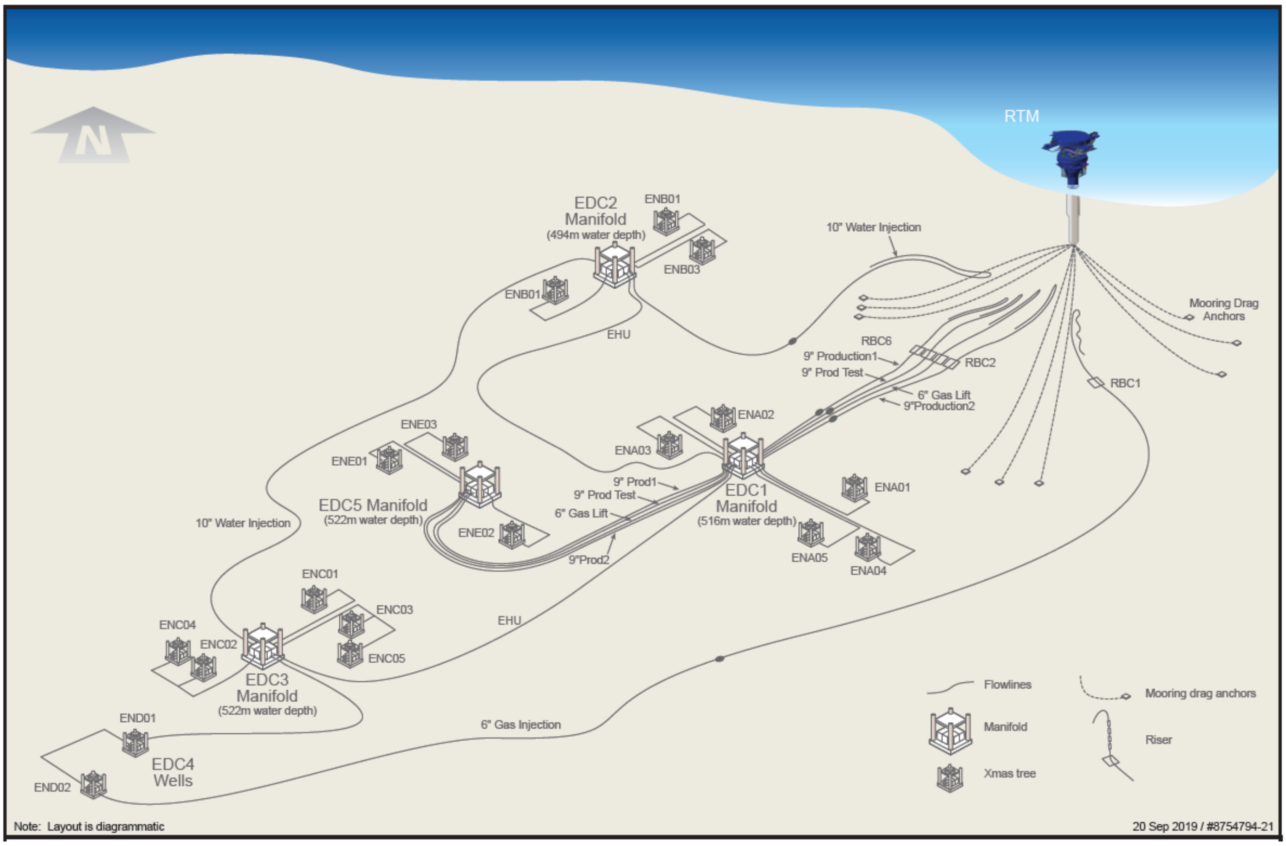


Figure 3-1: Enfield field subsea layout

3.3 Location

The proposed Petroleum Activities Program is located in WA-28-L in Commonwealth waters in the Exmouth Sub-basin. WA-28-L is about 38 km north of North West Cape. Locations and depths of the key subsea infrastructure are presented in **Table 3-2**. The location of the Petroleum Activities Program is presented in **Figure 3-2**.

Table 3-2: Infrastructure coordinates for key subsea infrastructure and water depth

Subsea Infrastructure	Latitude	Longitude	Approximate Water Depth (mLAT)
Manifolds/manifold foundation suction piles	21° 28' 54.19" S	113° 59' 21.19" E	516
	21° 27' 55.88" S	113° 59' 34.84" E	494
	21° 29' 15.35" S	113° 58' 30.82" E	550
	21° 28' 53.42" S	113° 59' 17.78" E	522
Flexible flowlines and risers	Start: 21° 29' 15.920" S End: 21° 28' 53.268" S	Start: 113° 58' 31.392" E End: 114° 00' 29.249" E	Start: 550 End: 396
	Start: 21° 29' 15.920" S End: 21° 28' 53.268" S	Start: 113° 58' 31.392" E End: 114° 00' 29.249" E	Start: 550 End: 396
	Start: 21° 29' 15.920" S	Start: 113° 58' 31.392" E	Start: 550

Subsea Infrastructure	Latitude	Longitude	Approximate Water Depth (mLAT)
	End: 21° 28' 53.268" S	End: 114° 00' 29.249" E	End: 396
	Start: 21° 27' 55.88" S End: 21° 28' 53.268" S	Start: 113° 59' 34.84" E End: 114° 00' 29.249" E	Start: 494 End: 396
	Start: 21° 29' 15.35" S End: 21° 27' 55.88" S	Start: 113° 58' 30.82" E End: 113° 59' 34.84" E	Start: 550 End: 494
	Start: 21° 30' 3.582" S End: 21° 28' 53.268" S	Start: 113° 57' 51.152" E End: 114° 00' 29.249" E	Start: 550 End: 396
	Start: 21° 29' 15.920" S End: 21° 28' 53.268" S	Start: 113° 58' 31.392" E End: 114° 00' 29.249" E	Start: 550 End: 396
Umbilicals	Start: 21° 28' 54.19"S End: 21° 28' 53.268" S	Start:113° 59'21.19"E End: 114° 00' 29.249" E	Start: 516 End: 396
	Start: 21° 27' 55.88" S End: 21° 28' 54.19"S	Start: 113° 59' 34.84" E End: 113° 59' 21.19"E	Start: 494 End: 516
	Start: 21° 28' 53.42" S End: 21° 28' 54.19" S	Start: 113° 59' 17.78" E End: 113° 59' 21.19" E	Start: 522 End: 516
	Start: 21° 29' 15.35" S End: 21° 28' 54.19"S	Start: 113° 58' 30.82" E End:113° 59' 21.19"E	Start: 550 End: 516
	Start: 21° 30' 3.582" S End: 21° 29' 15.35" S	Start: 113° 57' 51.152" E End: 113° 58' 30.82" E	Start: 550 End: 550
	Start: 21° 28' 52.86" S End: 21° 27' 58.85" S	Start: 113° 59' 19.64" E End: 113° 59' 37.41" E	Start: 517 End: 487
	Start: 21° 29' 25.99" S End: 21° 30' 03.38" S	Start: 113° 58' 07.55" E End: 113° 57' 50.76" E	Start: 567 End: 550
	Start: 21° 28' 55.52" S End: 21° 29' 04.71" S	Start: 113° 59' 23.06" E End: 113° 58' 54.02" E	Start: 511 End: 538
Drag anchors for mooring lines	21° 28' 25.28" S	114° 00' 29.85" E	405
	21° 28' 26.93" S	114° 00' 32.33" E	402
	21° 28' 26.43" S	114° 00' 34.18" E	399
	21° 29' 07.62" S	114° 00' 54.73" E	364
	21° 29' 09.48" S	114° 00' 53.18" E	364
	21° 29' 11.50" S	114° 00' 51.56" E	365
	21° 29' 07.18" S	114° 00' 02.58" E	424
	21° 29' 04.96" S	114° 00' 01.19" E	426
	21° 29' 02.73" S	114° 00' 00.11" E	429
Mooring lines	Start: 21° 28' 52.93" S End: 21° 28' 25.18" S	Start: 114° 00' 29.38" E End: 114° 00' 29.92" E	408
	Start: 21° 28' 52.93" S End: 21° 28' 26.93" S	Start: 114° 00' 29.36" E End: 114° 00' 32.35" E	405
	Start: 21° 28' 52.94" S End: 21° 28' 26.31" S	Start: 114° 00' 29.46" E End: 114° 00' 34.40" E	396
	Start: 21° 28' 53.39" S End: 21° 29' 7.88" S	Start: 114° 00' 29.67" E End: 114° 00' 54.94" E	362

Subsea Infrastructure	Latitude	Longitude	Approximate Water Depth (mLAT)
	Start: 21° 28' 53.42" S End: 21° 29' 9.67" S	Start: 114° 00' 29.63" E End: 114° 00' 53.49" E	363
	Start: 21° 28' 53.43" S End: 21° 29' 0.70" S	Start: 114° 00' 29.58" E End: 114° 00' 38.46" E	377
	Start: 21° 28' 53.33" S End: 21° 29' 7.34" S	Start: 114° 00' 29.12" E End: 114° 00' 2.35" E	422
	Start: 21° 28' 53.36" S End: 21° 29' 4.72" S	Start: 114° 00' 28.98" E End: 114° 00' 1.25" E	424
	Start: 21° 28' 53.39" S End: 21° 29' 3.11" S	Start: 114° 00' 28.94" E End: 114° 00' 0.02" E	426
Debris anchor and mooring line	Start: 21° 28' 56.80" S End: 21° 29' 35.46" S	Start: 113° 59' 21.92" E End: 113° 59' 0.26" E	Start: 513 End: 520

3.4 Operational Area

The Operational Area defines the spatial boundary of the Petroleum Activities Program, as described, risk assessed and managed by this EP, including vessel-related petroleum activities. The Operational Area is illustrated in **Figure 3-2** and is defined by a 1500 m area around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a 500 m exclusion zone (temporary) around the offshore support vessels to manage vessel movements.

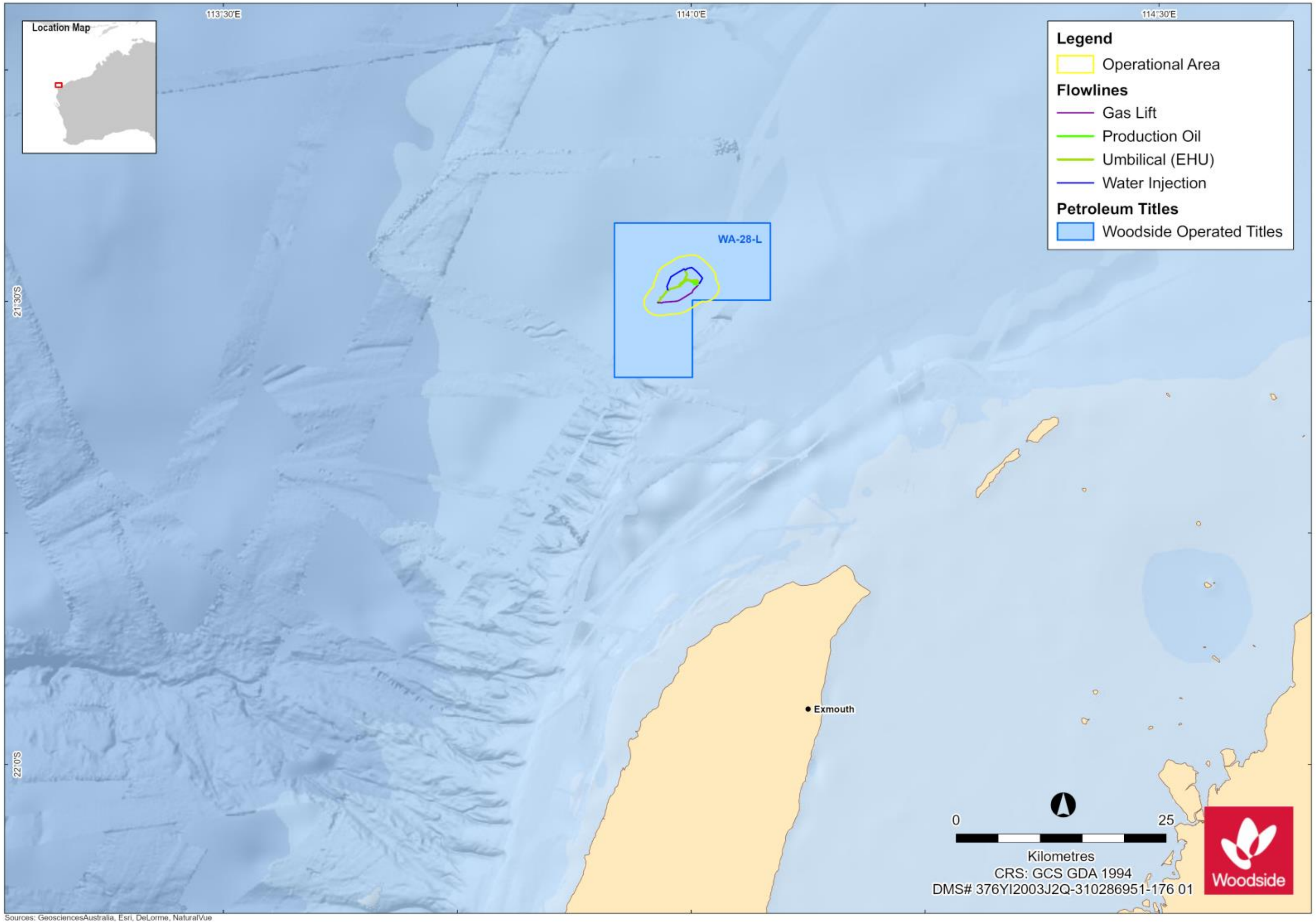


Figure 3-2: Petroleum Activities Program location and Operational Area

3.5 Timing

The Petroleum Activities Program may take up to 12 months cumulative duration, scheduled in 2022-2024 as shown in **Table 3-3**. The Petroleum Activities Program has the potential to be undertaken simultaneously with other decommissioning activities within WA-28-L (**Sections 1.10.1.1** and **3.8**).

Table 3-3: Timing of Petroleum Activities Program

Activity	Cumulative Duration	Approximate Timing
Preparation and removal of subsea infrastructure	Up to 12 months	2022-2024

When ongoing, activities will be 24 hours per day, seven days per week. Timing and duration of these activities is subject to change due to project schedule requirements, vessel availability, unforeseen circumstances and weather. This EP has risk assessed decommissioning activities throughout the year (all seasons) to provide operational flexibility. All the above timeframes are subject to change and, as no particular time periods have been nominated, changes to the above will not be interpreted as 'new stages' against Regulation 17(5) if within the lifetime of this EP.

3.6 Infrastructure Overview

Subsea infrastructure to be decommissioned under this EP is outlined in **Table 3-4** and shown in **Figure 3-1**. This infrastructure was identified and assessed through review of as-built drawings and footage from IMR surveys. All infrastructure covered under this EP is free from all but residual hydrocarbons, and the subsea system is positively isolated from the Xmas trees with blind seal plates installed between each Xmas tree and rigid well tie-in spool.

Table 3-4: Description of subsea infrastructure

Infrastructure		Quantity	Approximate dimensions and weight per item	Materials / Composition	Possible residual chemicals/hydrocarbons or contamination	Status	Condition	Last inspection date
Manifolds	5-slot manifold	2	Height: 3.5 m Width: 8.5 m Length: 8.5 m Weight: 73.9 t	22Cr Carbon steel Epoxy paint Polyurethane (~1 %)	Flushed as per associated flowlines. **Total estimated discharges:** 3.3 m^3 treated seawater (with 19.7 – 42.2 mg/L residual hydrocarbons) per manifold	Above mudline, on top of foundations	Suspended, loop flushed, filled with treated water, valves closed	April 2016
	3-slot manifold (water injection)	2	Height: 3.0 m Width: 6.4 m Length: 6.5 m Weight: 18.7 t	22Cr Carbon steel Epoxy paint Polyurethane (~1 %)	Flushed as per associated flowlines **Total estimated discharges:** 0.7 m^3 seawater (with residual hydrocarbons and possible scale) per manifold	Above mudline, on top of foundations	Suspended, loop flushed, filled with treated water, valves closed	April 2016
	Manifold foundation suction pile	4	Two-skirt pile (2): Height: 6.7 m Outer diameter: 7.5 m Attached foundation: Dimensions unknown Weight: 70.3 t	Carbon steel Concrete Epoxy paint	Contains seawater and sediment only.	5.8 - 7 m below mudline	Connected and buried, recovery points in good condition, no scour	April 2016
			Single-skirt pile (2): Height: 5.5 m Outer diameter: 6m Attached foundation: Height: 2.4 m Width: 7.1 m Length: 9.4 m Weight: 39.3 t			5.5 - 7 m below mudline	Connected and buried, recovery points in good condition, no scour	April 2016
Risers and flowlines	Flexible risers and flowlines, including Uraduct stabilisation and riser bases	7	Flowline length: 2.2 - 5 km Riser length: ~800 m Diameter: 6“ / 8“ / 9“ / 10“ Weight: 66 – 427 t	Stainless Steel Carbon steel Polyethylene Nylon Kevlar Polyester Polypropylene Polyolefin Epoxy paint Foam	Flushed with treated seawater (Hydrosure O-3670R 1000 ppm) Water injection lines flushed with seawater, may contain scale. **Total estimated discharges:** 750 m^3 treated seawater (70 – 180 m^3 per riser/flowline) with 19.7 – 42.2 mg/L residual hydrocarbons and possible scale. Additional residual hydrocarbons trapped between flowline layers (unknown volume).	Above mudline, with some sections partially or fully buried	Loop flushed, filled with treated water, risers disconnected from RTM capped and wet stored on the seabed	2016 - 2017
	Riser holdback anchors	4	Dimensions: 5 x 5 x 0.85 m Weight: 51 – 53 t	Carbon steel Epoxy paint	n/a	Mostly above mudline, with 10 – 40% burial	Engaged, connected by a tether to the riser holdback clamp	April 2016
Umbilicals	Umbilicals	8	Length: 0.8 – 2.3 km Diameter: 85.9 – 184.3 mm Weight: 25 – 84 t	Copper Polyethylene Polyvinyl Chloride Carbon steel Polyamide Nylon Polypropylene	**Volumes per umbilical:** Scale inhibitor: 124 – 780 L Methanol: 222 -1271 L Hydraulic fluid (HW 443): 206 – 570 L Hydraulic fluid (HW 434): 115 – 319 L Demulsifier: 143 – 468 L	Above mudline, with some sections partially or fully buried	No power supply, 5 umbilicals connected to manifolds and 3 disused umbilicals are wet stored	April 2016

Infrastructure		Quantity	Approximate dimensions and weight per item	Materials / Composition	Possible residual chemicals/hydrocarbons or contamination	Status	Condition	Last inspection date
				Epoxy paint	**Total estimated discharges:** ~12,000 L between 5 umbilicals (1039 – 3389 L per umbilical)			
Jumpers	Production and gas lift jumpers	4	Length: ~300 m Width: 214 – 359 mm Weight 70 - 200 t	Stainless Steel Polyethylene Polyethylene Nylon Kevlar Polyester Polypropylene Polyolefin Epoxy paint	Flushed as per associated flowlines. **Total estimated discharges:** ~80 m^3 treated seawater (10-30 m^3 per jumper) with 19.7 – 42.2 mg/L residual hydrocarbons.	Above mudline, with some sections partially or fully buried	Loop flushed, filled with treated water, flowlines and jumpers are connected to the structures	2016-2017
	Electrical / hydraulic jumpers	2	Length: 150 m Weight: 740 / 1200 t	Copper Polyethylene Polyvinyl Chloride Carbon Steel Polyamide Nylon Polypropylene Epoxy paint	Not flushed; hydraulic jumpers contain scale inhibitor, methanol, hydraulic fluid (HW 525), demulsifier, as per associated umbilicals. Electrical jumpers may contain dielectric oil. **Total estimated discharges:** 3.51 m^3 (1.75 m^3 per hydraulic jumper; 0.005 m^3 per electrical jumper)	Above mudline, with some sections partially or fully buried	Suspended, connected, no power supply, in good condition	April 2016
Rigid well tie-in spools	Rigid well tie-in spools	15	Length: 40 - 82 m Diameter: 2” or 6” Weight: 8 – 13.5 t	Stainless steel Carbon steel Polyurethane Epoxy paint	Flushed as per associated flowlines. **Total estimated discharges:** 0.17 – 3 m^3 treated seawater (with 28 – 42 ppm residual hydrocarbons) per spool.	Above mudline	Flushed, filled with treated seawater, in good condition with mechanical barrier (blind seal plate) isolating spool and subsea infrastructure from production tubing/wells	April 2016
Drag anchors	Drag anchors	9	Width: 6.3 m Length: 5.9 m Weight: 12 t	Steel Epoxy paint	n/a	Buried below mudline, up to 8m (at fluke tip).	Active, connected to moorings lines	March 2021
	Mooring lines	9	Length: ~1 km Weight: 160 t	Steel Polypropylene (~1%)	n/a	Located on seabed, partially buried below mudline in sections.	Active, connected to RTM	March 2021
Debris anchor	Anchor	1	Weight: 15 t	Steel Epoxy paint	n/a	Buried below mudline.	Connected to mooring line	n/a
	Mooring line	1	Length: 1.4 km	Steel Polypropylene (~1%)	n/a	Located on seabed, partially buried below mudline in sections.	Disconnected	n/a
Sand/aggregate bags	Sandbags / bulker bags	~120	Weight: 80 / 1400 kg	Plastic bag (~1%) Sand or aggregate filled	n/a	Located on or buried below mudline	Alongside subsea infrastructure	n/a

3.7 Other Property including Exploration Wellheads in the Licence Area

Licence area WA-28-L also includes infrastructure covered under the approved Ngujima-Yin Facility Operations EP (the Greater Enfield Development[1]), Nganhurra Operations Cessation EP and Enfield P&A EP (**Sections 1.10.1.1** and **3.8**) .

There are no other wellheads or property in the WA-28-L licence area. All other wells in the licence area have been permanently plugged and abandoned and wellheads removed.

3.8 Enfield Decommissioning Planning

Decommissioning planning for the Enfield Development is well advanced with planning being undertaken to meet the requirements of Section 572 (3) and the General Direction 812, as per **Section 1.10.1.1**. **Figure 3-3** provides an overview of the planned integrated Enfield decommissioning schedule, including EP submissions and key milestones for decommissioning planning and offshore execution. **Table 3-7** outlines the timing and duration for activities that comprise the Petroleum Activities Program of this EP (**Section 1.2**) as well as for other decommissioning activities related to the Enfield Development**.**

[1] The Enfield and Greater Enfield Developments are two separate field developments in the WA-28-L title area.

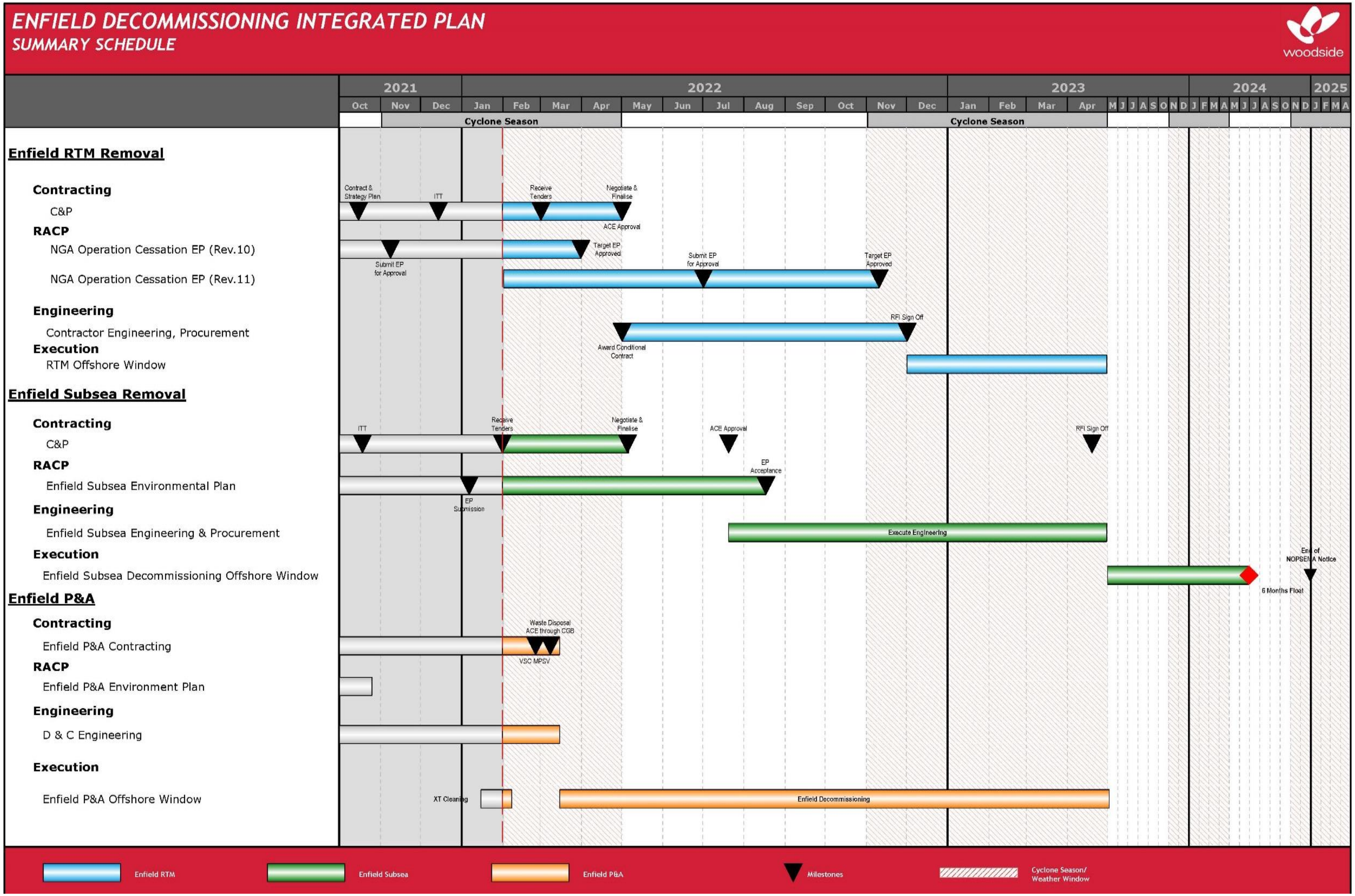


Figure 3-3: Enfield decommissioning integrated schedule and key milestones

Table 3-5: Overview of Enfield decommissioning activities, indicative timing and durations and EPs

Activity	Indicative Execution Timing	EP Submission Timing	Duration (Cumulative Duration)
RTM removal from title area	Anticipated offshore execution to occur prior to the end of cyclone season (prior to end April 2023).	Nganhurra Operations Cessation of EP - under assessment	To be determined in accordance with a future revision of the Nganhurra Operations Cessation EP
Decommissioning of subsea infrastructure	**Section 3.5** (Main offshore execution campaign window planned to commence following completion of RTM removal and P&A around June 2023. Removal may also be done as multiple smaller campaigns during the period 2022-2024).	This EP	**Section 3.5**
Permanent plugging of wells for abandonment, well IMR and removal of well infrastructure	Planned P&A is expected to commence during 2022 and be completed by end April 2023.	Enfield P&A EP - accepted	Permanent plugging activities are expected to take an average of 30 days per well to complete.

Although not planned, SIMOPs with activities covered under this EP and the Enfield P&A EP may occur; however, subsea decommissioning will not overlap RTM removal activities. Cumulative impacts associated with SIMOPs have been evaluated in this EP (**Section 6.5**) and a SIMOPs management plan will be developed to manage potential interactions.

3.9 Surveys and Studies Undertaken to Support Petroleum Activities Program

Production infrastructure can become contaminated over time from components of the hydrocarbon product. The two contaminants of concern are ionising radiation (Naturally Occurring Radioactive Material) and mercury.

NORM is the term used to describe materials containing radionuclides that exist in the natural environment. NORM is widely distributed, at varying concentrations in the Earth's crust and consequently also present in natural concentrations in gas and oil reservoirs (IOGP, 2016). The radionuclides of interest include uranium-238 and their radioactive decay products (such as isotopes of radium, radon, polonium, bismuth and lead) (ARPANSA, 2008).

In subsea infrastructure, NORM can either precipitate inside the flowlines in the form of scale or create surface contamination on the inside of flowlines during hydrocarbon production (IOGP, 2016). This is tested for by using a hand-held radiation meter. As radiation is everywhere, if detected and recorded as being above background thresholds, a sample is taken and sent to the lab for analysis, and used for informing the waste handling and management strategy.

Mercury occurs in trace quantities in hydrocarbon products and over time may accumulate in equipment, vessels and pipelines/flowlines in the form of scale, or inside the lining of infrastructure (IPIECA, 2014). Mercury is transported in the gas and fluids while the conditions are hot and as temperature decreases, mercury deposition can occur. Mercury deposits will partially vaporise at relatively low temperatures (room temperature) and progressively increases as the temperature rises (IPIECA, 2014).

Mercury is tested for by using a hand held mercury vapour testing unit. If detected, further testing of the infrastructure is undertaken using High-Definition X-Ray Florescence (HDXRF). This enables a quantification of remaining mercury (if any) impregnated into the carcass of the infrastructure and is used for informing the waste handling and management strategy.

The results from the testing described below are being used to support field decommissioning activities and management of waste (see **Section 3.13.1**).

3.9.1 Nganhurra FPSO Testing for Contamination

The Nganhurra FPSO topsides were tested for NORM and mercury in December 2018. The sampling identified three areas where NORM were present in sludge located in the topsides. No mercury was detected.

The sludge was collected and disposed of via a specialist radiation contractor. A Free-release certificate was issued for the topsides locations prior to FPSO sail away certifying that above equipment/items have been inspected and free-released from any future restrictions due to the presence of radioactive material. This confirmed that NORM present was in very small quantities, of very low concentrations, and does not represent a hazard to workers, members of the public of the environment.

3.9.2 Subsea Risers Testing for Contamination

During cessation production a ~2 m section of a production riser and a ~2 m section of a water injection riser were removed from the cut end of the risers where they had been disconnected from the RTM buoy. The two sections were taken onshore for testing for NORM and mercury.

No radiation was detected from either of the riser sections. In addition, there was no scale visible.

Mercury in the form of vapour was detected in both the sections of risers, however no mercury was detected in the riser carcasses.

3.9.3 Seal Plate Testing for Contamination

The production seal plates that were removed and replaced with blind seal plates during cessation of production were taken onshore for testing of NORM and mercury. No radiation was detected from any of the seal plates and there was no scale visible.

No mercury vapour was detected from any of the seal plates, however impregnated mercury was detected in a single seal plate (ENA-02). The levels were below all thresholds for special waste disposal and so the seal plate was disposed of at a normal waste facility as Class 1 waste (WA Landfill Waste Class I threshold of mercury contaminated waste is 0.2 mg/kg or below (DWER, 2019)).

3.10 Project Vessels

3.10.1 Project Vessel Overview

A maximum of two offshore/general support vessels will be required in field to complete the Petroleum Activities Program at any time. These are summarised in **Table 3-6.**

All project vessels will be subject to the Marine Offshore Assurance process and review of the Offshore Vessel Inspection Database (OVID). All required audits and inspections will assess compliance with the laws of the international shipping industry, which include safety and environmental management requirements, and maritime legislation including *International Convention for the Prevention of Pollution from Ships 1973* as modified by the Protocol of 1978 (MARPOL) and other International Maritime Organization (IMO) standards.

For power generation, vessels may use diesel-powered generators and/or LNG. All vessels will display navigational lighting and external lighting on a 24-hour basis, 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*.

Project vessels may also assist in implementing the Oil Pollution First Strike Plan in the event of a spill (**Appendix I**).

Table 3-6: Project vessel overview

Vessel	Activities
Offshore support vessels (Subsea Construction Vessel (SCV), Inspection, Maintenance and Repair (IMR), Anchor Handling Tug (AHT))	A variety of vessels may be used to decommission and remove subsea infrastructure. Vessels will require sufficient capacity to accommodate subsea infrastructure and be equipped with a variety of material handling equipment which includes cranes, winches, ROVs and ROV launch and recovery systems. Lifting operations involve loading and unloading of equipment from support vessels and recovery of subsea infrastructure from the seabed. Typical specifications for offshore support vessels are provided in **Table 3-7**.
General support vessels	General support vessels including cargo vessels and barges for transporting equipment and materials from port/staging area to the Operational Area and for general re-supply and support for the offshore support vessels. Support vessels may also have additional capability, such as ROV activities, lifting equipment for deployment and retrieval of subsea equipment, monitoring and inspection. Typical specifications for support vessels are similar to those provided in **Table 3-7** for offshore support vessels.

Table 3-7: Typical offshore support vessel specifications

Component	Specification Range		
	Sapura Constructor	***DOF Skandi Singapore***	***Far Saracen***
Vessel Type/Design/Class	Construction Vessel	IMR	AHT
Accommodation (maximum persons on board)	~120 personnel	~100 personnel	~40 personnel
Station keeping	Minimum of DP2		
Fuel (@ 90% capacity)	~1006 m^3	~1000 m^3	~998 m^3
Lube oil storage capacity	~35 m^2	~35 m^3	~20 m^3

3.10.1.1 Refuelling

All vessels will utilise diesel-powered generators for power generation and will be refuelled via support vessels, approximately weekly during activities. Other fuel transfers that may occur within the Operational Area include refuelling of cranes, helicopters or other equipment as required.

3.10.1.2 Dynamic Positioning

DP uses satellite navigation and radio transponders in conjunction with thrusters to maintain position at the required location. Vessels use dual redundant Differential Global Positioning System (DGPS) to maintain position at the required location. If required, additional positioning equipment, such as taut wire or seabed transponders may be deployed. The transponders emit signals that are detected by receivers on the vessel and used to calculate position; they are typically deployed in an array on the seabed, using clump weights comprising concrete, for the duration of subsea infrastructure decommissioning activities. Transponders and clump weights are recovered at the end of the activity.

3.10.2Remotely Operated Vehicles

Vessels may be equipped with an ROV system that is maintained and operated by a specialised contractor aboard the vessel. ROV may be used for activities such as:

- IMR activities
- as-found survey (as required)

- placement of ROV tool baskets on the seabed and/or mud mats on the seabed
- subsea rigging, handling and cutting
- marine growth cleaning of the subsea infrastructure
- water jetting (if required for marine growth cleaning)
- manual valve functioning
- open water tool observation and guidance
- sediment relocation
- as-left ROV survey.

3.10.3 Helicopters

During the Petroleum Activities Program, crew changes may be performed using helicopters as required. Helicopter operations within the Operational Area are limited to helicopter take-off and landing on the helideck. Helicopters may be refuelled on the helideck. Helicopters may also be used in emergency response events.

3.11 Inspection, Maintenance and Repair Activities

Subsea infrastructure has been left in a state of preservation that is not expected to require IMR activities prior to decommissioning. However, IMR may be undertaken (e.g. following as-found survey; **Section 3.12.1.3**) to ensure the integrity of the infrastructure for recovery. IMR activities are typically undertaken from an offshore support vessel via ROV.

IMR activities often require deployment frames/baskets, which are temporarily placed on the seabed. These frames/baskets typically have a perforated base with a seabed footprint of about 15 m^2. The frames/baskets are recovered to the vessel at the end of the activity.

3.11.1 Inspection Frequencies

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 frequency and scope of subsea and flowline inspection activities are determined using a risk-based inspection (RBI) methodology, resulting in detailed RBI plans. RBI planning is undertaken by subject matter experts to determine what future activities are required and at what frequency. The frequencies listed in **Table 3-8** are designed to suit the isolated flushed condition of the flowlines, risers, and structures. Hydrosure has been added to inhibit corrosion and prevent biofouling, so as to preserve the infrastructure until it is decommissioned.

With the FPSO off-station, online monitoring of the subsea system is redundant and therefore condition monitoring is reduced to visual inspections. This inspection data is then used to re-evaluate risks and define inspection frequencies and determine if maintenance or repair is required. There is no plan to perform any additional inspection or maintenance prior to recovery of infrastructure.

The approximate frequencies and potential locations of inspection and maintenance activities during the Petroleum Activities Program are presented in **Table 3-8**.

Table 3-8: Subsea IMR activities and frequencies

Activity	Location	Description	Approximate Frequency
Visual inspection	Subsea infrastructure	Routine visual inspection of subsea infrastructure undertaken using a support vessel and ROV (as required).	As required to inform decommissioning activities (0 to once during the life of the EP).
Pressure testing	Subsea infrastructure	Within the scope of this EP, pressure testing is unlikely to be required other than for isolation verification following an event requiring intrusive intervention to rectify.	Five-yearly (0 to once during the life of the EP)[1]
Marine growth removal	Subsea infrastructure	It may be necessary to remove excess marine growth before undertaking subsea inspections.	Five-yearly (0 to once during the life of the EP)[1]
Sediment relocation	Subsea infrastructure	If sediment builds up around a flowline or other subsea infrastructure, an ROV-mounted suction pump/dredging unit may be used to relocate sediment to allow inspection works to be undertaken.	Five-yearly (0 to once during the life of the EP)[1]
Subsea intervention	Subsea infrastructure	Within the scope of this EP, an intervention would only be required to rectify/repair an anomaly or event that has occurred or where proactive intervention for equipment recovery is required for analysis.	Five-yearly (0 to once during the life of the EP)[1]
Corrosion surveys	Subsea infrastructure	Surveys are undertaken using probes (e.g. electrical resistance probes) to assess the effectiveness of corrosion protection (e.g. corrosion protection layers or anode skids).	Five-yearly (0 to once during the life of the EP)[1]
Repair	Subsea infrastructure	Repair activities are those 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 and the environment. Subsea repair activities are not anticipated during the Petroleum Activities Program as the wells have been shut in and the subsea system preserved; however, repairs may be undertaken if they are needed to prepare for well intervention or future activities such as permanent plugging for abandonment or decommissioning.	-

[1] Depending on the timing of the most recent survey, the 5-yearly IMR activity may or may not fall within the timeframe of the EP.

3.11.2 Subsea Chemical Usage

Planned chemical discharges may occur during IMR activities. However, these are discharged in small volumes (**Table 3-9**). Operational chemicals that may be used on the Enfield subsea infrastructure are selected and assessed using Woodside's chemical selection and assessment procedures, as detailed in **Section 3.13**. Chemicals used in the subsea infrastructure may be released during IMR activities; these include, but are not limited to:

- control fluid – a water-glycol based control fluid. The subsea control system is an open-loop system that releases hydraulic fluid during valve functioning

- hydrate control – monoethylene glycol (MEG) and triethylene glycol (TEG) are used for hydrate control
- scale inhibitor – scale inhibitor manages and prevents scale build-up within subsea equipment
- biocide – biocides prevent bacterial growth in flowlines and risers that may cause corrosion
- dye – chemical dyes incorporated in the control fluid identify the source of a leak
- acid – sulfamic (or equivalent) acid removes calcium deposits
- oxygen scavenger – oxygen scavenger de-oxygenates the pipeline to prevent corrosion and aerobic bacterial growth.

Table 3-9: Typical discharge volumes during different IMR activities

Activity	Typical Discharge
Pressure/leak testing	Chemical dye incorporated into control fluid at ≤1%
Valve functioning	0.5 L to 6 L per valve actuation
Flushing	Residual hydrocarbon or chemical releases volume depends on injection port size, component geometry, and pumping rates
Hot stab change out	Hydrocarbons or control fluid <10 L
Jumper and umbilical replacement	Typical releases of hydraulic fluid, MEG, and corrosion inhibitor are estimated to be <10 L each

3.12 Decommissioning Activities

Decommissioning activities described below may occur in any sequence, depending on technical requirements, site and weather conditions and availability of personnel, equipment and vessels at the time.

3.12.1 Subsea Cleaning and Preparation Activities

3.12.1.1 Marine Growth Removal

Excess marine growth may need to be removed from subsea infrastructure using an ROV prior to removal from the seabed. Alternatively, flexibles lifted from the seabed and placed onboard an offshore support vessel may require cleaning prior to cutting or reeling. Any residual cleaning debris and water will be managed in line with the approach applied to routine vessel discharges. **Table 3-10** lists the different growth removal techniques that may be used.

Table 3-10: Marine growth removal methods

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 (typically sulfamic acid)	Chemically dissolves calcium deposits

3.12.1.2 Sediment Relocation

If sediment build up around subsea infrastructure has the potential to impede decommissioning activities, a water jet or ROV-mounted suction pump may be used to move sediment in the immediate vicinity of the infrastructure (i.e. within the existing footprint), to allow inspection/intervention works and removal of infrastructure to be performed.

3.12.1.3 As-found ROV Surveys

An as-found survey using an ROV may be conducted of all subsea infrastructure present in the field and planned for removal. This survey aims to identify any issues with the infrastructure (e.g. burial, integrity) which have the potential to affect the approach to decommissioning. The as-found survey may also identify miscellaneous debris for recovery. ROVs may also be used to conduct an as-left survey as discussed in **Section 3.12.6**.

3.12.2 Release of Residual Gas and/or Hydrocarbons

The flexible risers, flowlines, manifolds and spools were flushed with treated seawater during the cessation of operations phase to ALARP concentrations of hydrocarbons, but may contain some residual hydrocarbons that were not able to be flushed (**Table 3-4**). As this infrastructure is recovered, the contents will be drained or vented to the environment. Total released volumes are estimated in **Table 3-4**.

3.12.3 Release of Chemicals from Umbilicals and Electrical / Hydraulic Jumpers

As the umbilicals and control jumpers are recovered, the contents will be drained to the environment. Estimated release volumes are included in **Table 3-4**.

3.12.4 Removal and Recovery of Infrastructure

Removal and recovery of subsea infrastructure is described in **Table 3-11**. The planned or potential discharges associated with the removal and recovery of subsea infrastructure is included in **Table 3-4**.

Table 3-11: Infrastructure removal methods

Infrastructure	Removal options
Manifolds	ROV will unlatch the manifold module from foundation and secure the lifting arrangement.
Manifold foundation suction piles	Option 1: Excavate around the base, then reverse install by engaging the suction pile flooding system to fill the caisson with water and assist the lifting operation. Failure mechanisms that would prevent this option: • mud mat hatches unable to close and maintain pressure • hot stab operability issues • failure of structural integrity of suction pile • maximum allowable pressure, defined by pile structural capacity, insufficient to release the pile Prior to offshore retrieval, a detailed procedure will be developed to address and managed these identified risks to maximise the ability to reverse install. Option 2: If Option 1 is not technically feasible for any of the above reasons, cut the pile as close to mudline as possible using diamond wire saw and remove the cut section.
Flexible risers and flowlines	Flexible lines will be recovered via a vertical Lay System (VLS) or cut into pieces and ROV initiated recovery clamps or subsea basket used to recover pieces from the seabed. During the recovery of flexible flowlines it may be necessary to excavate the flowlines to allow full exposure. Uraduct Stabilisation will be recovered as part of normal flowline recovery operation.
Riser bases and holdback anchors	Anchors will be disconnected from the riser base by cutting the riser holdback tether, then lifted from the seabed using slings. Followed by recovery of riser bases.

Infrastructure	Removal options
Umbilicals	Umbilicals with attached Cobra head connectors can be recovered by respooling.
Jumpers (production, gas lift, electrical/hydraulic)	Jumpers will be disconnected/cut and placed into ROV/Subsea basket for recovery.
Rigid well tie-in spools	Disconnect spools from the Manifold and XT's using ROV; May be recovered as whole piece using ROV initiated recovery clamps or may be cut into several pieces using diamond wire saw.
Mooring lines	Cut at the exposure site on seabed. Can be lifted using winches as whole piece or cut into smaller pieces using diamond wire saw.
Drag anchors and debris anchor	Status is buried. Anchors are proposed to be left *in situ*. Refer to **Table 3-12** for evaluation.
Sand/aggregate bags	Sand/aggregate bags will be cut open to release contents to seabed, then bags lifted via attached slings and recovered to surface.

3.12.5 Anchors and Mooring Lines

The nine drag anchors are being used to secure the RTM in place. The RTM is planned to be removed prior to the Petroleum Activities commencing. Removal of the mooring lines located above the mudline is described in **Table 3-11**. The single debris anchor is infield as the result of an unplanned mooring line release in 2019. The anchor was unable to be recovered and remains buried in its installed position below the mudline.

Removal of the nine drag anchors, one debris anchor, and the buried section of connected mooring lines was evaluated and compared against leaving them buried below the mudline. An evaluation of all residual environmental impacts and risks from the two options, following application of control measures to manage and minimise the impacts and risks, is provided in (**Table 3-12**).

Table 3-12: Evaluation of the feasibility and environmental impacts and risk of anchor decommissioning options

Criteria	Removal	Leave buried
Description of options		
Method	Connect the support vessel wire to the mooring line and reel in the line, then pull to dislodge the anchor from the seabed. Retrieve to surface. Repeat for each of the nine drag anchors. As a contingency it may be necessary to use a second offshore support vessel to achieve the required pull; or as a secondary contingency to dredge to up to 8 m deep around each of the drag anchors to create a clear removal path. If dredging is required, use an offshore support vessel to deploy a sub-bottom profiler or magnetometer to confirm anchor location to inform dredging. For the debris anchor, use an offshore support vessel to deploy a sub-bottom profiler magnetometer to confirm debris anchor location and locate the end of the mooring line. Once located, use an ROV to water jet sediment away from the end of the mooring line. Connect the support vessel wire to the mooring line and reel in the line, then pull to dislodge the anchor from the seabed, Retrieve to surface. Contingencies for recovery and retrieval as per drag anchor described above.	Remove the section of mooring line above the mudline (steel and polypropylene), of each of the drag anchors. and leave the drag anchors and buried section of chain below the mudline (steel and paint). Leave the debris anchor and attached mooring line buried below mudline (steel and paint).
Feasibility		

Criteria	Removal	Leave buried
Technical risk	Recovery requires the bollard pull of a vessel large enough to overcome the friction of the anchor burial. To facilitate retrieval, additional dredging of sediment may be required to uncover the anchors and chain prior to pulling. Assuming the debris anchor can be located (noting that sub-bottom profilers or magnetometer have a detection limit of 10 m below the seabed) then technically it is feasible.	Technically feasible.
Environmental impacts and risks		
Physical presence: seabed disturbance	Disturbance to seabed from dredging and water jetting sediment away from the drag anchors and chains would be executed in such a way as to limit seabed disturbance to that required to uncover and dislodge each anchor. Elimination of seabed disturbance is not possible, as the drag anchors are confirmed as buried. Seabed disturbance for retrieving ten anchors and chains is expected to be localised impact not significant to environmental receptors, an F consequence. If dredging is required to create a clear removal path, this estimated to result in the relocation of up to 1150 m^2 of sediment (115 m^2 per anchor). This is expected to result in a slight, short term effect to soft sediment habitats, an E consequence. Removal of the anchors would eliminate the presence of corrosion products in the subsoil.	Corrosion and degradation products of the anchors and chains remain within a localised area below the mudline, where the anchors are currently buried. The ten anchors and chains are made of steel comprised predominantly of iron (~98%) and coated in epoxy paint. As they corrode they will turn into iron oxide ($Fe(OH)_2$ and $Fe(OH)_3$). Iron hydroxide is an inert form of iron, and has a very low toxicity. There are currently no trigger values for iron or its forms of hydroxide in the marine environment and as such is considered no threat to the receiving marine environment (ANZG, 2018). Due to the low toxicity to biota and the slow release rate, impacts to sediment quality are expected to be localised, with no lasting effect, an F consequence. The epoxy paint coating will also degrade over a very long timeframe at a very slow rate; larger pieces are likely to slowly erode and biotically degrade into small particles and be incorporated into the seabed. Given the quantity of material released, this will result in only a negligible, incremental decline in sediment quality in a localised area around each anchor. Leaving the anchors buried would eliminate seabed disturbance associated with removal.
Physical presence: interaction with other marine users	Anchor and chain removal would require an offshore support vessel (i.e. anchor handling tug). Additional duration in field is estimated to be 10-20 days (one to two days per anchor), and will depend on duration to locate the debris anchor and dredge to find the chain).	No significant differences in these environmental impacts and risks as a vessel is still required to undertake the remaining Petroleum Activities program.
Routine acoustic emissions		
Routine and non-routine discharges		
Routine and non-routine atmospheric emissions		

Criteria	Removal	Leave buried
Routine light emissions		
Unplanned hydrocarbon release: vessel collision		
Unplanned physical disturbance to seabed (dropped object)		
Ongoing impacts to other marine users	None as the anchors and chain will have been removed.	None as anchors and chain predicted to remain buried.

Leaving the ten anchors buried below the mudline is a better environmental outcome when compared to removal, due to the seabed disturbance to unbury the anchors and chains to enable retrieval. If minimal disturbance is able to be achieved, this would result in localised impact not significant to environmental receptors, an F consequence. Even with controls in place to reduce disturbance, such as minimising sediment relocation to that required to uncover the anchors, if dredging is required, an estimated 1150 m^2 of seabed would need to be disturbed. The amount of sediment relocation required to enable full recovery will result in a worse environmental impact when compared to leaving them buried. Leaving the anchors *in situ* does not result in physical seabed disturbance associated with removal and there is no threat to the receiving marine environment from their degradation overtime given their composition (**Table 3-4**).

No long-term monitoring and management of the anchors is proposed, as the anchors have been confirmed as completely buried during the previous decommissioning removal activities, and there is no lasting effect to the marine environment from degradation and no impact to other marine users.

All other environmental impacts and risks have no significant differences between the two options as a vessel is still required to undertake the remaining Petroleum Activities Program. Therefore, impacts and risks associated with vessel activities will still occur, and are not able to be eliminated by leaving the anchors buried.

Consistent with Section 572(7) and Section 270(3)(c)(ii), Woodside proposes to leave the anchors *in situ* based on the outcomes from the environmental impacts and risks assessment, as it provides a better environmental outcome when compared to removal of the anchors.

3.12.6 As-Left Survey

An as-left survey will be undertaken using an ROV following the completion of decommissioning activities. The survey is intended to confirm that all infrastructure above the mudline has been removed, identify any debris/dropped objects for recovery, and assess seabed condition. Drag anchors buried below the mudline will be left *in situ* (**Section 3.12.5**), and partial manifold suction piles may be left if it is determined not ALARP and acceptable to fully remove them (**Section 3.12.4**).

The as-left survey may use acoustic surveying (e.g. MBES or side scan sonar (SSS)) in combination with an ROV mounted camera and will provide detailed assessment of seabed of within an area of approximately 30 m around the footprint of recovered infrastructure. Any infrastructure debris identified during the survey will be recorded for recovery. To make good any damage to the seabed or subsoil in the licence area caused by any person engaged or concerned in the operations in relation to the Enfield Development Project, is a requirement under Direction 4 (**Section 1.10.1.1**). Seabed survey data is to be used to demonstrate that there is no unacceptable damage to the seabed that requires remediation. See **Section 7.8.2.4** for reporting against the general direction.

3.12.7 Sediment Sampling

Sediment sampling will be undertaken to demonstrate that the conservation and protection of natural resources in the licence area relevant to the Enfield Development Project have been provided for as per Direction 3 (**Section 1.10.1.1**). Sediment sampling will be undertaken from a Subsea Support Vessel using either an ROV-deployed sediment sampler or drop corer to collect samples of seabed sediments. See **Section 7.8.2.4** for reporting against the general direction.

3.13 Project Waste

Generated wastes may be broadly classified into one of two categories:

1. general non-hazardous solid wastes
2. hazardous solid and liquid wastes.

Non-hazardous solid wastes produced on project vessels include cardboard, plastic, aluminium and paper. Hazardous wastes are materials that are harmful to human health or the environment and include waste prescribed in the Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 and WA Environmental Protection (Controlled Waste) Regulations 2004. Hazardous wastes stored on vessels may include:

- lubricating oils, hydraulic fluids, cleaning and cooling agents
- oil filters and batteries
- oily rags
- paint, aerosol cans
- medical wastes
- acids/caustics and solvents.

Approximate volumes of key waste materials generated from infrastructure removal include:

- 360 t stainless steel, from flowlines, riser and jumpers
- 4500 t carbon steel, from flowlines, risers, jumpers, umbilicals, manifolds, spools and mooring chains
- 220 t polyethylene, from flowlines, risers, jumpers, umbilicals, manifolds, spools and mooring chains
- 35 t nylon, from flowlines, riser and jumpers
- 22 t Kevlar, from flowlines, riser and jumpers
- 330 t Polyolefin from flowlines, riser and jumpers
- 54 t foam, from flowlines, riser and jumpers
- 240 t concrete, from manifolds, spools and mooring chains.

3.13.1 Management of Wastes and Recovered Infrastructure

Non-hazardous waste materials will be stored on board the project vessels in suitable containers (segregated from hazardous waste materials) for transport back to shore for disposal/recycling in accordance with local regulations.

All hazardous waste generated will be documented and tracked, segregated from other waste streams and stored in suitable containers. Recyclable hazardous wastes, such as oils and batteries, will be stored separately from non-recyclable materials. All of these wastes are disposed of onshore at a licensed facility.

All waste streams will be classified and managed in accordance with applicable legislative requirements, or in accordance with international guidance where applicable, for example:

- Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 which implements the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- WA Environmental Protection (Controlled Waste) Regulations 2004
- MARPOL: International Convention for the Prevention of Pollution from Ships
- International Finance Corporation: EHS Guidelines: Environmental Waste Management.

Recovered infrastructure will be managed through the projects contracting strategy which will include an infrastructure disposal strategy where waste management solutions will be assessed against the principles of the waste management hierarchy.

While no NORM contamination is expected, mercury may be present (**Section 3.9**). Handling and disposal of the infrastructure includes contingency procedures for dealing with contaminants onshore and offshore, should any be detected (**Section 6.9.5**).

3.14 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. This excludes legacy chemicals including residual fluids present in the subsea infrastructure, which have been assessed for discharge in **Section 6.8.4**.

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 and the Netherlands. It applies the requirements of the Convention for the Protection of the Marine Environment of the North-East Atlantic (Oslo and Paris Commission for 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 managing chemicals.

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 3-4**):

- **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.

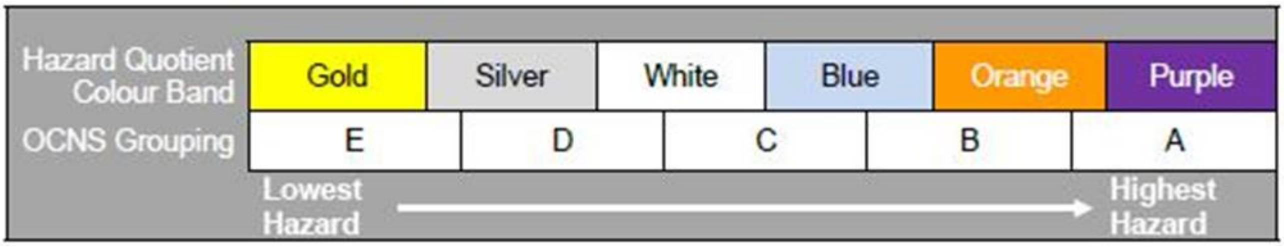


Figure 3-4: OCNS ranking scheme

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 types of chemicals that need to be assessed further to understand the environmental impacts of discharge into the marine environment are:
  - 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.

Further assessment includes assessing the ecotoxicity, biodegradation and bioaccumulation of the chemicals in the marine environment in accordance with the CEFAS hazard assessment and the Department of Mines and Petroleum (now Department of Mines, Industry Regulation and Safety) Chemical Assessment Guide: Environmental Risk Assessment of Chemicals used in WA Petroleum Activities Guideline (2013).

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 6**). As per **Section 2.5.2**, references to the Master Existing Environment, Appendix H in the Enfield Plug and Abandonment EP (hereafter referred to as the Master Existing Environment), have been made throughout this EP.

The EMBA is the largest spatial extent where unplanned events could have an environmental consequence on the surrounding environment. For this EP, the EMBA is the potential spatial extent of surface and in-water hydrocarbons at concentrations above ecological impact thresholds, in the event of the worst-case credible spill. The ecological impact thresholds used to delineate the EMBA are defined in **Section 6.9.1.2**. The worst-case credible spill scenario for this EP is a vessel collision resulting in hydrocarbon release. The EMBA also includes any areas that are predicted to experience shoreline contact with hydrocarbons above threshold concentrations.

Woodside recognises that hydrocarbons may be visible beyond the EMBA at lower concentrations than the ecological impact thresholds defined in **Section 6.9.1.2**. In respect of this, an additional socio-cultural EMBA has been defined as the potential spatial extent within which social-cultural impacts may occur from changes to the visual amenity of the marine environment. These visible hydrocarbons are not expected to cause ecological impacts. Receptors relevant to the socio-cultural EMBA include Commonwealth and State marine protected areas (MPAs), National and Commonwealth Heritage Listed places, areas of tourism and recreation, and commercial and traditional fisheries. For this EP, the socio-cultural EMBA for surface hydrocarbons encompasses an area within the boundaries of the EMBA for ecological impacts. The EMBA and socio-economic EMBA are shown in **Figure 4-1** and described in **Table 4-1**.

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

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

Hydrocarbon Type	EMBA[1]	Socio-cultural EMBA[1]	Planning Area for Scientific Monitoring
Surface	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.	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).	
Dissolved	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.		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.**

Hydrocarbon Type	EMBA[1]	Socio-cultural EMBA[1]	Planning Area for Scientific Monitoring
Entrained	100 ppb This represents potential toxic effects, particularly sublethal effects to highly sensitive species (NOPSEMA 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.		In the event of a spill, the Director of National Parks (DNP) will be notified of AMPs which may be contacted by hydrocarbons at this threshold (**Section 5.4**).
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 detail including the source of the thresholds used to define the exposure areas in this table are provided in* ***Section 6.9.1.2***

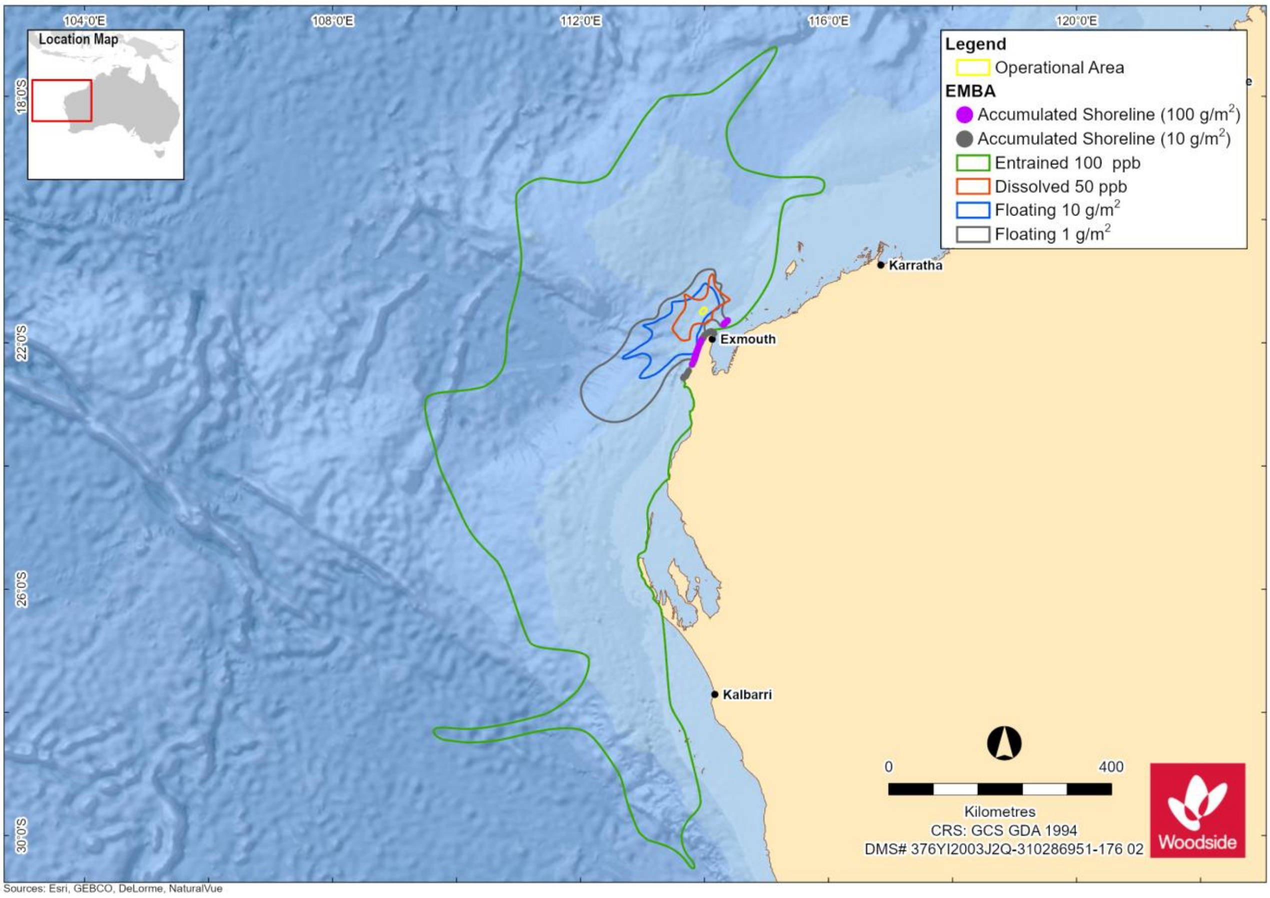


Figure 4-1: Environment that may be affected by the Petroleum Activities Program

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 approximately 400–600 m. Within the NWMR, the Operational Area lies within the Northwest Province (**Figure 4-2**). The EMBA overlaps with additional provincial bioregions of the NWMR, including the Northwest Transition, Northwest Shelf Province, Central Western Shelf Transition, Central Western Transition and Central Western Shelf Province. The EMBA extends into the South-west marine region (SWMR) and overlaps with two provincial bioregions of the SWMR: The Central Western Province and Southwest Shelf Transition. Woodside's Description of the Existing Environment summarised the characteristics for the relevant marine bio-regions in Section 2 of the Master Existing Environment.

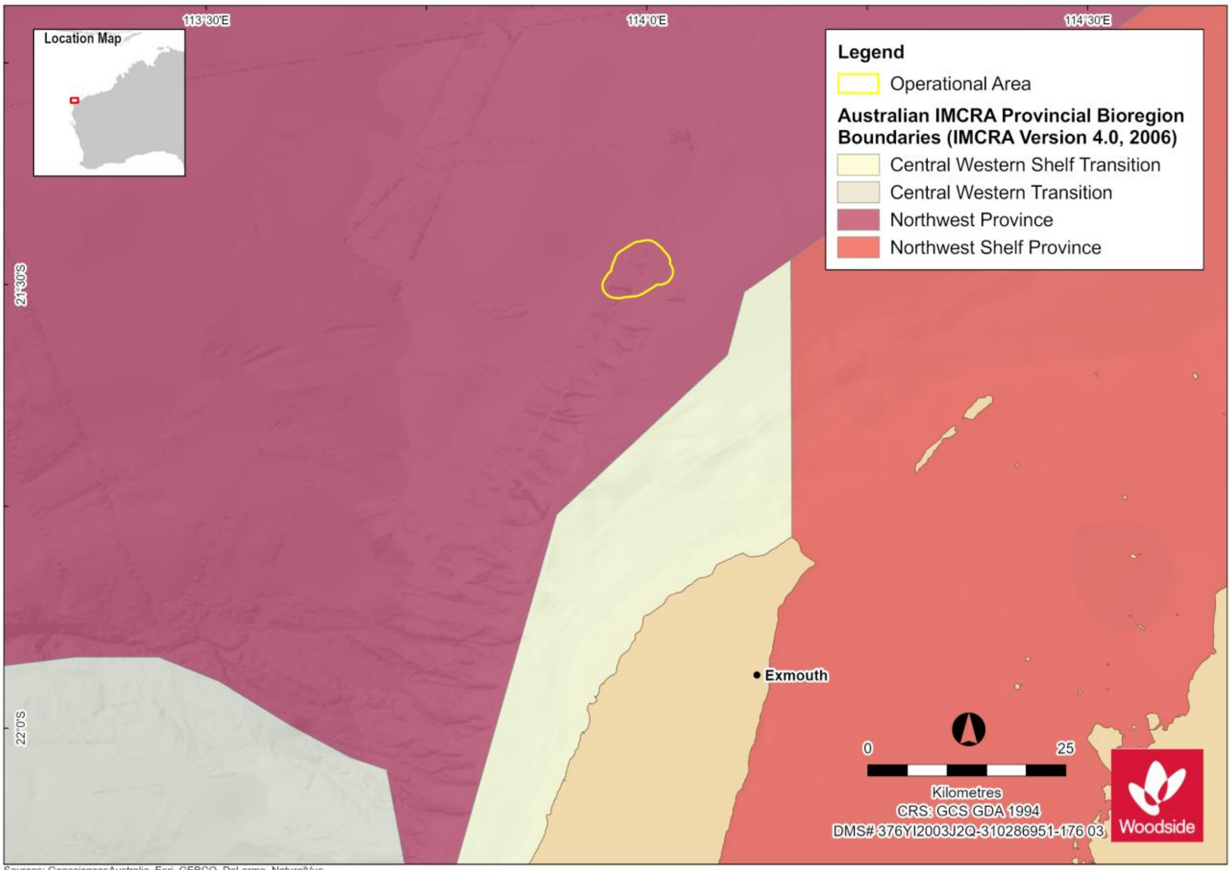


Figure 4-2: Location of the Operational Area and relevant marine bioregions

4.3 Matters of National Environmental Significance (EPBC ACT)

Table 4-2 and **Table 4-3** summarise the matters of national environmental significance (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 and described in detail in Section 3 of the Master Existing Environment.

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

MNES	Number	Description
World Heritage Properties	None	The closest World Heritage Property is the Ningaloo Coast World Heritage Property, located 17 km south of the Operational Area.
National Heritage Places	None	The closest National Heritage Place is the Ningaloo Coast National Heritage Place, located 17 km south of the Operational Area.
Wetlands of International Importance (Ramsar)	None	The closest Ramsar Wetland is Eighty Mile Beach, located 618 km north-east of the Operational Area.
Commonwealth Marine Area	1	Generally, the Commonwealth Marine Area stretches from three nautical miles (nm) to 200 nm from the coast. The Operational Area is located within the NWMR.
Listed Threatened Ecological Communities (TEC)	None	No Threatened Ecological Communities (TECs) as listed under the EPBC Act are known to occur within the marine waters of the NWMR.
Listed Threatened Species	17	Threatened species that were identified by the PMST as potentially occurring within the Operational Area are identified in **Section 4.6.1** to **Section 4.6.4**, and described in Sections 3-8 of the Master Existing Environment.
Listed Migratory Species	32	Migratory species that were identified by the PMST as potentially occurring within the Operational Area are identified in **Section 4.6.1** to **Section 4.6.4**, and described in Sections 3-8 of the Master Existing Environment.

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

MNES	Number	Description
World Heritage Properties	1	The Ningaloo Coast and Shark Bay World Heritage Properties are located within the EMBA.
National Heritage Places	1	The Ningaloo Coast and Shark Bay National Heritage Places are located within the EMBA.
Wetlands of International Importance (Ramsar)	None	There are no Ramsar Wetlands located within the EMBA.
Commonwealth Marine Area	2	Generally, the Commonwealth Marine Area stretches from 3 nm to 200 nm from the coast. The EMBA overlaps the NWMR and SWMR.
Listed Threatened Ecological Communities	None	No Threatened Ecological Communities (TECs) as listed under the EPBC Act are known to occur within the marine waters of the NWMR.
Listed Threatened Species	61	Threatened species that were identified by the PMST as potentially occurring within the EMBA are identified in **Section 4.6.1** to **Section 4.6.4** and described in Sections 3-8 of the Master Existing Environment.
Listed Migratory Species	77	Migratory species that were identified by the PMST as potentially occurring within the EMBA are identified in **Section 4.6.1** to **Section 4.6.4**, and described in Section 3-8 of the Master Existing Environment.

4.4 Physical Environment

The Operational Area is located on the upper continental slope in waters approximately 400 to 600 m deep (**Figure 4-3**). The Operational Area overlaps with the northern extent of the Enfield Canyon, which forms part of a tributary of the Cape Range Canyon. The Enfield Canyon exhibits relatively low topographic relief (20–30 m), with some isolated boulders (sometimes greater than three metres in height) observed (BMT Oceanica, 2016).

A summary of the physical characteristics of the environment within the Operational Area and EMBA are provided in Section 2.3 of the Master Existing Environment.

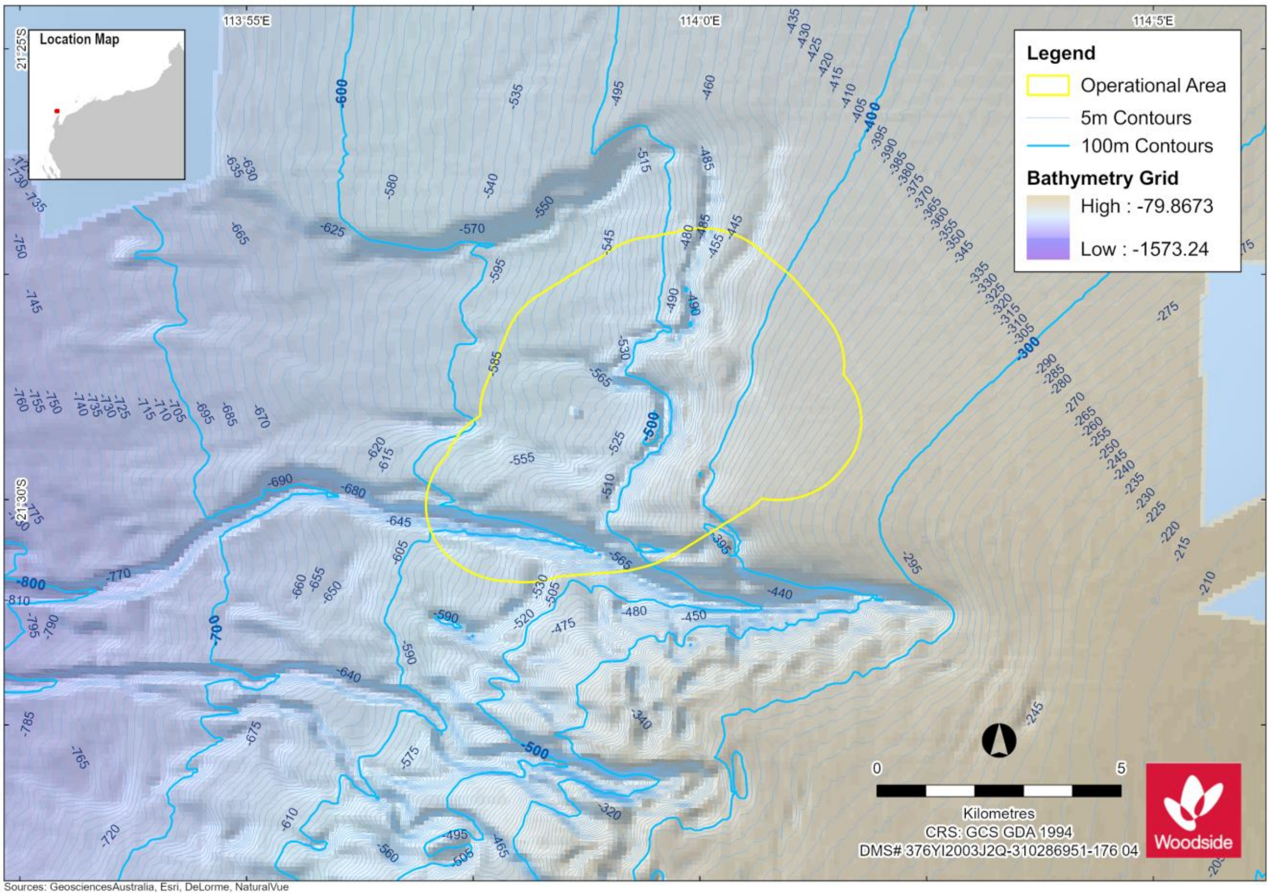


Figure 4-3: Bathymetry of the Operational Area

4.5 Habitats and Biological Communities

Sediment investigations within the Enfield Canyon, based on acoustic data, indicated that the upper slope habitat (in depths of approximately 200 to 500 m) is generally composed of coarser and/or more consolidated sediments as compared to the mid-slope (500 to 1000 m) (BMT Oceanica, 2016). Sediments within the Enfield Canyon where they overlap with the Operational Area were found to comprise sand, silt, clays and fines (BMT Oceanica, 2016). Isolated areas of hard substrate within the Enfield Canyon were characterised by isolated boulders, and were found to be featureless (BMT Oceanica, 2016). Sediment quality in the Enfield Canyon was high, with most potential contaminants (metals and hydrocarbons) below ANZECC/ARMCANZ sediment quality guidelines (BMT Oceanica, 2016).

Despite the lack of significant areas of hard substrate within the Operational Area, some deep-water filter feeding communities are still expected to be present in the silty clay/sand sediments, including deposit feeding epifauna (e.g. holothurians) and infauna (e.g. polychaetes). A benthic community assessment was carried out by AIMS for WA-28-L, and included ROV surveys near the Operational Area (Heyward and Rees, 2001). The surveys revealed four main invertebrate groups of deepwater benthos including crustaceans, sponges, echinoderms and cnidarians (octocorals).

Subsea infrastructure also offers a hard substrate and subsequent attachment point for marine epibenthic growth in an environment typically characterised by soft sediments, which can be extensive. For example, ROV surveys of the Woodside Energy Goodwyn Alpha Platform jacket on the North-West Shelf (0 – 130 m), reported up to 11 types of marine growth to occur on infrastructure, including hard corals, algae and other encrusting species, as well as an abundance of fish species important to the demersal scalefish fishery in the region (McLean et al., 2019). Marine growth and associated faunal communities decline with increasing depth as a result of reduced light attenuation and subsequent nutrient availability. A study of 25 wellheads in water depths of 78 m to 825 m across the North West Shelf revealed commercially important fish species present around infrastructure and marine growth including ascidians, octocorals, sponges and basket stars (McLean et al., 2018). Marine growth and fish abundance decreased in water depths greater than 350 m, replaced by sparse coverage of crinoids and barnacles.

An ROV survey of marine communities associated with the Enfield subsea infrastructure reported a relatively rich diversity of fish and mobile epifauna along flowlines, umbilicals and manifolds (Bond and McLean, 2020). Flowline and umbilicals were reported to host 76 different species, including decapods (hermit crabs, prawns, squat lobsters and commercially important scampi). Manifolds, wells and riser base connection anchors reported 21 different species and recorded a higher number of finfish than flowlines and umbilicals. Hermits and squat lobsters were the most abundant mobile invertebrates. Benthic habitat featured low coverage of hydroids and barnacles, likely due to the depth (Bond and McLean, 2020). This survey demonstrated the habitats and communities associated with the Enfield subsea infrastructure are relatively richer than those reported from the surrounding areas.

A 2016 survey of the Enfield Canyon observed 80 species from 41 families, consistent with data from the broader region (BMT Oceanica, 2016; Last et al., 2005). Ichthyofauna observed during the survey was characterised by macrourid, berycid, morid, liparid, halosaurid and congrid species, which is consistent with other observations of continental slope fish assemblages in the region (BMT Oceanica, 2016; Last et al., 2005). This slightly differed from the assemblages observed in the Greater Enfield area, which also observed sternoptychid, oreosomatid and nettastomatid fishes (Heyward et al., 2001a; Heyward and Rees, 2001). Given the characteristic high diversity and low abundance fish assemblages in the upper continental slope, differences are expected to be the result of relatively low sampling effort rather than actual differences between the assemblages observed, as habitats in surveyed areas were similar. The families observed during surveys in the vicinity of the Operational Area are widely distributed in continental slope habitats, both in Australia and other ocean basins (Last et al., 2005), likely due to the widespread nature of such continental slope habitats and lack of barriers to dispersal.

Similarly, recent observations of epifauna in the Enfield Canyon indicated the density of deposit-feeding fauna was low and sparsely distributed throughout the surveyed area (BMT Oceanica, 2016), which is consistent with results from other investigations in the region (Heyward et al., 2001a; Heyward and Rees, 2001). Deposit-feeding fauna (e.g. holothurians and echinoids) were more abundant in the continental slope portion of the canyon than the head of the canyon (on the continental shelf break). The relative increase of deposit feeding fauna in this part of the canyon may be indicative of increased food availability, which is potentially related to increased deposition through reduced water movement (BMT Oceanica, 2016). This was consistent with casual observation of stronger currents at the canyon head during the Enfield Canyon systems survey (BMT Oceanica, 2016). Bioturbation was observed within the Enfield Canyon, indicating the presence of burrowing epifauna and infauna (BMT Oceanica, 2016).

Key habitats and ecological communities within the EMBA are identified in **Table 4-4** and described in Section 4 and 5 of the Master Existing Environment.

Table 4-4: Habitats and communities within the EMBA

Habitat/Community	Key locations within the EMBA
Marine primary producers	
Coral	Shallow coral reef habitats within the EMBA include those within Ningaloo Reef (35 km south of the Operational Area), Muiron Islands Marine Management Area (36 km south-east of the Operational Area) and the Houtman Abrolhos Islands AMP (624 km south of the Operational Area). Coral reef habitats within the EMBA are described in Section 4.4 of the Master Existing Environment.
Seagrass beds and macroalgae	Seagrass beds and macroalgae habitats are present in the wider region, and are widely distributed in shallow coastal waters that receive sufficient light to support seagrasses and macroalgae. Seagrass beds and macroalgal habitats within the EMBA include those within Ningaloo Reef (35 km south of the Operational Area) and Shark Bay (450 km south of the Operational Area). Seagrass beds and macroalgae are described in Section 4.4 of the Master Existing Environment.
Mangroves	Mangroves can be found in the wider region in locations such as Ningaloo and Exmouth Gulf, and Shark Bay. Mangrove habitats within the EMBA are described in Section 4.4 of the Master Existing Environment.
Sandy beaches	Sandy beaches are common along the WA coastline including Ningaloo and Exmouth Gulf, and Shark Bay. Sandy Beach habitat within the EMBA are described in Section 4.4 of the Master Existing Environment.
Salt marshes	Salt marshes are found at Shark Bay (450 km south of the Operational Area). Salt marsh habitats within the EMBA are described in Section 4.4 of the Master Existing Environment.
Other communities and habitats	
Plankton	Plankton within the Operational Area is expected to reflect the conditions of the NWMR. Primary productivity of the NWMR appears to be largely driven by offshore influences, with periodic upwelling events and cyclonic influences driving coastal productivity with nutrient recycling and advection. Refer to Section 4.3 of the Master Existing Environment for a description of planktonic communities in the NWMR and SWMR.
Pelagic and demersal fish populations	In the EMBA, fish diversity and abundance is typically correlated with habitat distribution, with complex habitats, such as coral and rocky reefs, hosting more diverse and abundant assemblages. Notable habitats hosting diverse fish assemblages include Ningaloo Reef (Stevens et al., 2009) and the Houtman Abrolhos Islands. Refer to Section 5.4 of the Master Existing Environment for a description of planktonic communities in the NWMR and SWMR.
Epifauna and infauna	The EMBA contains deep and shallow water habitats dominated by soft sediments and sparse benthic biota. The benthic communities inhabiting the predominantly soft, fine sediments of the deepwater benthic habitats are characterised by infauna such as polychaetes and sparsely distributed sessile and mobile epifauna. Refer to Section 4.4 of the Master Existing Environment for a description of epifauna and infauna in the NWMR and SWMR.

4.6 Protected Species

A total of 55 EPBC Act listed species considered to be MNES were identified as potentially occurring within the EMBA, of which a subset of 30 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 C**, 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. Two conservation dependent species have also been identified with a potential to occur within the Operational Area and EMBA. These species, the southern bluefin tuna and scalloped hammerhead, are listed on the Species Profile and Threats Database (DAWE, 2021).

Table 4-5 to **Table 4-13** list the species identified by the PMST as potentially occurring within the Operational Area and EMBA that have a potential to be impacted by the Petroleum Activities Program, as well as overlapping Biologically Important Areas (BIAs) or Habitat Critical to Survival (Habitat Critical). A description of each species is included in Section 5 – Section 8 of the Master Existing Environment.

4.6.1 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
Carcharodon carcharias	White shark	Vulnerable	Migratory	Species or species habitat may occur	Foraging, feeding or related behaviour known to occur.
Anoxypristis cuspidata	Narrow sawfish	N/A	Migratory	Species or species habitat may occur	Species or species habitat likely to occur
Carcharhinus longimanus	Oceanic whitetip shark	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Isurus oxyrinchus	Shortfin mako	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Isurus paucus	Longfin mako	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Manta birostris	Giant manta ray	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat known to occur
Carcharias taurus	Grey nurse shark (west coast population)	Vulnerable	N/A	N/A	Species or species habitat known to occur
Pristis clavata	Dwarf sawfish	Vulnerable	Migratory	N/A	Species or species habitat known to occur
Pristis zijsron	Green sawfish	Vulnerable	Migratory	N/A	Species or species habitat known to occur

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Rhincodon typus	Whale shark	Vulnerable	Migratory	N/A[2]	Foraging, feeding or related behaviour known to occur.
Lamna nasus	Porbeagle shark	N/A	Migratory	N/A	Species or species habitat may occur
Manta alfredi	Reef manta ray	N/A	Migratory	N/A	Species or species habitat known to occur

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

Species	BIA type	Approximate distance of BIA from Operational Area
Whale shark	Foraging (northward from Ningaloo along 200 m isobath)	8 km east
	Foraging (Ningaloo Marine Park)	28 km south
White shark	Foraging (Abrolhos)	762 km south

[2] The whale shark was not identified by the PMST as potentially occurring within the Operational Area. However, given the species documented distribution, seasonal aggregations at Ningaloo Reef and proximity of the foraging BIA to the Operational Area, it is assumed that this species may occasionally transit the Operational Area. A description of the whale shark is included in Section 5 of the Master Existing Environment.

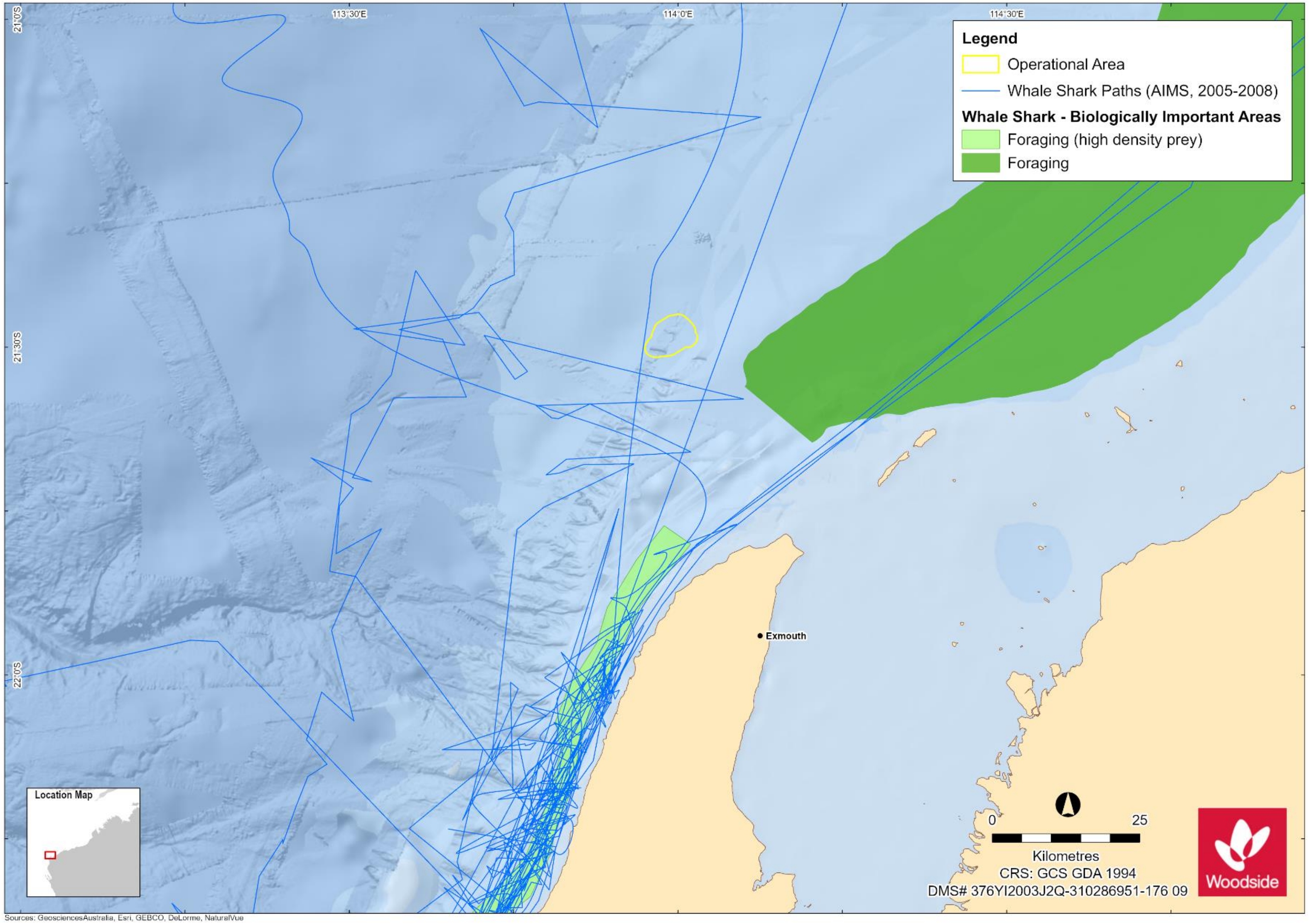


Figure 4-4: Whale shark BIAs and satellite tracks of whale sharks tagged between 2005 and 2008 (Meekan and Radford, 2010)

4.6.2 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 known to occur	Breeding known to occur
Chelonia mydas	Green turtle	Vulnerable	Migratory	Species or species habitat known to occur	Breeding known to occur
Dermochelys coriacea	Leatherback turtle	Endangered	Migratory	Species or species habitat known to occur	Foraging, feeding or related behaviour known to occur.
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	Migratory	Species or species habitat known to occur	Breeding known to occur
Natator depressus	Flatback turtle	Vulnerable	Migratory	Congregation or aggregation known to occur	Breeding known to occur
Aipysurus apraefrontalis	Short-nosed seasnake	Critically Endangered	N/A	N/A	Species or species habitat likely to occur
Aipysurus foliosquama	Leaf-scaled seasnake	Critically Endangered	N/A	N/A	Species or species habitat known to occur

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

Species	BIA type	Approximate distance of BIA from Operational Area
Flatback turtle	Internesting (Thevenard Island, Montebello Islands)	5 km east
	Nesting (Thevenard Island, Barrow Island, Montebello Islands)	67 km east
Green turtle	Internesting (North West Cape, Muiron Islands, Montebello Islands, Barrow Island)	13 km south-east

Species	BIA type	Approximate distance of BIA from Operational Area
	Nesting (North West Cape)	35 km south-east
Hawksbill turtle	Internesting (Ningaloo coast and Jurabi coast)	11 km south-east
	Nesting (Ningaloo coast and Jurabi coast)	31 km south-east
Loggerhead turtle	Internesting (Ningaloo coast and Jurabi coast, Muiron Islands)	11 km south-east
	Nesting (Ningaloo coast and Jurabi coast)	31 km south-east

Table 4-9: 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
Green turtle	North West Cape	Adele Island, Maret Island, Cassini Island, Lacepede Islands, Barrow Island, Montebello Islands (all with sandy beaches), Serrurier Island, Dampier Archipelago, Thevenard Island, North West Cape, Ningaloo coast	15 km south	20 km	Nov–Mar	Jan–May (peak: Feb–Mar)
Loggerhead turtle	Western Australia	Dirk Hartog Island, Muiron Islands, Gnaraloo Bay, Ningaloo coast	15 km south	20 km	Nov–May (peak: Jan)	Jan–May
Flatback turtle	Pilbara	Montebello Islands, Mundabullangana Beach, Barrow Island, Cemetery Beach, Dampier Archipelago (including Delambre Island and Huay Island), coastal islands from Cape Preston to Locker Island	2 km east	60 km	Oct–Mar (peak: Feb-Mar)	Oct–Mar
Hawksbill turtle	Western Australia	Dampier Archipelago (including Rosemary Island and Delambre Island), Montebello Islands (including Ah Chong Island, South East Island and Trimouille Island), Lowendal Islands (including Varanus Island, Beacon Island and Bridled Island), Sholl Island	31 km east	20 km	All year (peak: Oct–Feb)	All year (peak: Dec–Feb)
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					

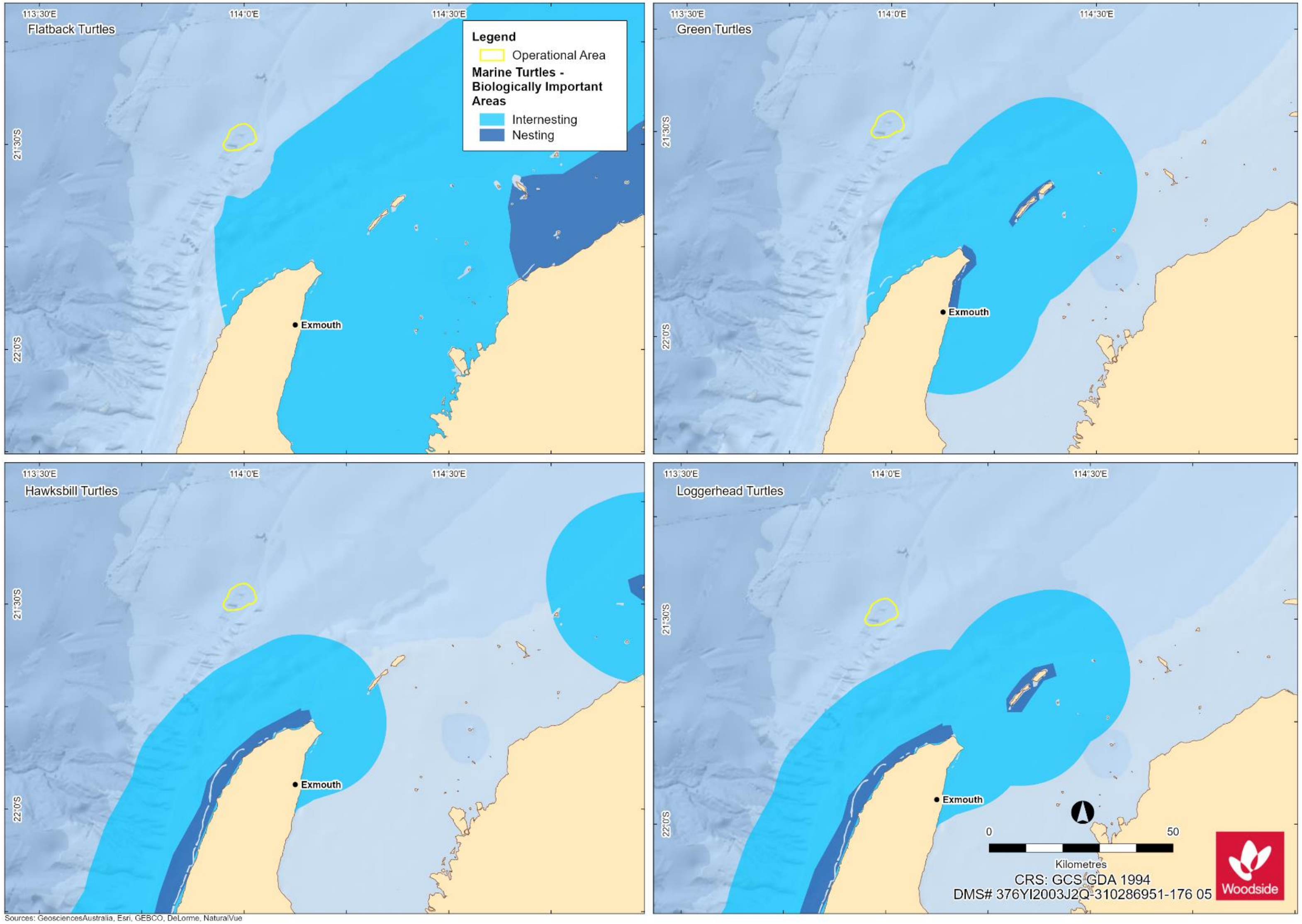


Figure 4-5: Marine turtle BIAs

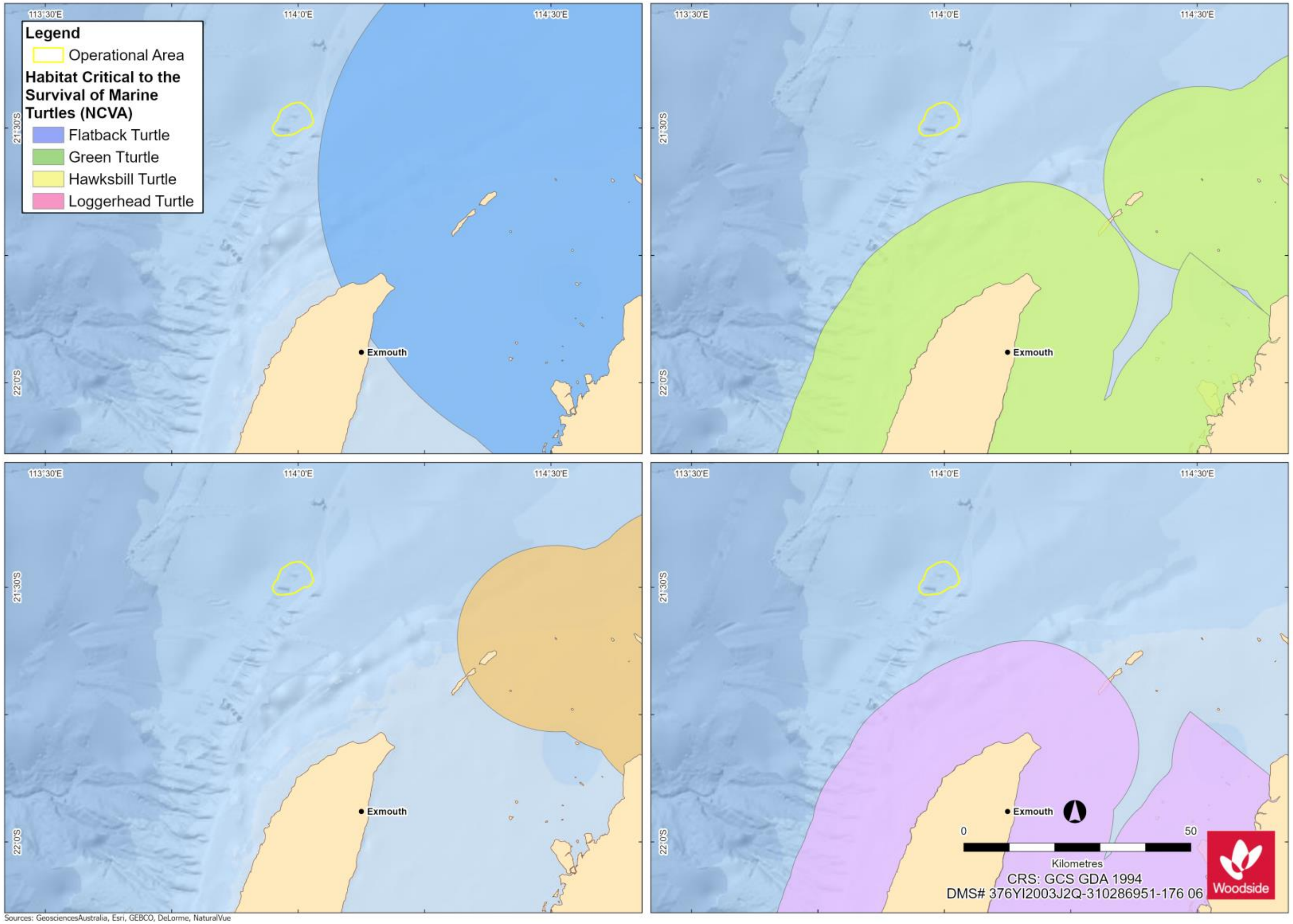


Figure 4-6: Habitat Critical to the Survival of marine turtles

4.6.3 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	Migration route known to occur	Migration route known to occur
Megaptera novaeangliae	Humpback whale	Vulnerable	Migratory	Species or species habitat known to occur	Breeding known to occur
Balaenoptera borealis	Sei whale	Vulnerable	Migratory	Species or species habitat likely to occur	Foraging, feeding or related behaviour likely to occur
Balaenoptera physalus	Fin whale	Vulnerable	Migratory	Species or species habitat likely to occur	Foraging, feeding or related behaviour likely to occur
Eubalaena australis	Southern right whale	Endangered	Migratory	Species or species habitat may occur	Species or species habitat likely to occur
Balaenoptera bonaerensis	Antarctic minke whale	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Balaenoptera edeni	Bryde’s whales	N/A	Migratory	Species or species habitat likely to occur	Species or species habitat likely to occur
Orcinus orca	Killer whale	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Physeter macrocephalus	Sperm whale	N/A	Migratory	Species or species habitat may occur	Species or species habitat may occur
Tursiops aduncus	Spotted bottlenose dolphin (Arafura/Timor Sea populations)	N/A	Migratory	Species or species habitat may occur	Species or species habitat known to occur
Dugong dugon	Dugong	N/A	Migratory	N/A	Breeding known to occur

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Sousa chinensis	Indo-Pacific humpback dolphin	N/A	Migratory	N/A	Species or species habitat known to occur
Neophoca cinerea	Australian sea lion	Endangered	Migratory	N/A	Breeding known to occur

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

Species	BIA type	Approximate distance of BIA from Operational Area (km)
Pygmy blue whale	Migration (WA coastline Augusta to Derby)	Overlaps
	Foraging (Ningaloo Marine Park)	27 km south-west
Humpback whale	Migration (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)	Overlaps
	Resting (Abrolhos)	722 km south
Dugong	Foraging, breeding, nursing, calving (high density seagrass beds at Exmouth Gulf and Ningaloo coast)	28 km south
Australian sea lion	Foraging (Abrolhos)	745 km south

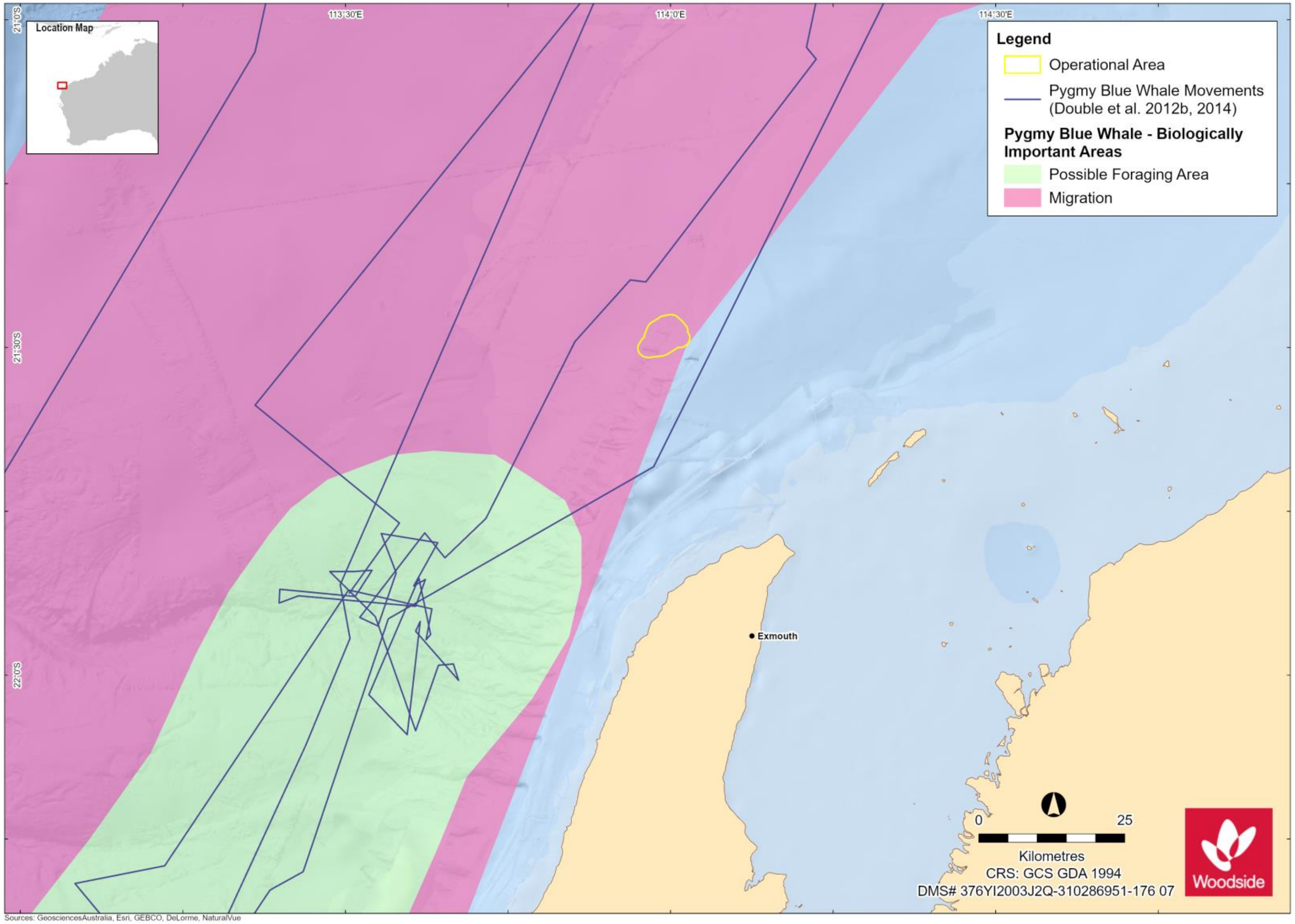


Figure 4-7: Pygmy blue whale BIAs and satellite tracks of tagged whales (Double et al., 2012b, 2014)

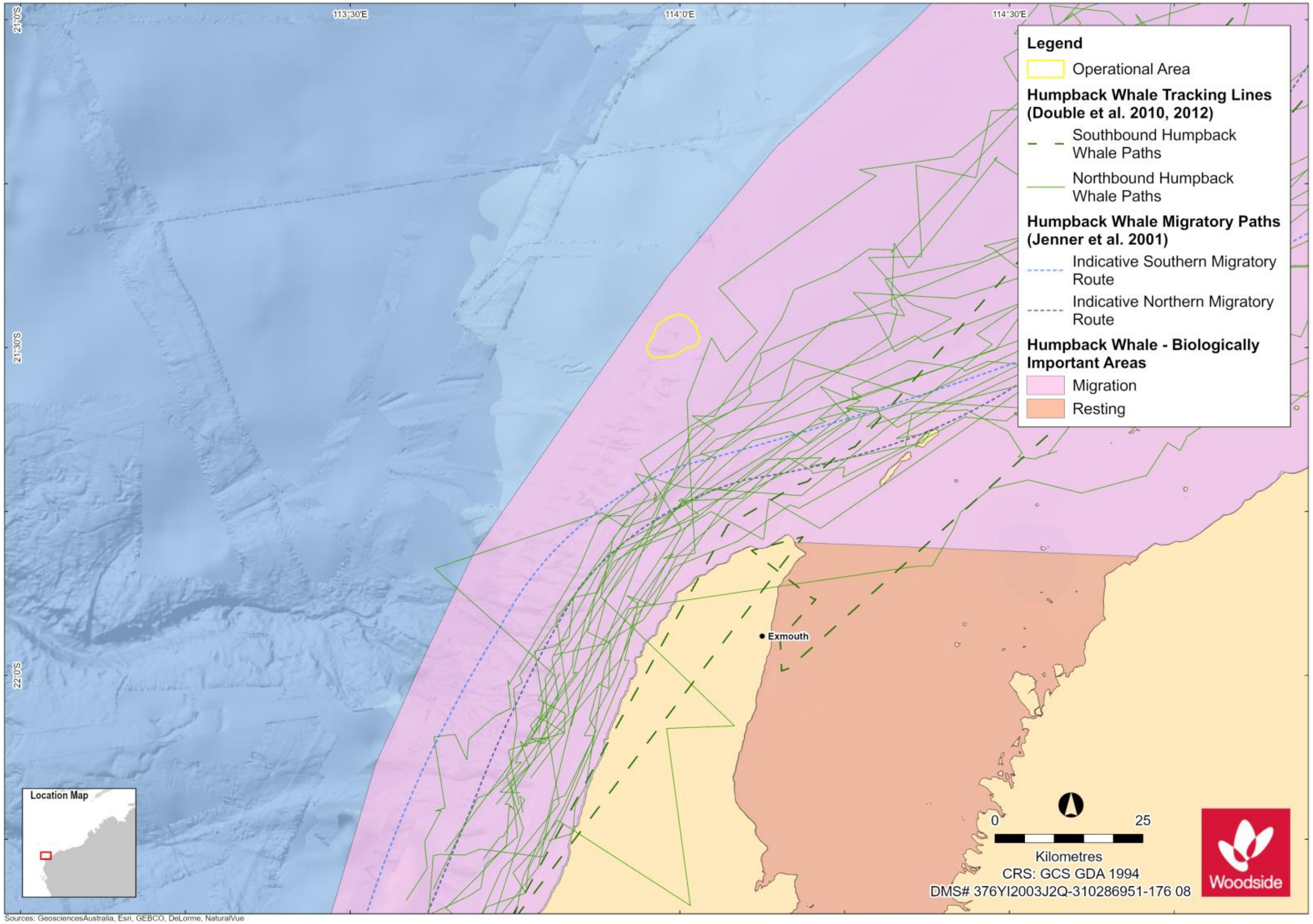


Figure 4-8: Humpback whale BIAs and satellite tracks of whales tagged between 2010 and 2012 (Double et al., 2010, 2012a) and indicative migratory paths (Jenner et al., 2001)

4.6.4 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	Species or species habitat known to occur
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Migratory	Species or species habitat may occur	Species or species habitat known to occur
Macronectes giganteus	Southern giant petrel	Endangered	Migratory	Species or species habitat may occur	Species or species habitat may occur
Numenius madagascariensis	Eastern curlew	Critically Endangered	Migratory	Species or species habitat may occur	Species or species habitat known to occur
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	N/A	Species or species habitat may occur	Foraging, feeding or related behaviour likely to occur
Sternula nereis nereis	Australian fairy tern	Vulnerable	N/A	Foraging, feeding or related behaviour likely to occur	Breeding known to occur
Anous stolidus	Common noddy	N/A	Migratory	Species or species habitat may occur	Species or species habitat likely to occur
Ardenna carneipes	Flesh-footed shearwater	N/A	Migratory	Species or species habitat may occur	Foraging, feeding or related behaviour likely to occur
Ardenna pacifica	Wedge-tailed shearwater	N/A	Migratory	N/A	Breeding known to occur
Fregata ariel	Lesser frigatebird	N/A	Migratory	Species or species habitat may occur	Species or species habitat known to occur
Fregata minor	Greater frigatebird	N/A	Migratory	N/A	Species or species habitat may occur

Species name	Common name	Threatened status	Migratory status	Potential for interaction	
				Operational Area	EMBA
Calidris tenuirostris	Great knot	Critically Endangered	Migratory	N/A	Species or species habitat known to occur
Anous tenuirostris melanops	Australian lesser noddy	Vulnerable	N/A	N/A	Breeding known to occur
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit (menzbieri)	Critically Endangered	N/A	N/A	Species or species habitat known to occur
Thalassarche carteri	Indian yellow-nosed albatross	Vulnerable	Migratory	N/A	Foraging, feeding or related behaviour may occur
Calonectris leucomelas	Streaked shearwater	N/A	Migratory	N/A	Species or species habitat likely to occur
Hydroprogne caspia	Caspian tern	N/A	Migratory	N/A	Breeding known to occur
Onychoprion anaethetus	Bridled tern	N/A	Migratory	N/A	Breeding known to occur
Sterna dougallii	Roseate tern	N/A	Migratory	N/A	Breeding known to occur
Thalasseus bergii	Greater crested tern	N/A	Migratory	N/A	Breeding known to occur
Papasula abbotti	Abbott’s booby	Endangered	N/A	N/A	Species or species habitat may occur
Charadrius leschenaultii	Greater sand plover	Vulnerable	Migratory	N/A	Species or species habitat known to occur
Puffinus assimillis	Little shearwater	N/A	N/A	N/A	Foraging known to occur

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

Species	BIA type	Approximate Distance of BIA from Operational Area (km)
Wedge-tailed shearwater	Breeding and foraging (southern Pilbara coastline)	Overlaps
	Breeding and foraging (middle Pilbara coastline)	49 km north-east
	Breeding and foraging (Shark Bay)	443 km south
	Foraging (offshore waters between Shark Bay and Geographe Bay)	477km south
Australian fairy tern	Breeding and foraging (Ningaloo coast)	29 km south
	Foraging (Abrolhos)	720km south
Roseate tern	Breeding and foraging (Ningaloo coast)	86 km south
	Foraging (Bernier Island)	347 km south
	Breeding (Bernier Island)	367 km south
	Foraging (Abrolhos)	752 km south
	Foraging (offshore waters between Shark Bay and Augusta)	520 km south
Caspian tern	Foraging (between Kalbarri and Mandurah)	686 km south
Little shearwater	Foraging (between Kalbarri and Eucla)	655 km south
Australian lesser noddy	Foraging (Abrolhos)	754 km south
Common noddy	Foraging (Abrolhos)	730 km south
Bridled tern	Foraging (south-west coast of WA)	476 km south
Soft-plumaged petrel	Foraging (offshore waters of the south and west continental shelves)	854 km south

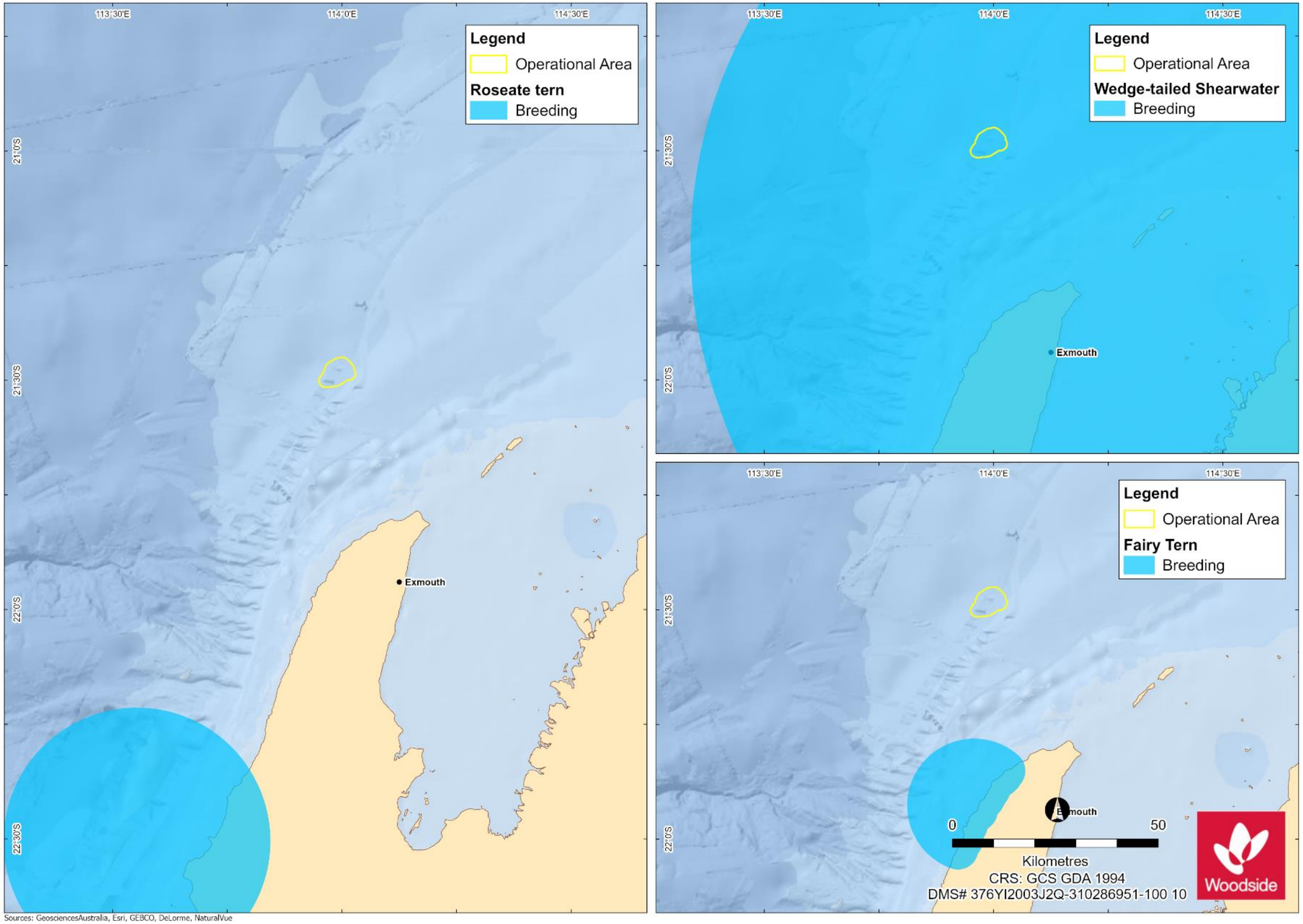


Figure 4-9: Seabird BIAs

4.6.5 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**. Movement patterns of all protected species identified in **Section 4.6** are described in Section 5 of the Master Existing Environment.

Table 4-14: Key seasonal sensitivities for 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												
Manta rays – presence/ aggregation/breeding (Ningaloo)[1]												
Whale shark* – foraging/ aggregation near Ningaloo[2]												
Marine Reptiles												
Green turtle – various nesting areas[3]												
Flatback turtle – various nesting areas[3]												
Loggerhead turtle – various nesting areas[3]												
Hawksbill turtle – various nesting areas[4]												
Mammals												
Blue whale – northern migration (Exmouth, Montebello, Scott Reef)[5]												
Blue whale – southern migration (Exmouth, Montebello, Scott Reef)[6]												
Humpback whale – northern migration (Jurien Bay to Montebello)[7]												
Humpback whale – southern migration (Jurien Bay to Montebello)[8]												
Seabirds and shorebirds												
Caspian tern – breeding (Ningaloo)[9]												
Crested tern – breeding (Ningaloo)[9]												
Fairy tern – breeding (Ningaloo)[9]												
Roseate tern – breeding (Ningaloo)[9]												

Species	January	February	March	April	May	June	July	August	September	October	November	December
Wedge-tailed shearwater – various breeding sites[9]												

	Species may be present in the Operational Area
	Peak period. Presence of animals is reliable and predictable each year

References for species seasonal sensitivities:

1. *Environment Australia, 2002*
2. *CALM, 2005; Environment Australia, 2002*
3. *DOEE, 2017; Chevron, 2015; CALM, 2005; DSEWPaC, 2012a*
4. *DOEE, 2017; Chevron, 2015*
5. *DSEWPaC, 2012a; McCauley and Jenner, 2010; McCauley, 2011*
6. *DSEWPaC, 2012a; McCauley and Jenner, 2010*
7. *CALM, 2005; Environment Australia, 2002; Jenner et al., 2001a; McCauley and Jenner, 2001*
8. *McCauley and Jenner, 2001*
9. *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)*

4.7 Key Ecological Features (KEFs)

KEFs within the Operational Area and EMBA are identified in **Table 4-15** and described in Section 9 of the Master Existing Environment. Figure 4-10 shows the spatial overlap of KEFs with the Operational Area and EMBA.

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

Key Ecological Feature	Distance from Operational Area to KEF
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	Overlaps the Operational Area
Continental slope demersal fish communities[1]	1 km north
Commonwealth waters adjacent to Ningaloo Reef	16 km south
Ancient coastline at 125 m depth contour	19 km south-east
Exmouth Plateau	74 km north-west
Wallaby Saddle	494 km south-west
Ancient coastline at 90-120 m depth	685 km south
Western demersal slope and associated fish communities	475 km south-west
Perth Canyon and adjacent shelf break, and other west coast canyons	709 km south
Commonwealth marine environment surrounding the Houtman Abrolhos Islands	628 km south
Western rock lobster	686 km south

1 KEF does not overlap Canyons linking the Cuvier Abyssal Plain and the ape range Peninsula KEF as the boundary extends only to the edge of this KEF. Therefore, the Continental Slope Demersal Fish Communities KEF does not overlap the Operational Area.

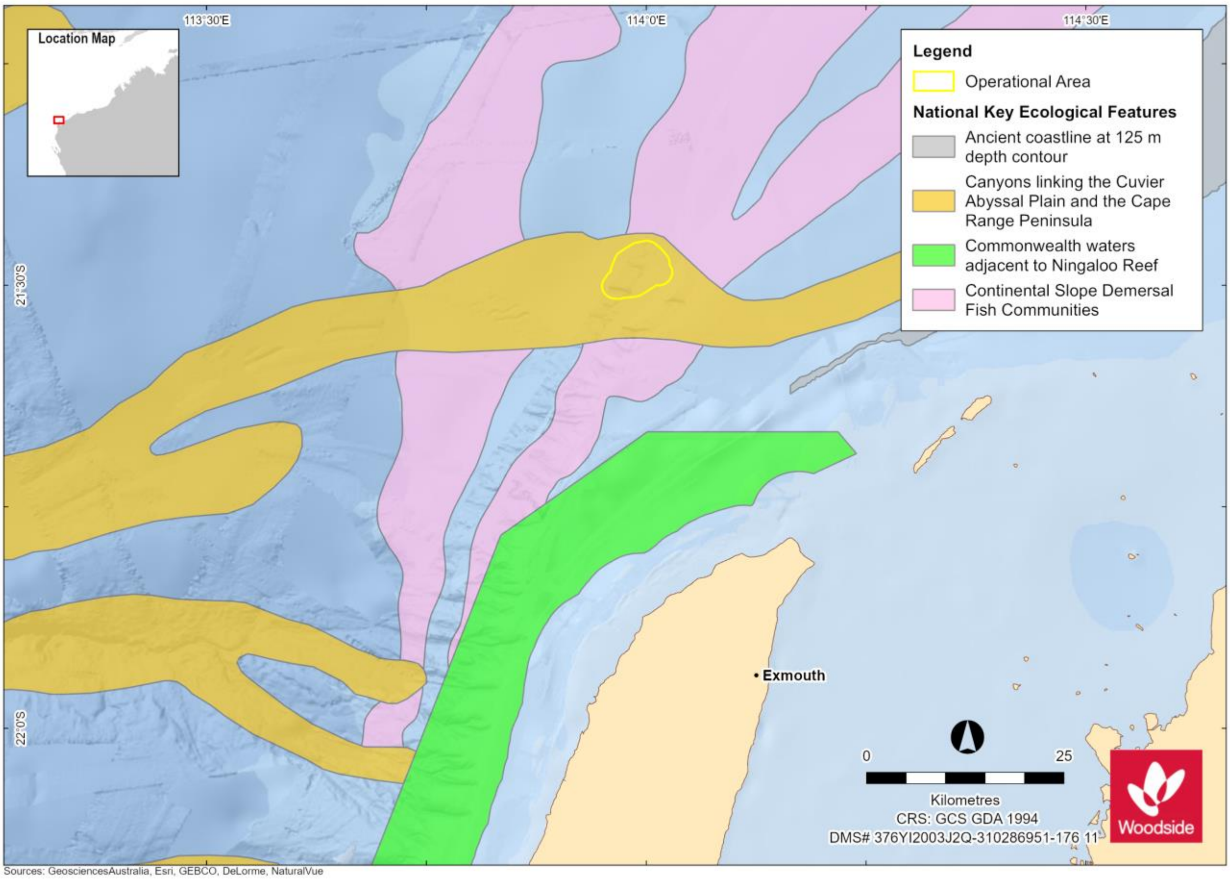


Figure 4-10: KEFs

4.8 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**. Section 10 of the Master Existing Environment describes the values and sensitivities of protected places and other sensitive areas in the EMBA.

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

Protected Place	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		
Gascoyne AMP	16 km south	Multiple Use Zone (IUCN VI)
	118 km south-west	Habitat Protection Zone (IUCN IV)
	210 km west	National Park Zone (IUCN II)
Ningaloo AMP	16 km south	Recreational Use Zone (IUCN IV)
	133 km south	National Park Zone (IUCN II)
	147 km south	Recreational Use Zone (IUCN IV)
Shark Bay AMP	327 km south	Multiple Use Zone (IUCN VI)
Montebello AMP	146 km north-east	Multiple Use Zone (IUCN VI)
Carnarvon Canyon AMP	330 km south-west	Habitat Protection Zone (IUCN IV)

Protected Place	Distance from Operational Area to protected place or sensitive area (km)	IUCN category* or relevant park zone overlapping the Operational Area and/or EMBA
SWMR		
Abrolhos AMP	479 km south west	Habitat Protection Zone (IUCN IV)
	632 km south west	Multiple Use Zone (IUCN VI)
	577 km south	Multiple Use Zone (IUCN VI)
	734 km south	Multiple Use Zone (IUCN VI)
	622 km south	National Park Zone (IUCN II)
	725 km south	National Park Zone (IUCN II)
	737 km south	National Park Zone (IUCN II)
	656 km south	Special Purpose Zone (IUCN VI)
	731 km south	Special Purpose Zone (IUCN VI)
State Marine Parks and Nature Reserves		
Marine Parks		
Ningaloo Marine Park	28 km south-east	Sanctuary, Recreation, General Use and Special Purpose Zones
Marine Management Areas		
Muiron Islands	31 km east	IUCN Ia, IUCN VI
Fish Habitat Protection Areas		
Abrolhos Island	745 km south	IUCN IV
Nature Reserves		
Muiron Islands	34 km east	IUCN Ia

**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.

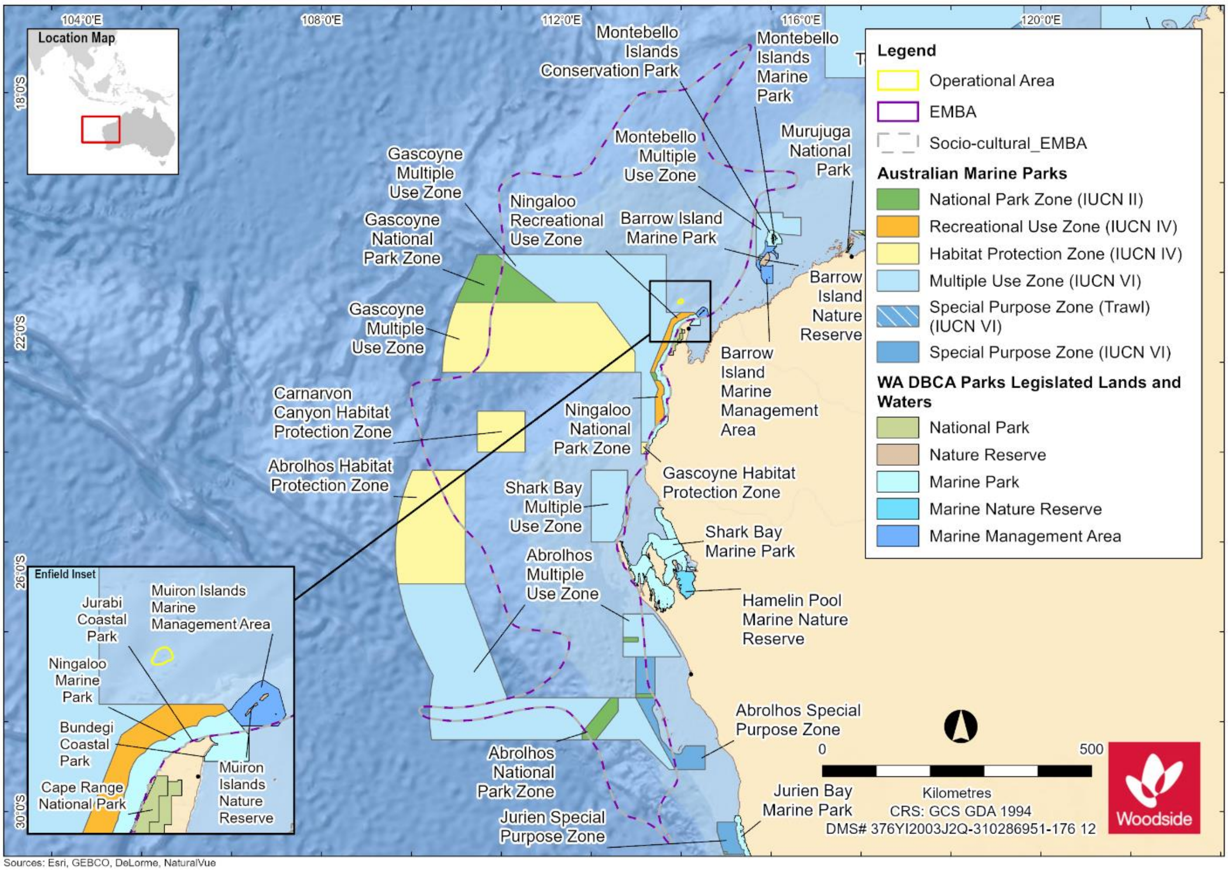


Figure 4-11: Protected areas overlapping the EMBA

4.9 Socio-Economic Environment

4.9.1 Cultural Heritage

4.9.1.1 European and Indigenous Sites of Significance

There are no known sites of European cultural heritage significance within the Operational Area. Section 11 of the Master Existing Environment describes cultural heritage sites within the EMBA.

Indigenous Australian people have a strong continuing connection with the area that extends back some 50,000 years. 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 people 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. In particular, the Yinggarda, Baiyungu and Thalanyji People have direct interest in the operation and impacts of the Petroleum Activities Program as Traditional Owners of the area overlapped by the EMBA (potential for shoreline accumulation along the Gascoyne coast). The EMBA also overlaps with coastline along the southern Gascoyne and mid-west regions, an area of which the Malgana People and Nanda People are Traditional Owners.

There are no known Indigenous sites of significance within the Operational Area.

Within the EMBA, Ningaloo Reef, Exmouth and the 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, are protected under the *Aboriginal Heritage Act 1972* (WA) or EPBC Act. The

Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Inquiry System was searched for the EMBA, which indicated numerous registered Indigenous heritage places (**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 Western Australian Department of Aboriginal Affairs (DAA) and relevant local Aboriginal communities.

4.9.1.2 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, numerous shipwrecks exist within the EMBA. **Table 4-17** lists shipwrecks within 15 km of the Operational Area.

Table 4-17: Recorded historical shipwrecks in the vicinity of the Operational Area

Vessel name	Year wrecked	Wreck location[1]	Latitude (D.MM °S)	Longitude (D.MM °E)	Distance from Operational Area
Beatrice[2]	1899	Off North West Cape	21.62	113.98	12 km south
Gem	1893	North West Cape	21.62	113.98	12 km south

[1] *Wreck location as recorded in Australian National Shipwreck Database (Department of the Environment and Energy n.d.)*

[2] *Unconfirmed location as coordinates in Australian National Shipwreck Database conflict with location description (off Eighty Mile Beach)*

4.9.1.3 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 4-18.** Section 11.2 of the Master Existing Environment outlines the values and sensitivities of these places.

Table 4-18: World, National and Commonwealth Heritage Listed Places within the EMBA

Listed Place	Distance from Operational Area to Listed Place
World Heritage Places (WHP)	
Ningaloo Coast World Heritage Property	17 km south
Shark Bay World Heritage Property	367 km south
National Heritage Places (NHP)	
Ningaloo Coast National Heritage Place	17 km south
Shark Bay National Heritage Place	367 km south
Commonwealth Heritage Places (CHP)	
Ningaloo Coast Commonwealth Heritage Place	17 km south

4.9.2 Commercial Fisheries

A number of Commonwealth and State fishery management areas are located within the Operational Area and EMBA. FishCube and Australian Fisheries Management Authority (AFMA) catch and effort data was requested to analyse the potential for interaction of fisheries with the Operational Area, and, in addition to fishing methods and water depths, used to determine consultation with State and Commonwealth fisheries that may be impacted by proposed petroleum activities (Department of Primary Industries and Regional Development [DPIRD], 2021; and AFMA/Australian Bureau of Agriculture and Resources Economics (ABARES) data). **Table 4-19** provides an assessment of the potential interaction within the Operational Area, and Section 11.5.1 of the Master Existing Environment provides further detail on the fisheries that have been identified through desk-based assessment and consultation. **Figure 4-12** shows Commonwealth and State fisheries identified as having a potential interaction with the Petroleum Activities Program.

Table 4-19: Potential for Interaction with Commonwealth and State Commercial Fisheries overlapping the Operational Area

Fishery	Potential for interaction within Operational Area	
Commonwealth Managed Fisheries		
North West Slope Trawl Fishery	×	The Operational Area is located just within the fishery management area for the North West Slope Trawl Fishery; however, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program given the current distribution of fishing effort is concentrated north-east of the Operational Area (Patterson et al., 2021).
Western Deepwater Trawl Fishery	✓	The Operational Area is located just within the fishery management area for the Western Deepwater Trawl Fishery. Recent fishing effort indicates some fishing activity adjacent to the North West Cape in the 2017/2018 and 2019/2020 seasons, however fishing effort within the Operational Area is unknown (Patterson et al., 2019, 2021). Therefore, Woodside considers it a possibility that interactions with the fishery will occur. Future interactions may also occur should infrastructure (suction manifold piles) be required to be left above the mudline; however, it is planned for all infrastructure to be removed at or below the mudline.
Southern Bluefin Tuna Fishery	×	While there is an overlap with the fishery management area and the Operational Area, no fishing effort has occurred within or nearby to the Operational Area for at least the last ten years (Patterson et al., 2021). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program given the current distribution of fishing effort is focused in the Great Australian Bight.
Western Skipjack Tuna Fishery	×	The Western Skipjack Tuna Fishery is not currently active and no fishing has occurred since 2009 (Patterson et al., 2021). Therefore, no fishing effort occurs within the Operational Area and Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Western Tuna and Billfish Fishery	×	While there is an overlap with the fishery management area and the Operational Area, no fishing effort has occurred within or nearby to the Operational Area for at least the last ten years (Patterson et al., 2021). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program given the current distribution of fishing effort is concentrated south-west the Operational Area.
State Managed Fisheries		
Pilbara Line Fishery	✓	The Operational Area sits on the border of two 60 nm Catch and Effort System (CAES) blocks, one of which has consistently reported effort every year since 2009 (CAES block ref. 21140) (DPIRD, 2021). It is likely that the Pilbara Line Fishery fishes to the east of the Operational Area towards the Pilbara coast and Montebello Islands, however, Woodside considers it a possibility that interactions with the fishery will occur during the Petroleum Activities program. No interactions are expected to occur from infrastructure left in situ given the fishing methods employed by the fishery are pelagic.
Specimen Shell Managed Fishery	×	This fishery typically uses hand collection methods to collect specimen shells in water depths of less than 30 m. However, ROV collection methods could enable fishing in water depths up to 300 m. The Operational Area is located across four 10 nm CAES blocks (212135, 212140, 213135 and 213140). Specimen Shell Managed Fishery fishing effort was reported in 10 nm CAES blocks 212140 and 213140 in 2015, using the ROV collection method (DPIRD, 2021). This ROV collection method is no longer active, and therefore Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.

Fishery	Potential for interaction within Operational Area	
Marine Aquarium Managed Fishery	×	This fishery generally collects fish for display in water depths of less than 30 m. While there is an overlap with the fishery management area and the Operational Area, the Marine Aquarium Managed Fishery is not expected to fish within the Operational Area and there is no reported fishing effort between 2009 and 2020 (DPIRD, 2021). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
West Coast Deep Sea Crustacean Managed Fishery	×	The West Coast Deep Sea Crustacean Managed Fishery can fish in waters deeper than the 150 m isobath and therefore overlaps the Operational Area. However, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program given effort is concentrated between Carnarvon and Fremantle.
Western Australian Abalone Managed Fishery	×	This fishery uses hand collection methods to collect abalone in water depths of less than 40 m. While there is an overlap with the fishery management area and the Operational Area, no commercial fishing has occurred north of Moore River since 2011-2012 (Strain et al., 2018). Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Mackerel Managed Fishery (Area 2 and Area 3)	×	The Operational Area is located across four 10 nm CAES blocks (212135, 212140, 213135 and 213140), which have not reported any fishing effort between 2009 and 2020 (DPIRD, 2021). Therefore, 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 and the Petroleum Activities Program.
South West Coast Salmon Managed Fishery	×	No fishing effort occurs north of the Perth metropolitan area. Therefore, no fishing effort occurs within or nearby to the Operational Area and Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Western Australian Sea Cucumber Fishery	×	The target species typically inhabit nearshore waters and no effort occurs within the Operational Area. Therefore, 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 and the Petroleum Activities Program.
Pilbara Crab Managed Fishery	×	The Operational Area overlaps with a closed area of the fishery (as per Schedule 2 of the draft Management Plan [DPIRD, 2018]) and therefore, fishing activity within the Operational Area is currently not permitted. Accordingly, Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.

Fisheries not overlapping with the Operational Area but occurring within the EMBA include the:

- Pilbara Trawl Managed Fishery
- Pilbara Trap Managed Fishery
- Pearl Oyster Managed Fishery
- West Coast Rock Lobster Fishery
- Onslow Prawn Managed Fishery
- Shark Bay Prawn Managed Fishery
- Exmouth Gulf Prawn Managed Fishery
- Gascoyne Demersal Scalefish Managed Fishery
- West Coast Demersal Scalefish Managed Fishery.

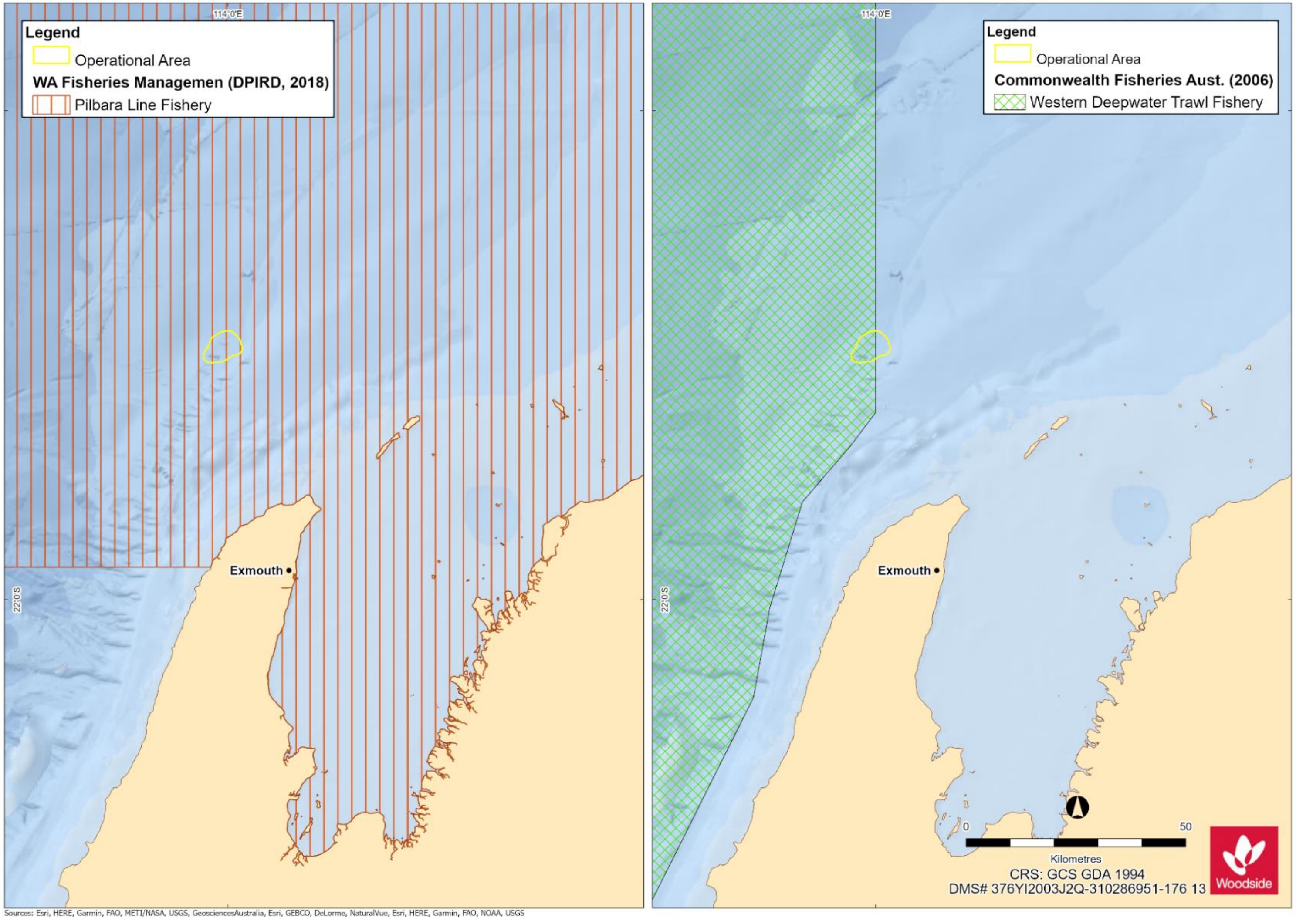


Figure 4-12: State fisheries with a potential for interaction with the Petroleum Activities Program

4.9.3 Traditional Fisheries

Dugong, fish and marine turtles that move between coastal and Commonwealth waters are important components of the Aboriginal people's culture and diet. Aboriginal people continue to actively manage their sea country in coastal waters of WA in order to protect and manage the marine environment, its resources and cultural values. Traditional or customary fisheries are typically restricted to shallow coastal waters and/or areas with structures such as reef. Therefore, traditional fishers are not expected to fish within the Operational Area, but will likely occur within the coastal waters of the wider EMBA.

4.9.4 Tourism and Recreation

There are growing tourism and recreational sectors in WA. The Pilbara and Gascoyne regions are popular visitor destinations for Australian and international tourists. Tourism is concentrated in the vicinity of population centres including Dampier, Exmouth, Coral Bay and Shark Bay.

No tourism or recreational activity is known to take place within or nearby the Operational Area given the water depths of approximately 400 – 600 m. Within the EMBA, tourism is one of the largest revenue earners of all the major industries of the Gascoyne and Pilbara regions 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 Coast World Heritage Property (17 km south of the Operational Area) 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 and encounters (July to October) and turtle watching (all year round) (Schianetz et al., 2009).

4.9.5 Commercial Shipping

The Australian Maritime Safety Authority (AMSA) has introduced a network of marine fairways across the NWMR off WA to reduce the risk of vessel collisions with offshore infrastructure. It is noted that none of these fairways intersect with the Operational Area; the nearest fairway is approximately 40 km north-west of the Operational Area (**Figure 4-13**). Vessel tracking data suggest shipping is concentrated to the north-east of the Operational Area, which is likely associated with ports.

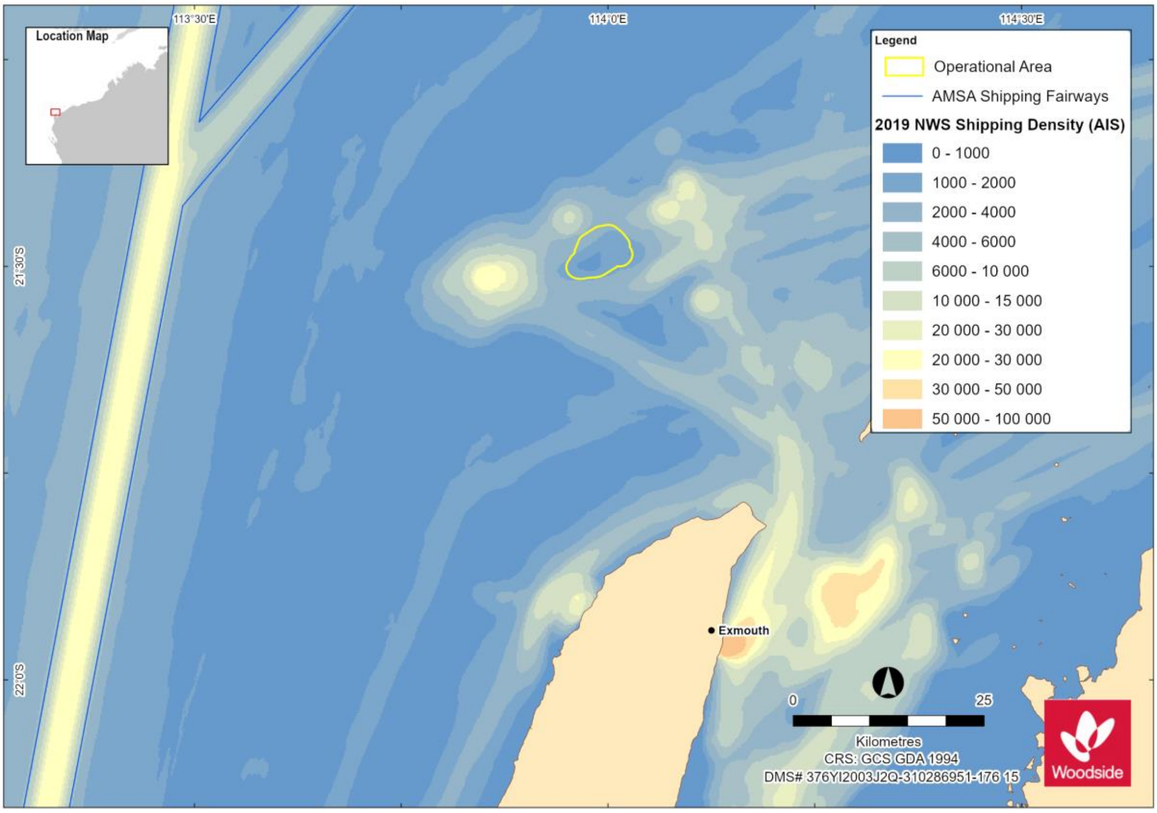


Figure 4-13: Vessel density map derived from AMSA satellite tracking system data (vessels include cargo, LNG tanker, passenger vessels, support vessels, and others/unnamed vessels)

4.9.6 Oil and Gas

Table 4-20 identifies other oil and gas facilities located within 50 km of the Operational Area. Section 11.9 of the Master Existing Environment describes current oil and gas development within the EMBA, also shown in **Figure 4-14**.

Table 4-20: Other oil and gas facilities located within 50 km of the Operational Area

Facility name and Operator	Distance from Operational Area to facility
Ngujima Yin FPSO (Woodside)	5 km north-east
Ningaloo Vision FPSO (Santos)	8 km north-east
Pyrenees Venture FPSO (BHP Billiton)	9 km south-east

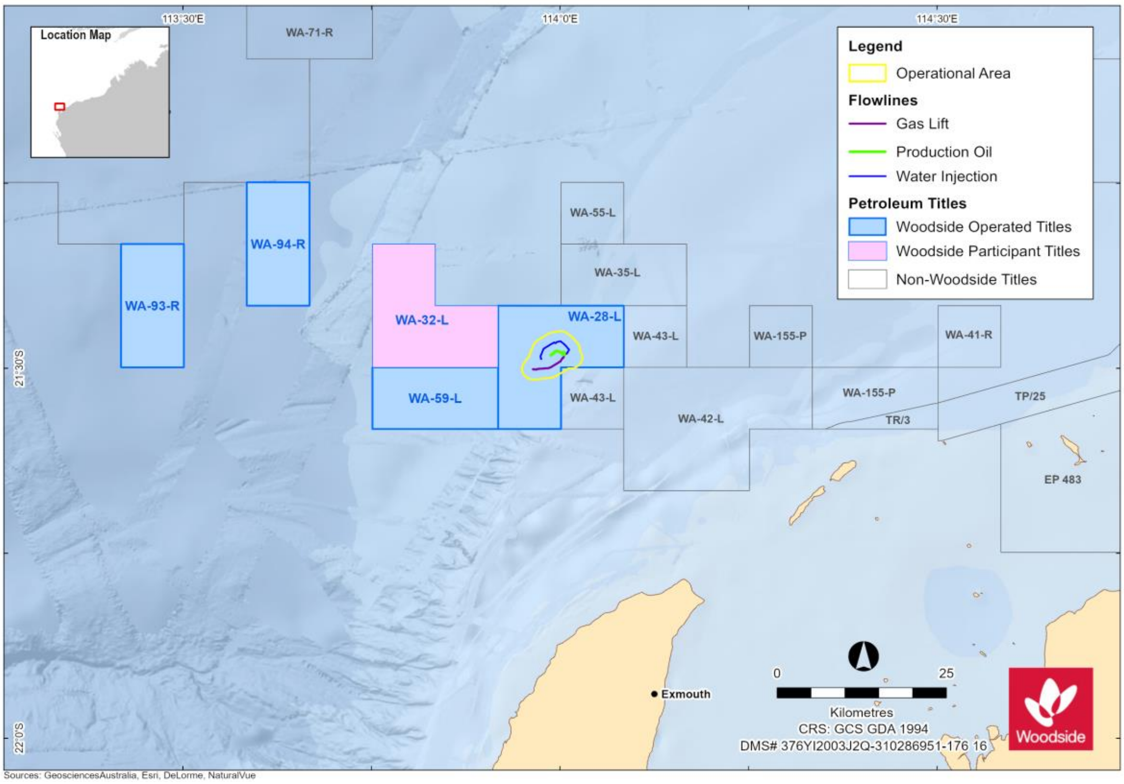


Figure 4-14: Oil and gas facilities

4.9.7 Defence

There are designated defence practice areas in the offshore marine waters off Ningaloo and the North West Cape, of which a military flying training area overlaps the Operational Area. Defence areas overlapping the Operational Area and EMBA are presented in **Figure 4-15**.

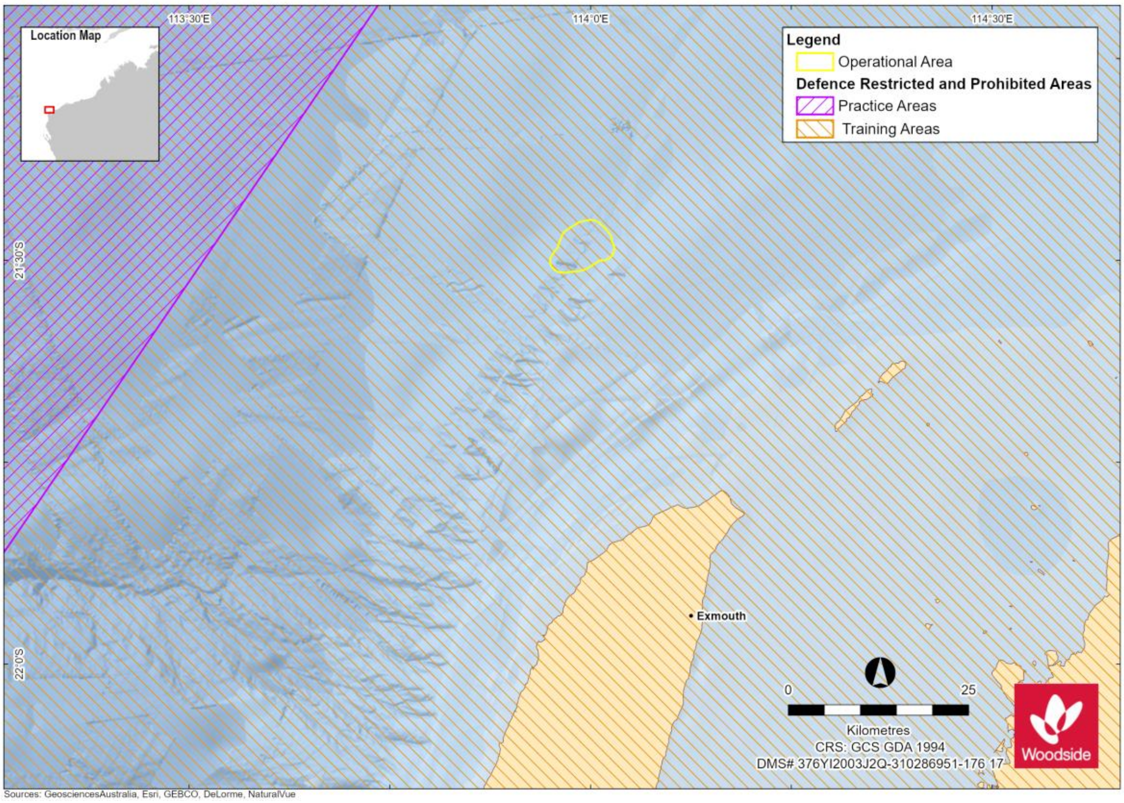


Figure 4-15: Defence areas

5. STAKEHOLDER CONSULTATION

5.1 Summary

Woodside is committed to consulting relevant stakeholders in the course of preparing this environment plan, to ensure stakeholder feedback informs its decision making and planning for proposed petroleum activities and builds upon Woodside's extensive and ongoing stakeholder consultation for its offshore petroleum activities in the region.

5.1.1 Stakeholder Consultation Guidance

Woodside has followed the requirements of subregulation 11A (1) of the Environment Regulations to identify relevant stakeholders, 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.

Woodside's assessment of stakeholder relevance is outlined in **Table 5-1**.

5.2 Stakeholder Consultation Objectives

In support of this EP, Woodside has sought to:

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

5.3 Stakeholder Expectations for Consultation

Stakeholder consultation for this activity has also been guided by stakeholder organisation 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:

- *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*

Woodside acknowledges that additional relevant stakeholders may be identified in the course of preparing this environment plan. These stakeholders will be contacted, provided with information relevant to their interests, and invited to provide feedback about the proposed activity. Woodside will assess their feedback, respond to the stakeholder, and incorporate feedback into the management of the proposed activity where practicable.

Woodside consultation arrangements typically provide stakeholders up to 30 days (unless otherwise agreed) to review and respond to proposed activities where stakeholders are potentially affected. Woodside considers this consultation period an adequate timeframe in which stakeholders can assess potential impacts of the proposed activity and provide 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)	Yes	Responsible for managing Commonwealth fisheries. The Western Deepwater Trawl fishery overlaps the Operational Area and ABARES data released in October 2021 indicates potential for fishing in the Operational Area. Woodside has also provided information to licence holders in the fishery, representative organisations – CFA and WAFIC – and DAWE, given their interest in commercial fishing.
Australian Hydrographic Office (AHO)	Yes	Response for maritime safety and Notices to Mariners.
Australian Maritime Safety Authority (AMSA) – maritime safety	Yes	Statutory agency for vessel safety and navigation and legislated responsibility for marine pollution response in Commonwealth waters.
Australian Maritime Safety Authority (AMSA) – marine pollution	Yes	Legislated responsibility for oil pollution response in Commonwealth waters. Proposed activity has a hydrocarbon spill risk, which may require AMSA response in Commonwealth waters.
Department of Agriculture, Water and the Environment (DAWE) – Fisheries	Yes	Responsible for implementing Commonwealth policies and programs to support agriculture, water resources, the environment and heritage. The Western Deepwater Trawl fishery overlaps the Operational Area and ABARES data released in October 2021 indicates potential for fishing in the Operational Area. Woodside has also provided information to licence holders in the fishery, representative organisations – CFA and WAFIC – and AFMA, given their interest in commercial fishing.
DAWE – Biosecurity (marine pests, vessels, aircraft and personnel)	Yes	DAWE administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity has the potential to transfer marine pests. DAWE 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.

Stakeholder	Relevant to activity	Reasoning
		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 DAWE's interests in the prevention of introduced marine species.
Department of Defence (DoD)	Yes	Responsible for defending Australia and its national interests. The Operational Area overlaps the Defence training area.
Department of Industry, Science, Energy and Resources (DISER)	Yes	Department of relevant Commonwealth Minister and is required to be consulted under the OPGGS (Env) Regulations.
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's parks, forests and reserves. Planned activities do not impact DBCA's functions, interests or activities. Woodside has chosen to provide information given the proximity of the activity to the Ningaloo State Marine Park.
Department of Mines, Industry Regulation and Safety (DMIRS)	Yes	Department of relevant State Minister and is required to be consulted under the OPGGS (Env) Regulations.
Department of Primary Industries and Regional Development (DPIRD)	Yes	Responsible for managing State fisheries. Potential for interaction during proposed activities with the Pilbara Line Fishery in the Operational Area. No interaction is expected with commercial fishers following the removal of infrastructure.
Department of Transport (DoT)	Yes	Legislated responsibility for oil pollution response in State waters. Proposed activity has a hydrocarbon spill risk, which may require DoT response in State waters.
Commonwealth managed fisheries*		
North-West Slope Trawl Fishery	No	The fishery has not been active in the Operational Area within the last five years. Woodside has provided information to the fishery's representative organisations – Commonwealth Fisheries Association and Western Australian Fishing Industry Council – on AFMA advice that it expects all Commonwealth fishers who have

Stakeholder	Relevant to activity	Reasoning
		entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations. No interaction is expected with commercial fishers following the removal of infrastructure.
Southern Bluefin Tuna Fishery	No	The fishery has not been active in the Operational Area within the last five years. Woodside has provided information to the fishery's representative organisations – 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. No interaction is expected with commercial fishers following the removal of infrastructure.
Western Tuna and Billfish Fishery	No	The fishery has not been active in the Operational Area within the last five years. Woodside has provided information to the fishery's representative organisations – 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. No interaction is expected with commercial fishers following the removal of infrastructure.
Western Deepwater Trawl Fishery	Yes	ABARES data released in October 2021 indicates potential for fishing in the Operational Area.
Western Skipjack Fishery	No	The fishery has not been active in the Operational Area within the last five years. Woodside has provided information to the fishery's representative organisations – 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. No interaction is expected with commercial fishers following the removal of infrastructure.
WA managed fisheries*		
Mackerel Managed Fishery – Pilbara (Area 2 and 3)	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years. Fishers are not active at water depths greater than 70 m (previous WAFIC advice).
South West Coast Salmon Managed Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years. 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 in the Operational Area 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).

Stakeholder	Relevant to activity	Reasoning
Western Australian Abalone Managed Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational area within the last five years, and is a dive and wade fishery with activities generally restricted to waters less than 40 m deep.
Pilbara Crab Managed Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years, and target species (blue swimmer crab) are only found in waters up to 50 m deep.
Marine Aquarium Fishery	No	Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last five years, and is a 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 in the Operational Area in the last five years, and is a dive and wade fishery with activities generally restricted to waters less than 30 m deep (previous WAFIC advice).
Pilbara Demersal Scalefish Fishery • Pilbara Trawl Fishery	No	The Operational Area is outside of the Pilbara Trawl Fishery.
• Pilbara Trap Fishery	No	The Operational Area is outside of the Pilbara Trawl Fishery.
• Pilbara Line Fishery	Yes	The fishery overlaps the Operational Area and DPIRD data indicate active fishing within the Operational Area.
Industry		
BHP	Yes	Adjacent Titleholder.
Santos	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.

Stakeholder	Relevant to activity	Reasoning
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	No	Represents the interests of the Southern Bluefin Tuna Fishery. The Fishery isn't active in the Operational Area. Woodside has provided information 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. No interaction is expected with commercial fishers following the removal of infrastructure.
Commonwealth Fisheries Association (CFA)	Yes	Represents the interests of commercial fishers with licences in Commonwealth waters, including the Western Deepwater Trawl fishery The Western Deepwater Trawl fishery overlaps the Operational Area and ABARES data released in October 2021 indicates potential for fishing in the Operational Area. No interaction is expected with commercial fishers following the removal of infrastructure.
Marine Tourism WA	Yes	Represents the interests of recreational fishers in WA. Activities have the potential to impact recreational fishers.
Pearl Producers Association (PPA)	No	Although interactions with licence holders in the Pearl Oyster Managed Fishery are unlikely, PPA has requested to be informed of Woodside's planned activities.
Recfishwest	Yes	Represents the interests of recreational fishers in WA. Activities have the potential to impact recreational fishers.
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 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. No interaction is expected with commercial fishers following the removal of infrastructure.
Western Australian Fishing Industry Council (WAFIC)	Yes	Represents the interests of licence holders in WA-managed fisheries. The Pilbara Line fishery overlaps the Operational Area and DPIRD data indicates active fishing within the Operational Area. WAFIC is also listed on the AFMA web site as a contact for the Western Deepwater Trawl fishery. The Western Deepwater Trawl fishery also overlaps the Operational Area and ABARES data indicates potential for fishing in the Operational Area.
WA Game Fishing Association	Yes	Represents the interests of charter owners and operators in WA. Activities have the potential to impact game fishers.
Other stakeholders		
Exmouth-based charter boat, tourism and dive operators	Yes	There has been effort in the Operational Area by charter boat operators.

Stakeholder	Relevant to activity	Reasoning
Cape Conservation Group	Yes	Volunteer not-for-profit organisation that is involved in protecting the terrestrial and marine environment of the North West Cape.
Protect Ningaloo	Yes	Volunteer not-for-profit organisation that is involved in protecting the terrestrial and marine environment of Ningaloo Reef
Exmouth Community Reference Group	Yes	Group established in 2002 to provide a forum for local community, industry and government stakeholders and the oil and gas industry to discuss operations and community issues.
Exmouth Game Fishing Club	Yes	Exmouth based game fishing club, which hosts a number of fishing tournaments in the region.
Exmouth Chamber of Commerce and Industry (ECCI)	Yes	Not-for-profit group that represents local businesses.
Shire of Exmouth	Yes	Local government entity for the Exmouth region. Broader interest in activities in the region.
Ningaloo Coast World Heritage Advisory Committee	No	Activities will not occur in the Ningaloo World Heritage Area. Woodside has chosen to provide information to the Committee given the proximity of planned activities to the Area.
Nganhurra Thanardi Garrbu Aboriginal Corporation	No	Registered Native Title body for the Exmouth region. The Operational Area is beyond the boundary of the determination area. Woodside has chosen to provide information to the Corporation, via their nominated representative the Yamatji Marlpa Aboriginal Corporation (YMAC).

** 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. The Master Existing Environment provides a detailed assessment of Commonwealth and State fisheries within or adjacent to the Operational Area.*

5.4 Stakeholder Consultation

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

The Consultation Information Sheet (**Appendix F**, reference 1.20) is published on the Woodside website and includes a toll-free 1800 phone number.

Table 5-2: Stakeholder Consultation Activities

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
Australian Government department or agency				
ABF	On 17 September 2021, 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 this adequately addresses stakeholder interests and no further consultation is required.
AFMA	On 17 September 2021, Woodside emailed AFMA advising of the proposed activity (**Appendix F**, reference 1.2) and provided a Consultation Information Sheet and fisheries maps.	On 29 September 2021, AFMA emailed Woodside advising it expected consultation to be undertaken with licence holders entitled to fish in the proposed area, either directly or through their representative organisation. AFMA also provided advice on contact details for representative organisations and concession holders.	On 21 October 2021. Woodside emailed AFMA advising that representative organisations for overlapping Commonwealth managed fisheries had been consulted for the proposed Activity.	Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 14 November 2021, Woodside emailed an update to AFMA (**Appendix F**, reference 1.21) following assessment of ABARES statistical data released in October 2021 for Commonwealth managed fisheries.	No feedback received.	No response required.	Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.9.2**, consulted relevant fisheries licence holders and representative organisations, and will notify AFMA prior to commencement and upon completion of activities (PS 1.2). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 6 December 2021, Woodside emailed AFMA to remind them of the closing date for consultation period (15 December 2021) and to request feedback on the information provided.	No feedback received.	No feedback required.	
	On 18 February 2022, Woodside emailed AFMA to clarify information in its initial consultation email to confirm which infrastructure is proposed to be removed and that which is proposed to be left *in situ*.	No feedback received.	No feedback required.	
AHO	On 17 September 2021, Woodside emailed the AHO advising of the proposed activity	On 20 September 2021, AHO emailed Woodside acknowledging that its advice about planned activities had been received and would register, assess, prioritise and validate Woodside's data in preparation for	On 21 October 2021, Woodside emailed AHO advising it would: Notify the AHO no less than four weeks before operations commence	Woodside notes confirmation to AMSA on 22 October 2021 that it will undertake the following notification to the AHO:

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	(**Appendix F**, reference 1.3) and provided a Consultation Information Sheet, and shipping traffic density map.	updating AHO's Navigational Charting products.	in order to promulgate a Notice to Mariners. Provide an update to the AHS on any material changes to planned activities.	• Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date (PS 1.1). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
AMSA (maritime safety)	On 17 September 2021, Woodside emailed AMSA advising of the proposed activity (**Appendix F**, reference 1.3) and provided a Consultation Information Sheet, and shipping traffic density map.	No response received.	No response required.	Consultation ongoing.
	On 21 October 2021, Woodside emailed AMSA noting it had not received feedback on its consultation advice of 17 September. • Woodside confirmed it would as per previous advice from AMSA for activities in the area: • Notify the AHO no less than 4 weeks before operations commence.	On 22 October 2021, AMSA emailed Woodside confirming: • 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.	On 29 October 2021, Woodside emailed AMSA acknowledging its confirmation of notification arrangements.	Woodside notes confirmation to AMSA on 22 October 2021 that it will undertake the following notification to the AHO: • Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date (PS 1.1). • Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities and movements 24–48 hours before operations commence (PS 1.3).

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	• Notify AMSA's JRCC at least 24-48 hours before operations commence. • Notify AMSA's JRCC when operations end. • Provide updates to both the AHO and AMSA on any material changes to planned activities • Ensure 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.	• 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.		• Woodside will provide updates to the AHO and JRCC should there be material changes to the activity. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
AMSA (marine pollution)	On 17 September 2021, Woodside emailed the AMSA advising of the proposed activity (**Appendix F**, reference 1.4) and provided a Consultation Information Sheet.	No feedback received.	No response required. Woodside to provide the Oil Pollution First Strike Plan to AMSA.	Woodside has provided a copy of the First Strike Plan (**Appendix I**) to AMSA and addressed oil pollution planning and response at **Appendix D**. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 22 October 2021, Woodside emailed AMSA and provided a copy of the Enfield Decommissioning Oil Pollution First Strike Plan.	No feedback received.	No response required. Woodside has provided the Oil Pollution First Strike Plan to AMSA.	
DAWE	On 17 September 2021, Woodside emailed DAWE advising of the proposed activity considering biosecurity matters (**Appendix F**, reference 1.5) and provided a Consultation Information Sheet and fisheries maps.	No feedback received.	No response required.	Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.9.2** of this EP, and will notify DAWE prior to commencement and upon completion of activities (PS 1.2). Woodside has addressed maritime biosecurity issues in **Section 6** of this EP based on previous offshore activities. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 14 November 2021, Woodside emailed an update to DAWE (**Appendix** F, reference 1.51) following assessment of ABARES statistical data released in October 2021 for Commonwealth managed fisheries.	No feedback received.	No response required.	

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 6 December 2021, Woodside emailed DAWE to remind them of the closing date for consultation period (15 December 2021) and to request feedback on the information provided.	No feedback received.	No feedback received.	
	On 18 February 2022 Woodside emailed DAWE to clarify information in its initial consultation email to confirm which infrastructure is proposed to be removed and that which is proposed to be left *in situ*.	No feedback received.	No feedback required.	
DoD	On 17 September 2021, Woodside emailed DoD advising of the proposed activity considering biosecurity matters (**Appendix F**, reference 1.6) and provided a Consultation Information Sheet and a Defence map.	On 18 October 2021, DoD emailed Woodside and provided the following advice: • Confirmation that WA-28-L was located within the North West Exercise Area (NWXA) and restricted airspace • Offshore infrastructure may impact Defence activities and that coordination between all stakeholders was needed to ensure competing needs were facilitated. • Required notifications. • Unexploded ordnance (UXO) may be present on and in the sea floor within the NWXA and that Woodside must	On 29 October 2021, Woodside emailed DoD and acknowledged DoD's advice on: • The location of the Operational Area with respect to the North West Exercise Area (NWXA) and restricted airspace. • Following procedures and restrictions relating to Notices to Mariners (NOTMAR) and Notices to Airmen (NOTAM). • The potential presence of unexploded ordinances. Woodside also acknowledged DoD's request to be notified five weeks prior	Woodside will undertake the following notifications to Defence and AHO: • Notify DoD at least five weeks prior to the scheduled activity commencement date (PS 1.4). • Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date (PS 1.1). • Given decommissioning activities occur within areas where previously activities have occurred, UXOs are not considered a credible risk.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
		inform itself as to the risks associated with conducting activities in the area. DoD further advised that: a) All activities in the area are conducted at its own risk; and b) The Commonwealth of Australia, represented by the Department of Defence, takes no responsibility for: i. reporting the location and type of UXO that may be in the areas; ii. identifying or removing any UXO from these areas; and iii. any loss or damage suffered or incurred by Woodside or any third party arising out of, or directly related to, UXO in the area. DoD made the following specific requests: • Woodside to notify DoD at least five weeks prior to the start of activities • Any activities undertaken within Restricted Airspace comply with relevant NOTAM restrictions. • If relevant, promulgate a NOTAM for temporary structures or establish a Danger Area for permanent structures. • Woodside to notify AHO at least four weeks prior to the start of activities.	to the start of activities and to notify the AHO four weeks prior to the start of activities.	Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
DISER	On 17 September 2021, Woodside emailed DISER 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.
DNP	On 17 September 2021, Woodside emailed DNP advising of the proposed activity considering potential risks to Australian marine Parks (**Appendix F**, reference 1.7), and provided a Consultation Information Sheet.	On 11 October 2021, DNP emailed Woodside and provided the following feedback: • DNP noted that proposed activities do not include the plug and abandonment of the former production wells and the removal of xmas trees and wellheads, which are being managed under a separate Environment Plan. • DNP confirmed that proposed activities do not overlap an Australian Marie Park but were located near the Ningaloo Marine Park and Gascoyne Marine Park, and activities undertaken may affect the values present in these Marine Parks. • DNP provided a list of KEFs that are present near the title area, and which are also identified as values of the Gascoyne and Ningaloo marine parks. • DNP also provided a list of BIAs are present or nearby to the operational area, and which are also identified as values of the Gascoyne and Ningaloo marine parks.	On 18 October 2021, Woodside emailed DNP and provided the following response: • The infrastructure (drag anchors, mooring lines and manifold foundations) and the Operational Area are outside the boundary of any AMPs. • The closest AMPs are the Gascoyne Marine Park Multiple Use Zone and Ningaloo Marine Park Recreational Use Zone, located approximately 16 km south of the Operational Area. • Two KEFs are present in the Operational Area and no impacts on marine parks or impacts that may affect these KEFs have been identified from leaving the infrastructure in situ.	Woodside will ensure DNP is made aware of any incidences within a marine park for the activity, 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.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
		• DNP made the following specific requests in order to identify any claims or objections about the proposed activity: • Provision of the safety and environmental assessment across short, medium and long-term horizons relating to the drag anchors and mooring lines which are proposed to be left in-situ. • Provision of the environmental assessment and identification of risks of the manifold foundations being cut above the mudline if complete removal is not feasible. • Provision of advice if Woodside is engaging the Gnulli people, who have responsibilities for sea country in the Gascoyne Marine Park as cultural values may be present. • DNP advised that a Sea Dumping permit may be required and that, if relevant, engagement would be required with DAWE. • DNP also requested Woodside to undertake activities with the utmost care and avoidance of unplanned impacts upon the environment now and into the future. • DNP provided links to the following resources to support the development of the EP, including: • NOPSEMA Guidance Note N-04750-GN1785 A620236	• Three BIAs are also present in the Operational Area and no impacts on marine parks or impacts that may affect these BIAs have been identified from leaving the infrastructure in situ. • Woodside has considered the environmental impacts and risks associated with both removal and in situ decommissioning options across short, medium and long term horizons. All impacts and risks from the proposed activity have been assessed as acceptable and ALARP in the EP. • The impact and risk assessment found the activity will not result in any impacts to the values of any AMPs, including any associated KEFs and BIAs, given the nature of impacts and distances to nearest AMPs. As such, the EP recommends leaving the drag anchors and mooring lines in situ, and leaving the manifold foundations in situ if removal is not technically feasible. Woodside also confirmed it had consulted the Yamatji Marlpa Aboriginal Corporation and the Department of Agriculture, Water and the Environment as the responsible Department for implementing Commonwealth policies and programs to support agriculture,	

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
		• North-west Marine Parks Network Management Plan 2018 • Australian Marine Parks Science Atlas DNP also communicated its expectation for consultation in the event of oil/gas pollution incidences that occur within a marine park or are likely to impact on a marine park.	water resources, the environment and heritage.	
		On 28 October 2021, DNP emailed Woodside thanking Woodside for its response and confirmed it had no objections or claims. DNP reiterated previous advice on sea dumping contacts, guidance information and emergency responses remained in place.	On 29 October 2021, Woodside emailed DNP noting its feedback.	
WA Government				
DBCA	On 17 September 2021, Woodside emailed DBCA advising of the proposed activity (**Appendix F**, reference 1.1) and provided a Consultation Information Sheet.	On 15 October 2021, DBCA emailed Woodside and advised it had previously provided comment in relation to petroleum production activities in proximity to ecologically sensitive receptors including marine parks and other reserves managed by DBCA under the CALM Act. In particular, DBCA noted need for comprehensive baseline monitoring of these receptors and oil spill response preparedness given activity proximity to the Ningaloo Marine Park and Muiron Islands Marine Management Area. DBCA welcomed any additional information in relation to Woodside's monitoring or oil spill response preparedness for the proposed decommissioning activities.	On 5 November 2021, Woodside emailed DBCA and confirmed: • Acknowledgement of DBCA's feedback for previously consulted petroleum activities and that the sensitive receptors relevant to Ningaloo Marine Park, Muiron Islands Nature Reserve and Marine Management Area had been considered in the EP against planned activities.	Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
		DBCA advised that that any activities requiring access to reserves managed by DBCA under the CALM Act or requiring the taking / disturbance of threatened fauna listed under the BC Act in State waters may require additional approvals under this legislation, and early consultation with DBCA was recommended.	• Woodside's Environment Plans (EPs) describe the existing environment that may be affected by the activity during planned and unplanned activities, including the particular values and sensitivities of the environment within and in proximity to operational areas and the Environment that maybe affected (EMBA) for impact assessment and risk evaluation. • Woodside maintains knowledge and an understanding of areas of ecological importance within and adjacent to operational areas (areas where activities are conducted primarily on the North-west Shelf). • An Oil Pollution Emergency Plan (OPEP) will be submitted as part of the EP for assessment by NOPSEMA, including an activity specific Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) and First Strike Plan.	
DMIRS	On 17 September 2021, Woodside emailed DMIRS advising of the proposed activity (**Appendix F**, reference 1.1) and provided a Consultation Information Sheet.	On 21 October 2021, DMIRS emailed Woodside acknowledging receipt of its consultation advice and advised it did not require any further information. DMIRS requested pre-start notification confirming the start date of the proposed activity and a cessation notification to inform DMIRS upon completion of the activity.	On 29 October 2021, Woodside emailed DMIRS confirming it would provide pre-start and cessation of activity notifications. Woodside also acknowledged DMIRS' consultation expectations in the event of an incident that could potentially impact on any land or water under State jurisdiction.	Woodside will undertake the following notifications to DMIRS (**Section 7.8.2.1** in this EP): • Notify DMIRS at least ten days before the activity commences, and within ten days of completing the activity

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
		It also provides information for reporting requirements for incidents that could potentially impact on any land or water under State jurisdiction.		• Woodside will ensure DMIRS is made aware of any reportable incidents (**Section 7.8.4**). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
DPIRD	On 17 September 2021, Woodside emailed DPIRD advising of the proposed activity (**Appendix F**, reference 1.8) and provided a Consultation Information Sheet and a fisheries map.	No feedback received.	No response required.	Woodside has assessed the relevancy of State fisheries issues in **Section 4.9.2** of this EP, and will notify DPIRD prior to commencement and upon completion of activities (PS 1.2). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
DoT	On 17 September 2021, Woodside emailed the DoT advising of the proposed activity (**Appendix F**, reference 1.9) and provided a Consultation Information Sheet.	On 17 September 2021, DoT emailed Woodside acknowledging receipt of its consultation email.	No response required. Woodside to provide the Oil Pollution First Strike Plan to AMSA.	Woodside has addressed oil pollution planning and response at **Appendix D.** Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
		On 29 September 2021, DoT emailed Woodside requesting to be consulted in line with its Guidance Note if there a risk of a spill impacting State waters from the proposed activities.	No response required. Woodside to provide the Oil Pollution First Strike Plan to AMSA.	

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 22 October 2021, Woodside emailed DOT and provided a copy of the Enfield Decommissioning Oil Pollution First Strike Plan.	On 29 October 2021, DoT emailed Woodside advising it would respond if it had any queries.	No response required.	
		On 19 November 2021, DoT emailed Woodside advising it had no comments on the provided First Strike Plan.	No response required.	
Commonwealth managed fisheries*				
Western Deepwater Trawl Fishery	On 14 November 2021, Woodside emailed licence holders (**Appendix F** reference 1.27) following assessment of ABARES statistical data released in October 2021 for Commonwealth managed fisheries. Licence holders were provided a Consultation Information Sheet and a fisheries map **Appendix F**	No feedback received.	No response required.	Woodside has assessed the relevancy of fisheries issues in **Section 4.9.2** of this EP, and will notify Western Deepwater Trawl licence holders prior to commencement and upon completion of activities **(PS 1.2).** Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 6 December 2021, Woodside emailed Western Deepwater Trawl Fishery licence holders to remind them of the closing date for consultation period (15 December 2021) and to request feedback on the information provided.	No feedback received.	No feedback received.	
	On 18 February 2022, Woodside emailed Western Deepwater Trawl Fishery licence holders to clarify information in its initial consultation email to confirm which infrastructure is proposed to be removed and that which is proposed to be left *in situ*.	No feedback received.	No feedback required.	
WA managed fisheries*				
Pilbara Line Fishery	On 17 September 2021, Woodside emailed Pilbara Line Fishery licence holders advising of the proposed activity (**Appendix F**, reference 1.10) and provided a Consultation	No feedback received.	No response required.	Woodside has assessed the relevancy of fisheries issues in **Section 4.9.2** of this EP, and will notify Pilbara Line Fishery licence holders prior to commencement and upon completion of activities **(PS 1.2)**. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	Information Sheet and a fishery map.			
	On 6 December 2021, Woodside emailed Pilbara Line Fishery licence holders to remind them of the closing date for consultation period (15 December 2021) and to request feedback on the information provided.	No feedback received.	No feedback received.	
Industry				
BHP	On 17 September 2021, Woodside emailed BHP advising of the proposed activity **Appendix F**, reference 1.11) and provided a Consultation Information Sheet and an adjacent titleholder map.	On 21 September 2021, BHP emailed Woodside acknowledging its consultation advice and advised it had no comments on the proposed activities.	No response required.	Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
Santos	On 17 September 2021, Woodside emailed Santos advising of the proposed activity (**Appendix F**, reference 1.11) and provided a Consultation Information Sheet and an adjacent 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.
Industry representative organisations				
APPEA	On 17 September 2021, 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.
ASBTIA	On 17 September 2021, Woodside emailed ASBTIA advising of the proposed activity (**Appendix F**, reference 1.13) and provided a Consultation Information Sheet and fishery 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.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
CFA	On 17 September 2021, Woodside emailed the representative organisation of the fishery – CFA – advising of the proposed activity (**Appendix F**, reference 1.13) and provided a Consultation Information Sheet and fisheries maps.	No feedback received.	No response required.	Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 4.9.2** of this EP, and will notify CFA prior to commencement and upon completion of activities (PS 1.2). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 14 November 2021, Woodside emailed an update to CFA (**Appendix** F, reference 1.13.1) following assessment of ABARES statistical data released in October 2021 for Commonwealth managed fisheries.	No feedback received.	No response required.	
	On 6 December 2021, Woodside emailed CFA to remind them of the closing date for consultation period (15 December 2021) and to request feedback on the information provided.	No feedback received.	No feedback received.	

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 18 February 2022, Woodside emailed CFA to clarify information in its initial consultation email to confirm which infrastructure is proposed to be removed and that which is proposed to be left *in situ*.	No feedback received.	No feedback required.	
Marine Tourism WA	On 24 September 2021, Woodside emailed Marine Tourism WA advising of the proposed activity (**Appendix F**, reference 1.11) 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.
PPA	On 17 September 2021, Woodside emailed PPA advising of the proposed activity (**Appendix F,** reference 1.14) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has assessed the relevancy of fisheries issues in **Section 4.9.2**. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 15 November 2021, Woodside emailed an update to PPA (**Appendix F**, reference 1.14.1) following assessment of ABARES statistical data released in October 2021 for Commonwealth managed fisheries.	No feedback received.	No response required.	
	On 6 December 2021, Woodside emailed PPA to remind them of the closing date for consultation period (15 December 2021) and to request feedback on the information provided.	No feedback received.	No feedback received.	
Recfishwest	On 24 September 2021, Woodside emailed Recfishwest advising of the proposed activity (**Appendix F**, reference 1.1) and provided a Consultation Information Sheet and a fisheries 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.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
Tuna Australia	On 17 September 2021, Woodside emailed Tuna Australia advising of the proposed activity (**Appendix F**, reference 1.12) and provided a Consultation Information Sheet and fishery 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 23 September 2021, Woodside sent a follow up email to Tuna Australia following advice that there had been a change to the organisation's principal contact point.	No feedback received.	No response required.	
WAFIC	On 17 September 2021, Woodside emailed WAFIC advising of the proposed activity (**Appendix F**, reference 1.15) and provided a Consultation Information Sheet and fishery map.	On 19 October 2021, WAFIC emailed Woodside and advised it supported the approach to remove the infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals. WAFIC sought additional information on whether sheet drag anchors and mooring lines proposed to be left in situ below the mudline will over time be exposed above the seabed and become a snag risk. WAFIC acknowledged that while the area was not currently in a trawlable area, this position may change in the future.	On 5 November 2021, Woodside emailed WAFIC and confirmed: • Acknowledgement of WAFIC's support for the removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals. • As a general principal for decommissioning activities, Woodside considers the potential for future change to fisheries management arrangements and assesses any risk posed to future trawl fishers in its EPs.	Woodside has assessed the relevancy of fisheries issues in **Section 4.9.2** of this EP, and will notify WAFIC prior to commencement and upon completion of activities (PS 1.2). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
			• Infrastructure will continue to be marked on navigational charts should any infrastructure left in-situ present a credible snag risk for current or future trawl fishers, • Much of the Enfield former production equipment was already marked on navigational charts and Woodside will provide advice to the Australian Hydrographic Office upon the completion of decommissioning activities of any required changes to current charts.	
		On 23 December 2021, WAFIC emailed to thank Woodside for its response on 5 November and advised it had no further comments on the EP at this stage.	No response required.	
	On 14 November 2021, Woodside emailed an update to WAFIC following assessment of ABARES data released in October 2021 for Commonwealth managed fisheries.	On 23 December 2021, WAFIC emailed separately to thank Woodside for its update on 14 November regarding relevant fisheries to the activity.	No response required.	

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 18 February 2022 Woodside emailed WAFIC to clarify information in its initial consultation email to confirm which infrastructure is proposed to be removed and that which is proposed to be left *in situ*.	No feedback received.	No feedback required.	
WA Game Fishing Association	On 24 September 2021, Woodside emailed the WA Game Fishing Association 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.
Other stakeholders				
Exmouth-based charter boat, tourism and dive operators	On 17 September 2021, Woodside emailed Exmouth-based charter boat, tourism and dive operators advising of the proposed activity (**Appendix F**, reference 1.16) 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.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
CCG	On 17 September 2021, Woodside emailed the CCG advising of the proposed activity (**Appendix F**, reference 1.16) 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.
Protect Ningaloo	On 17 September 2021, Woodside emailed Protect Ningaloo advising of the proposed activity (**Appendix F**, reference 1.16) 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.
Exmouth Community Reference Group	On 17 September 2021, Woodside emailed Exmouth Community Reference Group advising of the proposed activity (**Appendix F**, reference 1.16) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside has consulted the Exmouth Community Reference Group individually and with an update provided to the Group in November 2021. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
	On 4 November 2021, Woodside presented to the Exmouth Community Reference Group on planned decommissioning activities for the Enfield Field (**Appendix F**, reference 1.26).	No feedback received.	No response required.	
Exmouth Game Fishing Club	On 17 September 2021, Woodside emailed Exmouth Game Fishing Club advising of the proposed activity (**Appendix F**, reference 1.16) 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.
ECCI	On 17 September 2021, Woodside emailed ECCI advising of the proposed activity (**Appendix F**, reference 1.16) 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.

Stakeholder	Information provided	Stakeholder response	Woodside response	Woodside assessment and outcome
Shire of Exmouth	On 17 September 2021, Woodside emailed Shire of Exmouth advising of the proposed activity (**Appendix F**, reference 1.16) 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.
Ningaloo Coast World Heritage Advisory Committee	On 17 September 2021, Woodside emailed Ningaloo Coast World Heritage Advisory Committee advising of the proposed activity (**Appendix F**, reference 1.16) 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.
Nganhurra Thanardi Garrbu Aboriginal Corporation	On 17 September 2021, Woodside emailed Nganhurra Thanardi Garrbu Aboriginal Corporation, via their nominated representative YMAC, advising of the proposed activity (**Appendix F**, reference 1.17) 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.

5.5 Ongoing Stakeholder Consultation

Woodside is committed to the engagements listed in **Table 5-2**, based on stakeholder feedback.

Table 5-3: Ongoing stakeholder consultation

Stakeholder	Activity
AHO	Woodside will notify the AHO no less than 4 weeks before operations commence and provide updates to AHO on any changes to planned activities (PS 1.1).
AMSA	Woodside will notify AMSA's JRCC at least 24-48 hours before operations commence, the start and end of operations and provide updates to AMSA on any changes in timing to planned activities (PS 1.2).
DMIRS	Woodside will send DMIRS commencement and cessation notifications (**Section 7.8.2.1**).
DoT	Woodside will consult DoT if there is a spill impacting State waters from the proposed activity (**Appendix I**).
Relevant fishery stakeholders	Woodside will send relevant fisher stakeholders commencement and cessation of activity notifications, including AFMA, DAWE, DPIRD, WAFIC, PPA, CFA, ASBTIA and relevant Fishery Licence Holders (Pilbara Line Fishery and Western Deepwater Trawl Fishery) (PS 1.4).
DNP	Woodside will ensure DNP is made aware of any incidences within a marine park for the activity, as per the commitment in the Oil Pollution First Strike Plan (**Appendix H**).

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

6.1 Overview

This section presents the impact and risk analysis and evaluation, EPOs, EPSs and MC for the Petroleum Activities Program, using the methodology described in **Section 2** of this EP.

6.2 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 impacts and risks associated with the Petroleum Activities Program are reduced to ALARP, are of an acceptable level and consider all operations of the activity, including potential emergency conditions. The impact assessment for planned activities has been based on the size of the Operational Area.

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

- Planned activities (routine and non-routine) that have the potential for inherent environmental impacts.
- Unplanned events (accidents, incidents or emergency situations) with an environmental consequence, termed risks.

Within these categories, impact and risk assessment groupings are based on stressor type, e.g. emissions, physical presence, etc. In all cases, the worst credible consequence was assumed.

The ENVID (performed in accordance with the methodology described in Section 2) identified seven impacts and seven risks associated with the Petroleum Activities Program. Planned activities and unplanned events are summarised in **Table 6-1**.

The impact and risk analysis and evaluation for the Petroleum Activities Program indicate that all the current environmental impacts and risks associated with the activity are reduced to ALARP and are of an acceptable level, as discussed further in **Sections 6.7.2** and **6.9**.

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: Interaction with other users	**6.8.1**	F	Social and Cultural – No lasting effect (less than one month) to a community or areas/items of cultural significance	-	-	Broadly acceptable
Physical presence: Seabed disturbance	**6.8.2**	E	Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	-	-	Broadly acceptable
Routine and non-routine discharges: Project vessels	**6.8.3**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine and non-routine discharges: Infrastructure removal activities	**6.8.4**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine and non-routine acoustic emissions	**6.8.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Routine and non-routine atmospheric emissions	**6.8.6**	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	**6.8.7**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	-	-	Broadly acceptable
Unplanned Activities (Accidents, Incidents, Emergency Situations)						
Unplanned hydrocarbon release: Vessel collision	**6.9.2**	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

Aspect	EP Section	Risk Rating				Acceptability of Impact/Risk
		Impact/Consequence	Potential Impact/Consequence Level	Likelihood	Current Risk Rating	
Unplanned hydrocarbon release: Bunkering	**6.9.3**	E	Environment – Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	2	M	Broadly acceptable
Unplanned discharges: Deck and subsea spills	**6.9.4**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	2	L	Broadly acceptable
Planned and unplanned discharges: Loss of solid hazardous and non-hazardous wastes	**6.9.5**	F	Environment – No lasting effect (less than one month); localised impact not significant to environmental receptors (e.g. water quality).	2	L	Broadly acceptable
		E	Social and Cultural – Slight, short-term impact (less than one year) to a community or areas/items of cultural significance	-	-	Broadly acceptable
Physical presence: Vessel collision with marine fauna	**6.9.6**	E	Environment – Slight, short term local impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	1	L	Broadly acceptable
Physical presence: Dropped object resulting in seabed disturbance	**6.9.7**	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 of invasive marine species	**6.9.8**	D	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

6.3 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.

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 **Section 2.7.2**, 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)**.

6.4 Presentation

The environmental impact and risk 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)*													
Description of the Activity – Regulation 13(1)	*Description of the Environment – Regulations 13(2)(3)*						*Consultation – Regulation 11A*						
Impact and Risk Evaluation Summary *Summary of ENVID outcomes*													
Source of Risk *Regulation 13(1)*	***Environmental Value Potentially Impacted*** *Regulations 13(2)(3)*						***Evaluation*** *Section 0*						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***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) and 13(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 Used - Section 2.8.1				
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.*
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** and **Section 2.8** taking into account internal and external expectations, risk/impact to environmental thresholds and use of environment decision principles. Regulation 10A(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).*

[3] Qualitative measure

[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 2.7**).

6.5 Cumulative Impacts

There are operating FPSOs in the region of the Operational Area (**Section 4.9.6**). The Ngujima-Yin FPSO is the closest and is located approximately 5 km from the boundary of the Operational Area. Cumulative impacts from these facilities such as routine and non-routine discharges are therefore not expected.

Although not planned, there is a potential for SIMOPs to occur within the Operational Area for activities covered under this EP and well P&A, covered under the Enfield Plug and Abandonment EP as outlined in **Section 1.10.1.1** and **Section 3.8**. Timing of activities is subject to a number of factors including requirements under a NOPSEMA General Direction (**Table 1-4**), vessel availability and weather constraints.

The two activities occurring simultaneously is considered highly unlikely. A maximum of five vessels including one MODU may be present in the Operational Area at one time. Cumulative impacts and risks have been assessed in this EP where relevant, for example routine light emissions (**Section 6.8.7**) and acoustic emissions (**Section 6.8.5**).Woodside will implement a SIMOPs management plan to identify and manage any cumulative impacts and risks appropriately.

6.6 Indirect Impacts Outside of the Operational Area

The potential indirect environmental impacts and risks evaluated for the Petroleum Activities Program are those associated with onshore waste disposal from waste generated in the Operational Area. With consideration of the nature and scale of the potential indirect environmental impacts and risks, and the existing regulatory frameworks to manage them, relevant EPS, MC and EPOs demonstrating these indirect impacts/risks are managed to ALARP and acceptable levels are outlined in **Section 6.9.5**.

6.7 Environment Risks/Impacts not Deemed Credible or Outside the Scope of this EP

The ENVID identified sources of environmental risk/impact that were assessed as not being applicable (not credible), or outside the scope of this EP (refer **Section 2.5**). These are described in **Section 6.7.1** and **6.7.2**.

6.7.1 Shallow/Nearshore Activities

The Petroleum Activities Program is located in water depths greater than about 400 m and at a distance about 35 km from the nearest landfall (North West Cape). Consequently, risks associated with shallow/near shore activities such as vessel anchoring and risks of grounding were assessed as not credible.

6.7.2 Damage to Suspended Subsea Well from Dropped Objects Resulting in a Hydrocarbon Spill

During the Petroleum Activities Program there is potential for dropped objects, including during recovery of infrastructure. Impacts will be limited to within the Operational Area where there are 18 wells, which are currently suspended. The wells may be permanently plugged prior to subsea infrastructure removal activities. However, there is potential for some wells to still be in a suspended state or for P&A activities to be occurring concurrently to subsea decommissioning (**Section 6.5**). Should a dropped object result in damage to a suspended well, a hydrocarbon spill is possible, albeit highly unlikely.

The worst-case credible hydrocarbon release scenario from loss of well containment has been defined and assessed in the Enfield Plug and Abandonment EP (accepted by NOPSEMA on 14 October 2021). The EP provides a description and assessment of impacts and risks, as well as management controls and response capabilities. A hydrocarbon spill from loss of well containment is, therefore, not addressed further in this EP. Additional controls for prevention of dropped objects in proximity to wells with a current loss of containment risk as a result of the Enfield subsea infrastructure decommissioning Petroleum Activities Program are outlined in **Section 6.9.7**.

All infrastructure covered under this EP is free from all but residual hydrocarbons, and the subsea system is positively isolated from the Xmas trees with blind seal plates installed between each Xmas tree and rigid well tie-in spool (**Section 3.6**). As such, disconnection and recovery of the subsea infrastructure (including spools) will not result in a loss of containment from any associated well if activities are completed before the well has been P&A.

6.8 Planned Activities (Routine and Non-routine)

6.8.1 Physical Presence: Interaction with Other Marine Users

Context		
Project Vessels – **Section 3.7** Helicopters – **Section 3.10.3** Removal and Recovery of Infrastructure **– Section 3.12.4**	Socio-economic and Cultural Environment – **Section 4.9**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence / Impact***	***Likelihood***	***Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Interaction with other users – proximity of project vessels causing interference with or displacement to third party vessels (commercial fishing and commercial shipping)						X	A	F	-	-	GP PJ	Broadly acceptable	EPO 1 & 2
Contingency permanent continued (partial) presence of manifold foundation suction piles if removal at the mudline cannot be achieved.						X	A	F	-	-			

Description of Source of Impact

Presence of Project Vessels

The Petroleum Activities Program will require a number of vessels to be present in the Operational Area during decommissioning activities as summarised in **Table 3-6**. Preparation and removal of subsea infrastructure is expected to be conducted over a period of up to 12 months between 2022 and 2024. When ongoing, activities will be 24 hours per day, seven days per week. A 500 m exclusion zone (temporary) will be in place around the offshore support vessels during removal and recovery activities to manage vessel movements.

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

Continued Presence of Subsea Infrastructure

Contingency - If any of the four manifold foundation suction piles are unable to be removed completely by reverse installation, they will be cut up as close to the mudline as possible using a diamond wire saw, the cut section removed and the remaining left *in situ* permanently.

The anchors and chain are expected to remain buried. They're estimated to be embedded approximately 8.1 m at anchor fluke tip and 0.35 m at their shallowest point in relation to the seabed. Scouring is not predicted to occur based on scour analysis conducted using the available geotechnical and metocean data, which predicts the anchors will remain buried.

Impact Assessment
Potential impacts to environmental values

Displacement or Interference with Commercial Fishing Activities

The Operational Area overlaps five Commonwealth and seven State managed fisheries (**Section 4.9.2**). However, only the State-managed Pilbara Line Fishery (PLF) and the Commonwealth managed Western Deepwater Trawl Fishery (WDTF) are considered to be recently active in the vicinity of the Operational Area (**Section 4.9.2** and **Section 5.5**).

The Operational Area sits on the border of two CAES blocks for the PLF, one of which has consistently reported effort every year since 2009 (**Section 4.9.2**). It is mostly likely that the PLF targets waters to the east of the Operational Area towards the Pilbara coast and Montebello Islands; however, there is a possibility that interactions with the fishery will occur within the Operational Area.

The Operational Area overlaps an area of fishing effort off the North West Cape reporting activity from the 2017/2018 and 2019/2020 seasons (**Section 4.9.2**). Fishing effort is low, with only three vessels present in 2017/2018 and one in 2019/2020 (Patterson et al., 2019, 2021). Reports indicate the WDTF is localised in offshore waters, slightly south of Shark Bay, however it is possible that interactions may occur with the fishery within the Operational Area.

During decommissioning activities, vessels in the Operational Area may restrict the use of the area by WDTF and PLF licence holders, and any other commercial fisheries that have been identified as having potential (but are unlikely) to use the Operational Area. Use will particularly be restricted by the 500 m exclusion zone (temporary) that will be established around the offshore support vessels when undertaking activities. However, because vessels will be in the area for short periods over a defined amount of time, and because the fisheries' areas extend beyond the Operational Area, impacts during decommissioning activities will be negligible with no lasting effect.

Disturbance to commercial fisheries is not expected from the ten embedded anchors and associated mooring lines, given both are buried below the mudline.

In the event the manifold foundation suction piles are unable to be fully removed by reverse installation (preferred option), the piles will be cut as close to the mudline as possible. The long-term presence of sections of piles (up to 1 m above the mudline) left *in situ* may pose a potential snag hazard for commercial trawl fisheries. However, it is unlikely to displace or cause a risk to commercial fisheries given the water depths where the infrastructure is located (~400-600 m) and the variability and low fishing effort reported by the WDTF across the fishery. Future interactions with the fisheries and infrastructure left *in situ* are not expected given the distribution of effort from both WDTF and PLF, the fishing methods utilised by PLF (i.e. line fishing restricted to the upper portion of the water column), and the locations of remaining infrastructure above the mudline being provided to the AHO for marking on charts. Impacts to commercial fishing activities if any sections of piles remain *in situ* permanently are therefore expected to be negligible.

No concerns were raised through consultation with licence holders or fishing representative and regulatory bodies including AFMA, DAWE, DPIRD, CFA, PPA, and WAFIC on the activities covered under this EP (**Section 5**).

Displacement of Recreational Fishing

Recreational fishing is unlikely to occur in the Operational Area due to its water depth and distance from shore. Stakeholder consultation did not identify any recreational activities that could be impacted by the activity (**Section 5**). Recreational fishing in the region is concentrated around the coastal waters and islands of the NWMR, such as the Montebello Islands (about 150 km north-east from the Operational Area). Given this, no impacts to recreational fishers are expected.

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 temporary exclusion zone (500 m radius) that would be in place around offshore support vessels while conducting recover and removal activities.

Displacement to Commercial Shipping

The presence of the project vessels could potentially cause temporary disruption to commercial shipping. Shipping in the area is mainly related to the resources industry and the nearest fairway is approximately 40 km north-west of the Operational Area. The potential impacts associated with the Petroleum Activities Program may include displacement of vessels as they make slight course alterations to avoid the subsea support vessel(s). Stakeholder consultation did not identify any concerns for impacts to commercial shipping (**Section 5**). Therefore, impacts are expected to be negligible with no lasting effect.

Interference with Existing Oil and Gas Infrastructure

Interactions with operators of other nearby facilities have the potential to occur, including the Ngujima Yin FPSO, Ningaloo Vision FPSO and the Pyrenees Venture FPSO which are 5 km, 8 km and 9 km north-east of the Operational Area, respectively. This would mainly be as a result of project-based vessel movements to and from the Operational Area not covered within this EP. Stakeholder consultation did not identify any concerns for impacts to other operators in proximity to the Operational Area (**Section 5**). **Section 6.5** outlines potential for cumulative impacts from SIMOPs with other Woodside decommissioning activities within WA-28-L.

Cumulative Impacts

There is a potential for SIMOPs to occur with activities covered under this EP and other Woodside decommissioning activities within WA-28-L as described in **Section 6.5**. A maximum of up to four vessels and a MODU may be present

in the Operational Area at one time should SIMOPs occur with well P&A (covered under separate EP). While it is unlikely that the two activities would overlap, cumulative impacts to other marine users have the potential to occur due to an increased chance of interaction. Activities would be managed under a SIMOPs management plan and any impacts are expected to be short term localised displacement of users from the Operational Area with no lasting effect.
Summary of potential impacts to environmental values
Given the adopted controls, it is considered that the physical presence of project vessels and possible continued presence of a portion of the manifold foundation suction piles will not result in a potential impact greater than negligible, temporary and localised displacement of shipping, commercial/recreational fishing and oil and gas interests with no lasting effect.

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)**[5]	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Legislation, Codes and Standards				
Compliance with the Environmental Protection (Sea Dumping) Act 1981	F: Yes CS: Minimal to moderate cost. Standard practice.	Legislative requirement.	Control based on legislative requirements – must be adopted.	Yes **C 2.1**
Good Practice				
Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date.	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)).	Control is Standard Practice.	Yes **C 1.1**
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/sacrifice. Control is also Standard Practice.	Yes **C 1.2**
Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities and movements 24–48 hours 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/sacrifice. Control is also Standard Practice.	Yes **C 1.3**
Notify DoD at least five weeks prior to the scheduled activity commencement date	F: Yes CS: Minimal cost. Standard practice	Notification was requested by DoD during consultation. Communicating the Petroleum Activities Program to other	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes **C 1.4**

[5] Qualitative measure

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[5]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
		marine users ensures they are informed and aware, thereby reducing the likelihood of interfering with other marine users.		
Notify relevant stakeholders for activities within the Petroleum Activities Program that commence more than a year after EP acceptance.	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 1.5**
Re-notify AHO and AMSA 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.	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.	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/sacrifice.	Yes **C 1.7**
Where suction piles cannot be fully removed, and a remaining portion above the mudline may present a credible risk to future trawl fishers, notify AHO of pile locations so they can continue to be marked on navigational charts.	F: Yes CS: Minimal cost. Standard practice.	Communication to AHO provides an opportunity for the exact location of the infrastructure to continue to be marked on navigational charts, giving potential future trawl fishers sufficient information to plan activities around the infrastructure.	Benefits outweigh cost/sacrifice.	Yes. **C 2.2**
Professional Judgement – Eliminate				
Remove all infrastructure (other than suction piles) above the mudline.	F: Yes. CS: Moderate cost.	Removal of infrastructure eliminates any potential interactions with commercial fishers.	Benefits outweigh cost/sacrifice.	Yes **C 2.3**
If cutting of the manifold foundation suction piles is required using a diamond wire saw, dredge sediments	F: No. In order to use the diamond wire saw, the seabed would	Not considered – control not feasible	Not considered – control not feasible	No

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[5]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
surrounding the piles to allow cut at or below the seabed.	need to be lowered and be flat to accommodate the foundation of the saw. Technically not feasible to dredge the seabed flat around the pile with existing dredging equipment. CS: Not considered – control not feasible			
Unbury and remove anchors and mooring lines from below mudline.	F: Yes. CS: Anchors and mooring lines to be left *in situ* are buried below the mudline and would result in considerable seabed disturbance to remove.	Anchors and mooring lines are buried below the mudline and will not interfere with other marine users. Feasibility evaluated in **Table 3-12.**	Disproportionate. Cost/sacrifice outweighs benefit to be gained.	No
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls identified.				
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of the presence of project vessels and continued presence of infrastructure *in situ* on other users, such as commercial fisheries, recreational fishing, oil and gas operators, and shipping. 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 impact assessment has determined that, given the adopted controls, the physical presence of project vessels during decommissioning activities may result in negligible, localised impacts with no lasting effect (<1 month) to commercial fishing, recreational fishing, shipping and oil and gas operators. The Petroleum Activities Program is may take up to twelve months to complete between 2022-2024, given the short duration of activities and no infrastructure above the mudline will remain (other than up to 1 m sections of piles, if full removal is unsuccessful), decommissioning activities are not expected to cause impact to other marine users. Should an external cut using a diamond wire saw be required, and a portion of infrastructure remains above the mudline presenting a potential credible snag risk to future trawl fishers, the impact is expected to be negligible and continuing to mark these wells on navigation charts will further minimise any impact. Cumulative impacts from concurrent campaigns and associated increase in project vessels are not expected to significantly increase area marine users may be displaced from, may reduce the duration they are displaced, and will be managed through a SIMOPs management plan. The adopted controls are considered consistent with industry good practice and professional judgement and meet the requirements and expectations of AMSA, DPIRD, AHO, and other relevant stakeholders identified during impact assessment and consulted as part of stakeholder engagement. On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in **Section 2.8.1**, this is considered an acceptable level of impact.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 1 Marine users aware of the Petroleum Activities Program.	**C 1.1** Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date.	**PS 1.1** AHO notified of activities and movements to allow generation of navigation warnings (MSIN and NTM [including AUSCOAST warnings where relevant])	**MC 1.1.1** Consultation records demonstrate that AHO has been notified prior to commencement of an activity to allow generation of navigation warnings (MSIN and NTM [including AUSCOAST warnings where relevant]).
	C 1.2 Notify relevant government departments, fishing industry representative bodies and licence holders of activities prior to commencement and upon completion of activities.	**PS 1.2** AFMA, DAWE, DPIRD, CFA, WAFIC, and Pilbara Line and Western Deepwater Trawl licence holders notified prior to commencement and upon completion of activities.	**MC 1.2.1** Consultation records demonstrate that AFMA, DAWE, DPIRD, CFA, WAFIC, and Pilbara Line and Western Deepwater Trawl licence holders have been notified prior to commencement and upon completion of activities.
	C 1.3 Notify AMSA JRCC of activities 24–48 hours prior to undertaking activities within the Petroleum Activity Program.	**PS 1.3** Notification to AMSA JRCC 24-48 hours prior to the scheduled commencement date.	**MC 1.3.1** Consultation records demonstrate that AMSA JRCC has been notified prior to commencement of the activity within required timeframes.
	C 1.4 Notify DoD at least five weeks prior to the scheduled activity commencement date.	**PS 1.4** DoD notified at least five weeks prior to the scheduled activity commencement date.	**MC 1.4.1** Records demonstrate DoD has been notified prior to commencement of the activity within required timeframes.
	C 1.5 Notify relevant stakeholders of activities that commence more than a year after EP acceptance.	**PS 1.5** Relevant stakeholders will be notified of activities that commence more than a year after EP acceptance.	**MC 1.5.1** Records demonstrate relevant stakeholders have been notified of activities commencing more than a year after EP acceptance.
	C 1.6 Re-notify AHO and AMSA of any extended delays in the timing of the Petroleum Activities Program.	**PS 1.6** AHO and AMSA re-notified of any extended delay in the timing of the Petroleum Activities Program.	**MC 1.6.1** Consultation records demonstrate that AHO and AMSA were re-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	**PS 1.7**	**MC 1.7.1** Records demonstrate interactive map was provided and available to

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	updated information on activities being conducted as part of the Petroleum Activities Program.	Activity interactive map established and maintained throughout activities.	stakeholders throughout activities.
EPO 2 Prevent future adverse interactions with other marine users from infrastructure.	**C 2.1** Compliance with the Environmental Protection (Sea Dumping) Act 1981	**PS 2.1** Woodside continues to engage with DAWE regarding the application of the Environment Protection (Sea Dumping) Act 1981 and will comply with requirements under the Act.	**MC 2.1.1** Records demonstrate DAWE continues to be engaged on the application of the Environment Protection (Sea Dumping) Act 1981 relevant to the Petroleum Activities Program.
			MC 2.1.2 Application for a sea dumping permit, if required.
	C 2.2 Where suction piles cannot be fully removed, and a remaining portion above the mudline may present a credible risk to future trawl fishers, notify AHO of pile locations so they can continue to be marked on navigational charts.	**PS 2.2** AHO notified of locations of infrastructure remaining above the mudline, where it presents credible snag risk to future trawl fishers.	**MC 2.2.1** Records demonstrate that AHO has been notified of infrastructure remaining above the mudline, where it presents credible snag risk to future trawl fishers.
	C 2.3 Remove all infrastructure (other than manifold foundation suction piles) above the mudline.	**PS 2.3** Infrastructure above the mudline[6] will be removed prior to the end of 2024.	**MC 2.3.1** As-left survey demonstrates infrastructure above the mudline[5] has been removed.

[6] Should contingency diamond wire saw cutting method be required to remove manifold foundation suction piles, up to 1 m of infrastructure may be required to be left above the mudline.

6.8.2 Physical Presence: Seabed Disturbance

Context	
IMR activities **Section 3.11** Decommissioning Activities **Section 3.12** Remotely Operated Vehicles – **Section 3.10.2** Anchors and Mooring Lines – **Section 3.12.5** Removal and Recovery of Infrastructure – **Section 3.12.4**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5**

Impact Evaluation Summary

Source of Impact	*Environmental Value Potentially Impacted*						*Evaluation*						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence/Impact***	***Likelihood***	***Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Disturbance to seabed from IMR activities	X	X		X			A	F	-	-	LCS GP PJ	Broadly acceptable	EPO 3
Disturbance to seabed from subsea cleaning and preparation for infrastructure removal (marine growth removal and sediment relocation).	X	X		X			A	F	-	-			
Disturbance to seabed from cutting and removal of infrastructure.	X			X			A	E	-	-			
Loss of benthic habitat on infrastructure.				X			A	F	-	-			
Disturbance to seabed from contingency temporary wet parking infrastructure (including deploying mud mats, if required).	X			X			A	F	-	-			
Disturbance to seabed from ROV operations (including placement of ROV work basket on the seabed).	X			X			A	F	-	-			
Disturbance to seabed from deployment of transponders/ clump weights.	X			X			A	F	-	-			
Disturbance to seabed from leaving anchors *in situ* below the mudline.	X						A	F	-	-			
Contingency - presence of manifold foundation suction pile stub if full removal cannot be achieved.	X						A	F	-	-			

Description of Source of Impact
IMR Activities Routine visual inspection of subsea infrastructure undertaken using a support vessel and ROV (as required). IMR activities often require deployment frames or baskets to be temporarily placed on the seabed. These have a maximum footprint of approximately 15 m^2 and will be recovered at the end of the activity, therefore impact to the seabed will be negligible with no lasting effect (**Section 3.11**). ***Subsea Cleaning and Sediment Relocation*** Excess marine growth may need to be removed from subsea infrastructure using an ROV before performing decommissioning activities. Marine growth removal methods may use either brushes mounted to an ROV, water jetting, or acid (typically sulphamic acid) (refer to **Section 3.12.1.1**). Sediment build up around infrastructure may need to be relocated using a water jet or ROV-mounted suction pump. Subsea cleaning and sediment removal have the potential to result in localised seabed disturbance, sediment relocation and temporary increased turbidity. Residual cleaning debris and water on project vessels will be managed in line with routine vessel discharges approach. ***Cutting and removal of Infrastructure*** Localised seabed disturbance will occur when cutting and removing the following infrastructure: • cutting and recovery of spools • recovery of manifolds • recovery of mooring lines • recovery of flexible flowlines (including Uraduct (polyurethane) stabilisation), umbilicals and risers • reverse installation of manifold foundation suction piles, with contingency to cut above mudline and recover top section only • emptying and recovery of ~120stabilisation bags Cutting of infrastructure (piles, spools, mooring lines and potentially flexible flowlines) may be completed using a number of different tools (e.g. diamond wire saw, rotary saw, guillotine) which will result in small amounts of cuttings being generated that will be primarily composed of steel. Very small amounts of plastics cuttings would be generated as a result of cutting flexible flowlines (if required). If abrasive water jet cutting is required, grit and flocculant entrained in the high pressure water jet will be released to the seabed. Sand and aggregate will also be deposited on the seabed from stabilisation bags during recovery of the bags. Subsea infrastructure offers a hard substrate and subsequent attachment point for marine epibenthos growth in an environment typically characterised by soft sediments. Marine growth on the Enfield subsea infrastructure (as described in **Section 4.5**) will be removed with the infrastructure resulting in a loss of benthic habitat. See **Section 6.8.4** for description of potential discharges from removal of infrastructure. ***Contingency Temporary Wet Parking of Infrastructure*** Infrastructure may be temporarily wet parked on the seabed on mud mats prior to retrieval (within the timeframe of the activity campaign), resulting in an additional temporary seabed disturbance of up to 3.5 m by 3.5 m per mud mat near the location of each wellhead. Mud mats would be recovered following recovery of infrastructure. ***ROV Activities*** The use of an ROV may be required during various activities as described in **Section 3.10.2**. ROV operations may result in temporary seabed disturbance and suspension of sediments as a result of working close to, or occasionally on, the seabed, including placement of an ROV work basket on the seabed. However, ROV use 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, and a typical ROV work basket is 2 m by 2 m. ***Transponders / Clump Weights*** Transponders may be deployed to enable vessels to maintain position at the required location using dynamic positioning. The transponders are typically deployed in an array on the seabed, using clump weights comprising concrete. They will remain for the duration of infrastructure removal activities. The transponders and clump weights will be recovered at the end of activities, generally by ROV. ***Continued Presence of Subsea Infrastructure*** Ten anchors and approximately ~100 mooring line per anchor are proposed to be left *in situ*. The anchors and sections of mooring line to be left *in situ* are buried below the mudline, and consist of steel coated with epoxy paint (any sections of mooring line containing polypropylene are located above the mudline and will be cut and removed). Steel manifold foundation suction piles may also be cut above the mudline and left *in situ* if attempts at full removal are unsuccessful. Steel is predominantly iron (~98%) and may also include small amounts of carbon, manganese, chromium, silicon and phosphorus. The steel components will corrode and decompose *in situ* over time. The epoxy paint coating will also degrade over a very long timeframe at a very slow rate; pieces are likely to slowly erode and biotically degrade into small particles and be incorporated into the seabed. The epoxy paints, in their cured

form are inert to marine environment, however they can contain some metal components, including, zinc. As the paint breaks down, it will release at the very slow rate into the marine sediments immediately adjacent to the anchor.

Impact Assessment

Physical impacts to the seabed from the Petroleum Activities Program are expected to be for the most part confined to sediment-burrowing infauna associated with the soft sediment seabed and surface epifauna invertebrates, particularly filter feeders, inhabiting the infrastructure. Impacts are expected to be localised and mainly restricted to the footprint of the infrastructure and small areas around it. Impacts may occur from direct disturbance to the seabed or from elevated turbidity in the water column, which has the potential for slight and short-term impacts to deep-water biota through clogging of respiratory and feeding parts of filter-feeding organisms.

Benthic communities on the seabed within the footprint of the infrastructure consist of 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. Given the widespread representation of the infauna communities within the Operational Area and the broader NWMR, significant impacts to these communities are not expected. Impacts to infauna and epifauna associated with hard substrate could occur but would represent a small proportion of the wider representative biota.

Subsea Cleaning and Sediment Relocation

The use of water jetting to remove marine growth on the 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 perform cutting and removal of the infrastructure. Loss of benthic habitat from removal of marine growth is addressed below.

Sediment relocation will also result in elevated turbidity. 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 sparse distribution and low densities of benthic organisms at the water depths of the Operational Area.

Cutting and Removal of Infrastructure (Including Temporary Wet Parking)

The cutting and removal of subsea infrastructure, including the potential laydown of infrastructure and mud mats will affect a relatively small footprint of the seabed and lead to localised, temporary suspension of sediments. Seabed imprints left as a result of decommissioning activities may include shallow depressions and indentations from removed infrastructure (**Section 3.12.4**), which will subsequently act as depositional areas for suspended material in the area and infilling over time.

Cutting of infrastructure using a diamond wire saw will release small quantities of metal cuttings. Very small amounts of plastics cuttings would be generated as a result of cutting flexible flowlines (if required). Impacts of plastic ingestion vary based on taxon group and developmental stage (Foley et al., 2018; Beiras et al., 2018). Some bivalve species been found to expel microplastics, while polychaetes, for example, have proven to experience a variety of adverse effects from the addition of micro- or nano plastics into their environment (Wright et al. 2013). Given the small quantities and highly localised deposition of these cuttings, impacts to marine biota are expected to be slight.

If abrasive water jet cutting is required to cut infrastructure prior to removal, flocculant and grit will be also released to the seabed, causing localised smothering of benthic communities as well as creating localised and temporary increases in turbidity around the infrastructure. Similarly, material released from sand/aggregate bags during retrieval will result in localised deposition and potential smothering effects.

Given the length of time the subsea infrastructure has been in place on the seabed and the water depths of the Operational Area, it is expected that some level of marine growth exists (**Section 4.5**). Marine growth is likely comprised of species that are representative of the wider NWS region, including gorgonians, sponges, ascidians and bryozoans. Benthic habitat from the subsea infrastructure is likely to be of localised value but is not considered of significance in the context of the wider region. The consequence of removal is therefore considered slight.

ROV Activities

ROV activities near the seafloor (including deployment of a 2 m by 2 m ROV basket) may result in localised, short-term disturbance to the seabed from direct placement of the ROV basket and elevated turbidity from movement of the ROV. Impacts to environmental receptors are therefore expected to be slight, particularly given the low densities of benthic organisms at the water depths of the Operational Area.

Transponders / Clump Weights

Transponders deployed in an array on the seabed will result in localised, temporary disturbance to the seabed for the duration of infrastructure removal activities. Transponders and clump weights will be recovered at the end of the activity.

Continued Presence of Subsea Infrastructure

Ten anchors and ~100 m of mooring line per anchor are proposed to be left *in situ*, as described above. Manifold foundation suction piles may also be cut above the mudline and left *in situ* if attempts at full removal are unsuccessful. Localised scouring around the piles protruding from the seabed (approximately 1 m) may occur. Corrosion of the steel and erosion of the epoxy paint coating over time would result in the release of trace amounts of metals and

hydrocarbons, respectively, to the surrounding sediments. Any fragments of the epoxy paint that become separated from the steel are likely to remain in the immediate area and be incorporated into sediments. Due to the robustness of the materials involved, the degree of burial and the deep water location of the infrastructure, erosion and corrosion are likely to be relatively slow processes, approximately 0.025 mm/year and 0.06 mm/year (Wang, et al. 2005). Iron, the main constituent of steel, is not considered a significant contaminant in the marine environment (OSPAR PLONOR), is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997), and is an abundant element in marine sedimentary systems (Taylor and Macquaker, 2011). As the other constituents represent less than 1% of the steel composition, impacts to marine sediments, highly localised. Given the low toxicity of iron and slow release rate, it is likely that any impacts to marine sediments are going to be highly localised with no significant impact. The epoxy paints, in their cured form are inert to marine environment, however they can contain some metal components, including, zinc. It is possible that the zinc could be released into the sediment as the anchors breakdown, over time. Contaminants in sediments may be directly toxic to aquatic organisms or can be a source for bioaccumulation or biomagnification in the food chain, if above a certain threshold. The threshold for zinc in marine sediments is 200 mg/kg (dry weight). The expected quantity of zinc in the sediment is well below the lowest threshold value and therefore not considered to have an impact on the marine environment. ***KEFs*** The Operational Area overlaps one KEF: The Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF. The ecological values of the KEF are described in Section 9 of the Master Existing Environment, and include the potential for enhanced productivity due to upwelling, and increased connectivity between the continental shelf and the deep ocean. The Enfield Canyon hosts more diverse and abundant fish assemblages relative to the surrounding non-canyon habitat. The Operational Area overlaps a small proportion of the KEF and as such, the ecological functions and values of the KEF are not expected to be impacted by the Petroleum Activities Program. Based on the above assessment, seabed disturbance is unlikely to impact on the ecological value of the Operational Area and surrounding environment, including the Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF.
Summary of Potential Impacts to environmental values
Given the adopted controls, seabed disturbance from the Petroleum Activities Program will result in no greater than localised, slight and short-term impacts to benthic habitat and communities (i.e. Environment Impact – E).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[7]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Compliance with the Environmental Protection (Sea Dumping) Act 1981	F: Yes CS: Minimal to moderate cost. Standard practice.	Legislative requirement.	Control based on legislative requirements – must be adopted.	Yes **C 2.1**
Good Practice				
Recover transponders and clump weights at the end of infrastructure removal activities.	F: Yes CS: Minimal cost. Standard practice.	Elimination of ongoing risk of infrastructure remaining on the seafloor.	Benefits outweigh cost/sacrifice.	Yes **C 3.1**
Professional Judgement – Eliminate				

[7] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[7]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
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 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 considered – control not feasible	Not considered – control not feasible	Not considered – control not feasible	No
Do not wet park infrastructure prior to removal	F: Yes CS: Moderate.	Negligible reduction in the footprint on the sea floor.	Control grossly disproportionate. Reduced temporary seabed disturbance would result in negligible, therefore disproportionate, benefits associated with recovering infrastructure immediately after disconnection from the flow bases.	No
If cutting of the manifold foundation suction piles is required using a diamond wire saw, dredge sediments surrounding the piles to allow cut at or below the seabed	F: No. In order to use the diamond wire saw, the seabed would need to be lowered and be flat to accommodate the foundation of the saw. Technically not feasible to dredge the seabed flat around the pile with existing dredging equipment. CS: Not considered – control not feasible	Not considered – control not feasible	Not considered – control not feasible	No
Unbury and remove anchors and mooring lines from below mudline.	F: Yes. CS: Anchors and mooring lines to be left *in situ* are buried below the mudline and would result in considerable seabed disturbance to remove.	Anchors and mooring lines are buried below the mudline and will not interfere with other marine users.	Disproportionate. Cost/sacrifice outweighs benefit to be gained.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[7]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Do not cut flexible lines	F: No. Woodside intends to recover flexible lines via a Vertical Lay System (VLS). However, in case of complications, the option to cut flexibles into several pieces must be retained. CS: Not considered – control not feasible.	Negligible reduction in impact as plastic cuttings from cutting flexible lines will be of very small quantities with very limited, localised impacts to benthic biota.	Disproportionate. Cost/sacrifice outweighs benefit.	No
Do not cut and remove subsea infrastructure	F: Yes. However, infrastructure would remain *in situ* and would not meet Woodside's obligations under the General Direction from NOPSEMA (refer to **Table 1-4**) CS: none	Leaving subsea infrastructure *in situ* would avoid short-term release of fluids containing chemicals and residual hydrocarbons. However, as the equipment degrades over time, fluids eventually be released to the marine environment in the long term.	Grossly disproportionate.	No
Professional Judgement – Substitute				
None identified.				
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), Woodside considers the adopted controls appropriate to manage the impacts of disturbance to the seabed from subsea decommissioning activities. As no reasonable additional/alternative controls were identified that would further reduce the impacts without disproportionate sacrifice, the impacts and risks are considered ALARP.				
Demonstration of Acceptability				
Acceptability Statement The impact assessment has determined that, given the adopted controls, disturbance to the seabed from the Petroleum Activities Program will not result in a potential impact greater than slight and short-term disruption to a small area of the seabed, affecting a small proportion of the benthic population and no impact on critical habitat or activity. Further opportunities to reduce the impacts and risks have been investigated above. The adopted control is considered good oil-field practice/industry best practice and meets the requirements of Woodside's relevant systems and procedures. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of seabed disturbance to a level that is broadly acceptable.				

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 E[8] inside the Operational Area during the Petroleum Activities Program.	**C 2.1** Refer to **Section 6.8.1**	**PS 2.1** Refer to **Section 6.8.1**	**MC 2.1.1** Refer to **Section 6.8.1**
	C 3.1 Recover transponders and clump weights at the end of infrastructure removal activities.	**P 3.1** Seabed disturbance from clump weights and suction piles limited to that required for the duration of the Petroleum Activity.	**MC 3.1.1** Records demonstrate recovery of clump weights and suction piles from the seabed.

[8] Defined as 'Slight, short term local impact (<1 year), on species, habitat but not affecting ecosystem function, physical or biological attributes' (**Section 2.7.4**).

6.8.3 Routine and Non-routine Discharges: Project Vessels

Context		
Project Vessels – **Section 3.7**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5** Protected Species – **Section 4.6**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	*Environmental Value Potentially Impacted*						*Evaluation*						
	Marine Sediment	*Water Quality*	*Air Quality (incl Odour)*	*Ecosystems/ Habitat*	*Species*	*Socio-economic*	*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 support vessels		X			X		A	F	-	-	LCS PJ	Broadly acceptable	EPO 4
Routine discharge of deck and bilge water to marine environment from project support vessels		X			X		A	F	-	-			
Routine discharge of cooling water or brine to the marine environment from project vessels		X			X		A	F	-	-			

Description of Source of Impact

The project vessels routinely generate/discharge:

- **Sewage, greywater and putrescible waste:** Small volumes of treated sewage, grey water and putrescible wastes to the marine environment (impact assessment based on approximate discharge of 9 m³ per vessel per day), using an average volume of 75 L/person/day and a maximum of 120 persons on board. However, it is noted that vessels such as support vessels will have considerably less persons on board.
- **Bilge water:** Routine/periodic discharge of relatively small volumes of bilge water. Bilge tanks on project vessels receive fluids from many parts of the vessels. Bilge water can contain water, oil, detergents, solvents, chemicals, particles and other liquids or solids.
- **Deck drainage:** Variable water discharge from project vessel decks directly overboard or via deck drainage systems. Water sources could include rainfall events and/or from deck activities such as cleaning/wash-down of equipment/decks.
- **Brine and Cooling Water:** Cooling water from machinery engines or mud cooling units and brine water produced during the desalination process of reverse osmosis to produce potable water on board project vessels.

Environmental risk relating to the disposal/discharges above regulated levels or incorrect disposal/discharge of waste would be unplanned (non-routine/accidental) and are addressed in **Section 6.9.5**.

Impact Assessment

Potential impacts to environmental values

The main 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 monitored sewage discharges at its Torosa-4 Appraisal Drilling campaign which demonstrated that a 10 m^3 sewage discharge reduced to about 1% of its original concentration within 50 m of the discharge location. In addition to this, monitoring at distances of 50, 100 and 200 m downstream of the platform and at five different water depths confirmed that discharges were rapidly diluted and 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 Energy Limited, 2011). Mixing and dispersion would be further facilitated in deep offshore waters, consistent with the location of the Operational Area, through regional wind and large-scale current patterns resulting in the rapid mixing of surface and near surface waters where sewage discharges may occur. Studies investigating the effects of nutrient enrichment from offshore sewage discharges indicate that the influence of nutrients in open marine areas is much less significant than that experienced in enclosed areas (McIntyre and Johnston, 1975). Furthermore, open marine waters do not typically support areas of increased ecological sensitivity, due to the lack of nutrients in the upper water column and lack of light penetration at depth. Therefore, presence of receptors, such as fish, reptiles, birds and cetaceans, in significant numbers within the Operational Area is unlikely. Research also 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. Additional discharges outlined, which may include other non-organic contaminants (e.g. bilge water), will be rapidly diluted through the same mechanisms as above and are expected to be in very small quantities and concentrations as to not pose any significant risk to any relevant receptors. As such, no significant impacts from the planned (routine and non-routine) discharges that are listed above 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 Operational Area is more than 12 nm from land, which exceeds the 12 nm exclusion zones required under relevant Marine Orders. Routine and non-routine discharges are expected to be intermittent in nature for the duration of the Petroleum Activities Program. Therefore, cumulative impacts to water quality within the Operational Area are expected to be localised with no lasting effect. It is possible that protected marine fauna transiting the localised area may come into contact with these discharges (e.g. as they traverse the Operational Area during their seasonal migrations (**Section 4.6.5**). However, given the localised extent of cumulative impacts from multiple vessel discharges within the Operational Area, impacts to marine fauna are not expected.
Summary of Potential Impacts to environmental values
Given the adopted controls, it is considered that routine or non-routine discharges described will not result in a potential impact greater than localised contamination not significant to environmental receptors, with no lasting effect.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[9]***	***Benefit in Impact/Risk Reduction[10]***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 95 – pollution prevention – garbage (as appropriate to vessel class) which requires putrescible waste and food scraps to pass through a macerator so 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**

[9] Qualitative measure

[10] Measured in terms of reduction of likelihood (L), consequence (C) and current risk rating (CRR)

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[9]***	***Benefit in Impact/Risk Reduction[10]***	***Proportionality***	***Control Adopted***
Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class) which includes the following requirements: • a valid International Sewage Pollution Prevention Certificate, as required by vessel class • an AMSA-approved sewage treatment plant • a sewage comminuting and disinfecting 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 (> 4 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 project vessels, deck drainage will be collected via a closed drainage system.	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**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[9]***	***Benefit in Impact/Risk Reduction[10]***	***Proportionality***	***Control Adopted***
Marine Order 91 – oil (as relevant to vessel class) requirements, which includes mandatory measures for processing oily water prior to discharge: • machinery space bilge/oily water shall have IMO-approved oil filtering equipment (oil/water separator) with an on-line monitoring device to measure Oil in Water (OIW) content to be less than 15 ppm prior to discharge. • 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 <15 ppm without dilution or be treated by an IMO-approved oil/water separator, they will be contained on-board and disposed onshore. • valid International Oil Pollution Prevention Certificate.	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**
Good Practice				
No additional controls identified.				
Professional Judgement – Eliminate				
No additional controls identified.				
Professional Judgement – Substitute				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[9]***	***Benefit in Impact/Risk Reduction[10]***	***Proportionality***	***Control Adopted***
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 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 risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impact of planned (routine and non-routine) discharges from project vessels. 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, given the adopted controls, planned discharges (routine and non-routine) from project vessels is unlikely to result in a potential impact greater than temporary contamination above background levels and/or national/international quality standards and/or known biological effect concentrations outside a localised mixing zone with no lasting effect. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet legislative requirements under Marine Orders 91, 95 and 96. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of these discharges to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 4 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 – pollution prevention – garbage (as appropriate to vessel class) which requires putrescible waste and food scraps to pass through a macerator so it is capable of passing through a screen with no opening wider than 25 mm.	**PS 4.1** Project vessels compliant with Marine Order 95 – pollution prevention – Garbage.	**MC 4.1.1** Records demonstrate project vessels are compliant with Marine Order 95 – pollution prevention (as appropriate to vessel class).
	C 4.2 Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class)	**PS 4.2** Project vessels compliant with Marine Order 96 – pollution prevention – sewage (as appropriate to vessel class).	**MC 4.2.1** Records demonstrate project vessels are compliant with Marine Order 96 – pollution prevention – sewage (as appropriate to vessel

[11] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors' (**Section 2.7.4**).

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	which includes the following requirements: • a valid International Sewage Pollution Prevention Certificate, as required by vessel class • an AMSA-approved sewage treatment plant • a sewage comminuting and disinfecting 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 (>4 knots), to avoid discharges in environmentally sensitive areas.		class).
	C 4.3 Where there is potential for loss of primary containment of oil and chemicals on project vessels, deck drainage will be collected via a closed drainage system.	**PS 4.3** Contaminated drainage contained, treated and/or separated prior to discharge.	**MC 4.3.1** Records demonstrate project vessels have a bilge/oily water management systems.
	C 4.4 Marine Order 91 – oil (as relevant to vessel class) requirements, which includes mandatory measures for processing oily water prior to discharge: • machinery space bilge/oily water shall have IMO-approved oil filtering equipment (oil/water separator) with an on-line monitoring device to measure OIW content to be less than 15 ppm prior to discharge	**PS 4.4.1** Discharge of machinery space bilge/oily water will meet oil content standard of <15 ppm without dilution.	**MC 4.4.1** Records demonstrate discharge specification met for project vessels.
		PS 4.4.2 Deck drainage and bilge water will be discharged to meet the oil content standard of <15 ppm without dilution.	**MC 4.4.2** Records demonstrate maintained and up-to-date oil discharge records for project vessels.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	• 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 <15 ppm without dilution or be treated by an IMO-approved oil/water separator, they will be contained on-board and disposed onshore • Valid International Oil Pollution Prevention Certificate.		

6.8.4 Routine and Non-routine Discharges: IMR and Infrastructure Removal Activities

Context		
IMR Activities – **Section 3.11** Decommissioning Activities **Section 3.12**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5** Protected Species – **Section 4.6**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary													
Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence / Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Non-routine discharge of chemicals from umbilicals and control jumpers during removal process		X		X			A	F	-	-	LCS GP PJ	Broadly Acceptable	EPO 5
Non-routine discharge of treated seawater from flowlines, manifolds and spools		X					A	F	-	-			
Non-routine discharge of residual liquid/gas hydrocarbons		X		X	X		A	F	-	-			
Non-routine discharge of marine growth overboard from vessels		X		X			A	F	-	-			
Routine and non-routine discharges to the marine environment during IMR activities		X			X		A	F	-	-			

Description of Source of Impact

Removal of infrastructure

During the Petroleum Activities Program, subsea infrastructure including manifolds, flowlines and umbilicals will be removed, and residual fluids present in the infrastructure will be discharged into the marine environment as it is recovered. Fluids include treated seawater and some chemicals, and there may be some residual hydrocarbons present. Maximum total release volume is estimated at 750 m^3 of treated seawater (1 - 180 m^3 per item) with 19.7 – 42.2 mg/L residual hydrocarbons and possible scale. Additional residual hydrocarbons may be trapped between flowline layers.

The umbilicals contain hydraulic fluids (HW 443: 206 – 570 L; HW 434: 115 – 319 L), methanol (222 – 1271 L), scale inhibitors (124 – 780 L) and demulsifiers (143 – 468 L) in each umbilical. As the umbilicals are recovered, the contents will be drained to the environment. Release volumes are estimated at 12,000 L between 8 umbilicals. In addition, four control jumpers (production and gas lift) will also be recovered, releasing ~80 m^3 of treated seawater in total (10 – 30 m^3 per jumper) with 19.7 – 42.2 mg/L residual hydrocarbons. Hydraulic jumpers contain scale inhibitor, methanol, hydraulic fluid (HW 525), and demulsifier (1.75 m^3 per jumper); electrical jumpers may contain dielectric oil (0.005 m^3 per jumper).

Fluids will be discharged intermittently, and for short duration as infrastructure is recovered.

Marine growth

Marine growth attached to infrastructure that is loaded onto vessels will be removed on the vessel deck using HP water jetting and may involve the use of sulphamic acid to dissolve calcium deposits. Removed marine growth, and possibly small amounts of sulphamic acid will be discharged overboard to the marine environment. Marine growth removal may also occur subsea during cleaning and preparation activities or IMR activities (refer to **Section 6.8.2**).

All chemicals that may be operationally released or discharged to the marine environment during the Petroleum Activities Program are assessed as per Woodside Chemical Selection and Assessment Guideline. This guideline is used to demonstrate that the potential impacts of the chemicals that may be operationally released are acceptable and ALARP (refer to **Section 3.13**). This excludes residual chemicals already present within the flowlines, the majority of which are assessed below.

IMR

IMR activities may be conducted to ensure integrity of infrastructure prior to removal. This may include subsea chemical usage (**Section 3.11**). 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 procedure. This procedure is used to demonstrate that the potential impacts of the chemicals that may be released are acceptable and ALARP (refer to **Section 3.13**).

Impact Assessment

Potential impacts to environmental values

The release of residual hydrocarbon and chemical discharges may reduce local water quality through contamination of the water column, resulting in potential adverse effects to marine biota as a result of hydrocarbon and chemical toxicity. The discharges present a risk to the marine environment due to the contaminants within them.

Potential impacts to sensitive receptors may be attributable to dissolved hydrocarbons and suspended oil droplets and nutrients, as well as low residual concentrations of a small number of chemicals such as corrosion and scale inhibitors. Hydrocarbons, however, are considered the constituent of most concern to marine fauna, particularly polycyclic aromatic hydrocarbons (PAHs).

Release of Residual Hydrocarbons

Hydrocarbon exposure can lead to mortality of marine organisms within the immediate vicinity of a discharge plume, as well as sub-lethal chronic (long exposure) effects such as decreased genetic diversity in communities, decreased growth and fecundity, lower reproductive success, respiratory problems, behavioural and physiological problems, decreased developmental success and endocrine disruption (Neff et al., 2011).

Further details on potential biological and ecological impacts associated with hydrocarbon spills are presented in **Section 6.9.2**. A loss of residual hydrocarbon will be significantly reduced in terms of spatial and temporal scales, and given the minor quantities expected to be released, impacts to limited transient marine fauna (e.g. pygmy blue whales, humpback whales), fish populations and plankton (water column biota) are considered to be highly unlikely. No impacts to commercial fisheries, sensitive environmental receptors or KEFs are expected as impacts will be limited to temporary and localised contamination of water and highly localised impacts to lower-order species within the immediate vicinity of the discharge location. No impacts to any protected species are expected.

Chemical Discharges

The release of chemical discharges during IMR activities, or treated seawater containing preservation chemicals, marine growth removal chemicals and the minor discharge of control fluid from subsea valves and umbilicals may result in a localised and temporary minor decrease in water quality in the immediate area of the release; however, the impacts are expected to be of no lasting effect due to rapid dilution in the open ocean environment. All chemicals operationally discharged are subject to the chemical assessment process described in **Section 3.13**. Legacy chemicals remaining in manifolds, flowlines and umbilicals are designed to be of low toxicity and biodegradable in the marine environment. The relatively low concentrations of chemicals and non-instantaneous nature of the discharges as infrastructure is recovered is expected to result in rapid dilution and, therefore, impacts will be limited to negligible.

Marine fauna may be affected if they come in direct contact with a release (i.e. by traversing the immediate discharge area). Given the small volumes that represent the worst credible releases, and the dilution of any such discharge, the likelihood of ecological impacts to these marine fauna is considered to be highly unlikely.

No impacts to commercial or recreational fisheries, KEFs or protected species are expected.

Marine Growth

Marine growth removed from infrastructure and discharged overboard may result in a minor reduction in water quality through temporary elevated turbidity in the water column, but would rapidly sink/disperse and is not expected to result in impacts to water column biota.

Summary of Potential Impacts to environmental values

Given the adopted controls, it is considered that the discharges from infrastructure removal will not result in a potential impact greater than localised contamination not significant to environmental receptors, with no lasting effect.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[12]	***Benefit in Impact/Risk Reduction***[13]	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				
Fluids and additives planned to be used and 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 remain ALARP.	Benefits outweigh cost/sacrifice.	Yes **C 5.2**
Professional Judgement – Eliminate				
Do not cut flexible lines	F: No. Woodside intends to recover flexible lines via a Vertical Lay System (VLS). However, in case of complications, the option to cut flexibles into several pieces must be retained. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Do not cut and remove subsea infrastructure	F: Yes. However, infrastructure would remain *in situ* and would not meet Woodside's obligations	Leaving subsea infrastructure *in situ* would avoid short-term release of fluids	Grossly disproportionate.	No

[12] Qualitative measure
[13] Measured in terms of reduction of likelihood (L), consequence (C) and current risk rating (CRR)

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[12]***	***Benefit in Impact/Risk Reduction[13]***	***Proportionality***	***Control Adopted***
	under the General Direction from NOPSEMA (refer to **Table 1-4**). CS: none	containing chemicals and residual hydrocarbons. However, as the equipment degrades over time, fluids eventually be released to the marine environment in the long term.		
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), Woodside considers the adopted controls appropriate to manage the impact of planned (routine and non-routine) discharges from infrastructure removal. 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, given the adopted controls, routine and non-routine discharges from infrastructure removal may result in a localised impact with no lasting effect (< 1 month) on habitat (but not affecting ecosystem function), physical and biological attributes. 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, 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 or marine biota greater than a consequence level of F[14] from routine discharge from decommissioning during the Petroleum Activities Program.	**C 5.1** Fluids and additives planned to be used and intended or likely to be discharged to the marine environment will have an environmental assessment completed before use.	**PS 5.1** All chemicals intended or likely to be discharged to the marine environment reduced to ALARP using the chemical assessment process.	**MC 5.1.1** Records demonstrate chemical selection, assessment and approval process for selected chemicals is followed.
	C 5.2 Chemical reviews will be performed on all previously approved chemicals to confirm	**PS 5.2** Acceptability of previously approved chemicals are re-	**MC 5.2.1** Records confirm reviews have occurred, and any

[14] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors' (**Section 2.7.4**).

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	potential chemical impacts are reduced to ALARP.	evaluated to ensure ALARP and alternatives are considered.	actions/changes are

6.8.5 Routine and Non-routine Acoustic Emissions

Context	
Project Vessels – **Section 3.7**	Protected Species – **Section 4.6**

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	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 project vessels.					X		A	F	-	-	GP PJ	Broadly acceptable	EPO 6
Generation of acoustic signals from project vessels during normal operations.					X		A	F	-	-			
Generation of acoustic signals from cutting equipment.					X		A	F	-	-			
Generation of atmospheric noise from helicopter transfers within Operational Area.					X		A	F	-	-			
Noise generated from acoustic surveying					X		A	F	-	-			

Description of Source of Impact

Project vessels will generate noise both in the air and underwater, due to the operation of thruster engines, propeller cavitation, on-board machinery, etc. These noises will contribute to and have the potential to exceed ambient noise levels which range from around 90 dB re 1 µPa (root square mean sound pressure level (rms SPL)) under very calm, low wind conditions, to 120 dB re 1µPa (rms SPL) under windy conditions (McCauley, 2005).

Vessel Operations and Dynamic Positioning Systems

Vessels used for the Petroleum Activities Program are detailed in **Section 3.7**. 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 Petroleum Activities Program may not be executed as a single campaign or in a consecutive sequence, therefore acoustic emissions from vessels may occur at any time during the four-year life of the EP.

Project vessels may maintain DP for varying durations during the Petroleum Activities Program, depending on the activity being undertaken. The greatest sound levels are likely to be associated with the use DP thrusters to maintain position on station. 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. Similarly, Hannay et al. (2005) and McCauley (2005) have measured source level for support vessel with DP of 186 dB re 1 µPa at 1 m. It is expected that similar noise levels will be generated by vessels used for this Petroleum Activities Program. Acoustic emissions from the pipelay and installation vessel *Skandi Singapore* operating on DP were estimated to have a source level of 189.1 dB re 1 µPa (Connell et al., 2021). The *Skandi Hercules* construction anchor handling vessel operating on DP was estimated to have a source level of 181 dB re 1 µPa (Quijano and McPherson, 2021).

The combined source level from two vessels operating on DP is conservatively expected to be 195.1 dB re 1 µPa (rms SPL) based on the *Skandi Singapore* being the loudest noise source, which represents a doubling of sound pressure (189.1 dB + 6 dB).

Underwater Positioning Equipment

An array of long baseline (LBL) and/or ultra-short baseline (USBL) transponders may be installed on the seabed for positioning of vessels.

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). Transmissions are not continuous but consist of short 'chirps' with a duration that ranges from 3 to 40 milliseconds.

Cutting of Piles

Additional noise from the cutting of piles and other infrastructure may be generated. Infrastructure will be cut using either the abrasive water jet cutting method, or diamond wire cutting method. Underwater noise associated with diamond wire cutting is generally indistinguishable above background noise levels at lower frequencies, primarily detected at noise frequencies above 5 kHz (Pangerc et al., 2016). Quijano and McPherson (2021) estimated the source level of a diamond wire saw cutter at 169 dB re 1 µPa at 1 m.

Helicopter Transfers

Helicopter activities may occur in the Operational Area, including the landing and take-off of helicopters on vessel helidecks. Sound emitted from helicopter operations is typically below 500 Hz (Richardson et al., 1995). The peak received level diminishes with increasing helicopter altitude, but the duration of audibility often increases with increasing altitude. Richardson et al. (1995) reports that helicopter sound is audible in air for four minutes before it passed over underwater hydrophones, but detectable underwater for only 38 seconds at 3 m depth and 11 seconds at 18 m depth. Noise levels reported for a Bell 212 helicopter during fly-over was reported at 162 dB re 1 µPa and for Sikorsky-61 is 108 dB re 1 µPa at 305 m (Simmonds et al., 2004).

Subsea IMR Activities

Acoustic surveying may be required during as-found and as-left surveys to identify seabed features as well as any remaining infrastructure that requires removal. Acoustic surveys such as MBES and SSS generate a higher frequency acoustic signal, which attenuates more rapidly underwater compared to lower frequencies. Additionally, sound sources generated closer to the seabed have a lower received noise level in the horizontal direction due to seafloor scattering and absorption.

Impact Assessment

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.

Marine Mammals

Receptors

Ten cetacean species may be present in the Operational Area, including five threatened species (**Table 4-10**). Species include low-frequency (LF) cetaceans such as humpback whales and pygmy blue whales, and high-frequency (HF) cetaceans including spotted bottlenose dolphins (**Section 4.6.3**). The Operational Area overlaps with a humpback whale migration BIA and pygmy blue whale migration BIA. Individual pygmy blue whales may occasionally transit Operational Area during April to July and October to January during their seasonal migrations. Humpback whales migrate primarily during June and July (northbound) and late August/September to October (southbound). The recognised pygmy blue whale foraging BIA off North West Cape, and the humpback whale resting BIA in Exmouth Gulf are located >20 km from Operational Area.

Species Sensitivity and Thresholds

Marine mammals and especially cetaceans rely on sound for important life functions including individual recognition, socialising, detecting predators and prey, navigation and reproduction (Weilgart, 2007; Erbe et al., 2015; Erbe et al., 2018). Underwater noise can affect marine mammals in various ways including interfering with communication (masking), behavioural changes, a shift in the hearing threshold; permanent threshold shift (PTS) and temporary threshold shift (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 permanent threshold shift (PTS) (i.e. injury), temporary threshold shift (TTS) and a behavioural response for cetaceans as a result of impulsive and continuous noise sources are outlined in **Table 6-2.** These thresholds have been adopted by the United States National Oceanic and Atmospheric Administration (NOAA) (National Marine Fisheries Service [NMFS], 2014, 2018; Southall et al., 2019).

Table 6-2: 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 et al., (2019)

Marine Reptiles

Receptors

Five species of marine turtle may be present in the Operational Area (**Table 4-7**). The Operational Area is located 2 km from the internesting Habitat Critical to the survival of flatback turtles, and 5 km from the flatback turtle internesting buffer BIA. However, given water depths and distance from shore, the area does not constitute foraging or internesting habitat and occurrence of turtles is expected to be infrequent.

Species Sensitivity and Thresholds

The Recovery Plan for Marine Turtles (DOEE, 2017) notes that 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 to noise is short (acute) or long-term (chronic).

Marine turtles have been shown to respond to low frequency sound, with indications that they have the highest hearing sensitivity in the frequency range 100–700 Hz (Bartol and Musick, 2003). Lenhardt (1994) observed marine turtles avoiding low-frequency sound.

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.

The sound exposure thresholds for marine turtles are summarised in **Table 6-3**. No numerical thresholds have been developed for impacts of continuous sources (e.g. vessel noise) on marine turtles. A Popper et al. (2014) review assessed thresholds for marine turtles qualitatively, by assessing relative risk rather than by specific sound level thresholds. This assessment depends on activity-based subjective (semi-quantitative) ranges, and found that the risk of TTS onset was moderate at close range to the source (tens of metres), and low at intermediate (hundreds of metres) and far (thousands of metres) ranges (Popper et al., 2014).

Table 6-3: 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⁺	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(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: 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, Sharks and Rays

Receptors

The Operational Area is located in water depths of ~400-600 m, and therefore the fauna associated with this area will be predominantly pelagic species of fish. A foraging BIA for the whale shark is located 8 km east of the Operational Area.

Species Sensitivity and Thresholds

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 (sharks and rays) and scombrid fish (mackerel and tunas) or have a much-reduced swim bladder (e.g. flat fish) tend to have a relatively low auditory sensitivity.

Popper et al. (2014) developed sound exposure guidelines for fish, considering differences in fish physiology (**Table 6-4**).

Table 6-4: 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 – tens of metres), intermediate (I – hundreds of metres), and far (F – thousands of metres).

Source: Popper et al. (2014)

Project Vessels

As described above, cumulative broadband source levels for the project vessels will be limited to a conservatively estimated maximum of 195.1 dB re 1 μPa (rms SPL). For the purposes of this assessment two vessels operating concurrently on DP represent a single point source, and horizontal attenuation (transmission loss) from this point source has been predicted using both a modified spreading loss factor of 18log(r) and comparison with noise modelling for similar activities. The 18log(r) spreading loss factor is considered representative of the water depths of the Operational

Area, i.e. into deeper water downslope (where typical spherical spreading loss [20log(r)] would apply), along slope parallel to the coastline, and upslope into shallower waters (where modified cylindrical spreading [15log(r)] is more relevant).

Based on the application of a spreading loss factor of 18log(r), and a cumulative source level of 195.1 dB re 1 µPa (rms SPL), horizontal transmission loss has been calculated. Behavioural response thresholds of 120 dB re 1 µPa (continuous behavioural response threshold for cetaceans; refer **Table 6-3**) are estimated to be exceeded within approximately 15 km from the project vessels of DP. This is conservative compared to the modelled distances described below.

Modelling of propagation loss for the *Skandi Singapore* operating on DP, conducted by JASCO in approximately 100 m water depth in the Otway Basin, predicted that noise levels would drop below 120 dB re 1 µPa within 9.7 km (Connell et al., 2021). Modelling of the propagation loss for the *Skandi Hercules* in approximately 166 m water depth near the Ningaloo Marine Park predicted that noise levels would drop below 120 dB within 1.71 km (Quijano and McPherson, 2021). JASCO also estimated the combined noise from the *Skandi Hercules* operating on DP and the wire diamond saw cutter, and the modelling predicted combined noise levels would drop below 120 dB within 1.75 km (Quijano and McPherson, 2021).

While the sound speed profile of the water column and bathymetry may be different, the modelling provides a broad order of magnitude for propagation loss.

The Operational Area overlaps with migration BIAs for the humpback whale and pygmy blue whale, and there may be increased numbers of individuals within the Operational Area during the migration periods. However, 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. PTS and TTS criteria exceedance are based upon exposure for 24-hours by a stationary receptor, and it is unlikely that a migrating whale would remain within this range for 24-hours. For example, Möller et al. (2020) reported an average travel speed for pygmy blue whales of 1.17 ± 0.60 m/s for migratory behaviour, and Double et al. (2014) found migrating pygmy blue whales travelled an average distance of 21.9 ± 0.7 km per day. Noad and Cato (2007) reported humpback whale mean swimming speeds of 2.5 km/h for swimming whales and 4.0 km/h for non-singing whales during migration. Injury to other cetacean species within or adjacent to the Operational Area is also not considered credible as individuals are likely to be transiting through the area. Therefore, PTS and TTS thresholds are not expected to be exceeded for cetaceans transiting through the Operational Area.

As above, there are no quantitative sound exposure thresholds for behavioural responses in marine turtles resulting from continuous noise sources. Although the Operational Area is about 2 km from internesting habitat critical to the survival of flatback turtles, given the water depths and distance from shore, marine turtles are not expected to be in the area in high numbers even during nesting and internesting periods. Therefore, impacts to marine turtles from project vessels are expected to be negligible.

Other fauna associated with the Operational Area will be predominantly pelagic species of fish, with migratory species such as whale sharks transiting through the Operational Area; these species may be similarly affected by noise from project vessels.

Positioning Equipment Noise

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 (160 dB re 1 µPa) 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.

Cutting of Infrastructure

Twachtman et al. (2004) studied the operations and socioeconomic impact of nonexplosive removal of offshore structures, including noise and concluded that abrasive water jet cutting and diamond wire cutting methods are generally considered harmless to marine life and the environment. Similarly, Pangerc et al. (2016) described the underwater sound measurement data during an underwater diamond wire cutting of a 32" conductor (10m above seabed in ~80 m depth) and found that the sound radiated from the diamond wire cutting of the conductor was not easily discernible above the background noise at the closest recorder located at 100 m from the source. The sound that could be associated with the diamond wire cutting was primarily detectable above the background noise at the higher acoustic frequencies (above around 5 kHz) (Pangerc et. al., 2016) above the hearing range of low frequency cetaceans. Background noise was attributed to surface vessel activity such as DP. In another study, the US Navy measured underwater sound levels when the diamond saw was cutting caissons for replacing piles at an old fuel pier at Naval Base Point Loma (Naval Base Point Loma Naval Facilities Engineering Command Southwest 2017). They reported an average SPL for a single cutter at 136.1-141.4 dB SPL at 10 m (Sitikiewicz et al., 2018).

Any noise propagating at seabed from either abrasive water jet cutting or mechanical cutting of infrastructure is likely to attenuate to levels at, or close to background ambient levels within <100 m of the source, with ambient levels being significantly elevated by the concurrent presence of project vessel on DP immediately above the location of spools. JASCO modelling of a diamond saw cutter predicted that noise levels would drop below 120 dB re 1 µPa within approximately 300 m (Quijano and McPherson, 2021). As such, noise from the cutting of the casing and conductors will not add to cumulative noise levels for the operation to any extent.

Airborne Noise Sources – Helicopters

Helicopter engines and rotor blades are a potential source of noise emissions, which may result in behavioural disturbance to marine fauna. Water has a very high acoustic impedance contrast compared to air, and the sea surface is a strong reflector of noise energy (i.e. very little noise energy generated above the sea surface crosses into and propagates below the sea surface (and vice versa) – most is reflected). The angle at which the sound path meets the surface influences the transmission of noise energy from the atmosphere through the sea surface; angles ±>13° from vertical are almost entirely reflected (Richardson et al., 1995). Given this, and the typical characteristics of helicopter flights within the Operational Area (duration, frequency, altitude and air speed), the opportunity for underwater noise levels that may result in behavioural disturbance are considered to be highly unlikely. Note: Helicopter noise during approach, landing and take-off is more likely to propagate through the sea surface due to the reduced air speed and lower altitude. However, helicopter noise during approach, landing and take-off will be mingled with underwater noise generated by the facility hosting the helipad (e.g. thruster noise and machinery noise). Additionally, approach, landing and take-off are relatively short phases of the flight, resulting in little opportunity for underwater noise to be generated.

Given the standard flight profile of a helicopter transfer, maintenance of a more than 500 m horizontal separation from cetaceans (as per EPBC Regulations), and the predominantly seasonal presence of whales within the Operational Area, interactions between helicopters and cetaceans that result in behavioural impacts are considered to be highly unlikely. In the highly unlikely event that cetaceans are disturbed by helicopters, responses are expected to consist of short-term behavioural responses, such as increased swimming speed; the consequence of such disturbance is considered to have no lasting effect.

Although unlikely, turtles may be present in low numbers within the Operational Area and may be exposed to helicopter noise when on the sea surface (e.g. when basking or breathing). Typical startle responses occur at relatively short ranges (tens of metres) (Hazel et al., 2007) and, as such, startle responses during typical helicopter flight profiles are considered remote. If a turtle has a behavioural response to the presence of a helicopter, it is expected to exhibit diving behaviour, which has no lasting effect.

The Operational Area may be occasionally visited by migratory and oceanic birds but the area does not contain any emergent land that could be used as roosting or nesting habitat. The closest emergent land is 33 km south (North West Cape). One seabird BIA, a breeding area for wedge-tailed shearwaters, overlaps the Operational Area (August to April). However, there are no nesting sites such as islands within or near the Operational Area. Given the expected low density of seabirds within the Operational Area due to a lack of roosting or nesting habitat, the relative infrequency of helicopter flights and lack of lasting effect of potential behavioural responses to helicopter noise, impacts would be unlikely, localised and temporary, and result in no lasting effect.

Subsea IMR Activities

JASCO (2013) conducted noise modelling for five low energy survey instruments off the coast of California. One of these instrument types are comparable to acoustic survey equipment. All equipment types were modelled in the sandy bottom environment, similar to that of the Operational Area. Although the bathymetry, salinity, water temperature and sub-seafloor sediment type may differ, given the similarities in equipment type and seafloor habitat, the modelling is considered comparable for the nature and scale of the low energy IMR survey equipment.

The modelling reported distances to specific threshold levels for different types of marine mammals. Where applicable M-weighted Rmax (the distance to the farthest occurrence of the threshold level) estimates were used. Since receptors identified in **Section 4.6** include a greater range of species, unweighted Rmax, was used for species where M-weighted estimates were not appropriate, which is considered conservative. The distance at which the 160 dB re 1 µPa (rms SPL) behavioural threshold was reached was 290 m.

Potential behavioural response impacts may include:

- Cetaceans: Potential behavioural disturbance from the acoustic survey activities for cetaceans, likelihood of PTS or TTS is not considered credible, given individuals would need to be directly next to the noise source for prolonged duration and vessels are not point sources (i.e. sound is distributed from multiple locations of the vessel over a large area).
- Fish: Potential masking and behavioural disturbance at near and intermediate range; likelihood of PTS or TTS is considered not to be credible given fish would move away from the source and the activities noise sources are all higher in frequency (12 - 700 kHz) therefore they are outside the range of fish hearing (2-4 kHz). Site attached fish (e.g. some species of demersal fish) are not expected to be exposed to underwater noise above impact thresholds given water depths in the area where these fish may be more prevalent.
- Marine turtles: Likelihood of potential masking and behavioural disturbance or PTS or TTS is considered not to be credible given the source frequency of proposed equipment (12 -700 kHz) is well outside the known hearing frequency range of turtles (0.1 - 0.7 kHz).

Potential Impacts to Values of the Ningaloo Coast WHP

The Ningaloo Coast WHP is located 16 km south of the Operational Area. The values of the Ningaloo Coast WHP are defined in Section 10 of the Master Existing Environment. Natural values include aggregations of whale sharks and marine mammals, and important nesting habitat for marine turtles.

As above, PTS/TTS thresholds for cetaceans are not expected to be exceeded, and potential for impacts to marine mammals within the Ningaloo Coast WHP property would be limited to behavioural impacts with no lasting effect. Impacts to marine turtles and whale sharks within the Ningaloo Coast WHP from noise are not expected.

The Petroleum Activities Program is expected to be undertaken in a manner that is consistent with the management objectives for the Ningaloo AMP, Ningaloo Coast WHP and the North-west Marine Park Network. No long-term or ecologically significant impacts are predicted, and the values will be conserved and protected.

Cumulative Assessment

Cumulative impacts to marine fauna may occur if multiple activities occur concurrently or in quick succession within an area. Relevant activities that could result in a cumulative impact are limited to operation of the Ngujima Yin FPSO, commercial shipping and SIMOPs with the Enfield P&A and riser turret mooring inspection and removal Petroleum Activities Programs.

<u>Commercial Shipping</u>

There is no overlap with commercial shipping fairways and the Operational Area. Migratory cetacean species including the pygmy blue whale and humpback whale may transit the Operational Area seasonally throughout the duration of the Petroleum Activities Program. The impact of noise to marine turtles and fishes (including whale sharks) is considered to be negligible.

Given the nearest shipping fairway is approximately 38 km north-west of the Operational Area, cumulative impacts to marine fauna are expected to be limited to a behavioural response, for example pygmy blue whales and humpback whales may deviate slightly from their migration route, with no lasting effect.

<u>Oil and Gas</u>

The Ngujima-Yin FPSO is located approximately 5 km north-east of the Operational Area. Both the Operational Area and Ngujima-Yin FPSO are located in open water and do not constrain the migration route for pygmy blue whales or humpback whales. Cumulative impacts are expected to be limited to a behavioural response with no lasting effect.

<u>SIMOPs with the Enfield P&A and Riser Turret Mooring Inspection Petroleum Activities Programs</u>

The Enfield P&A Petroleum Activities Program includes the use of a MODU on DP and two project vessels, and the Riser Turret Mooring Petroleum Activities Program includes the use of up to two projects vessels. In the unlikely event activities under the three EPs occur in the Operational Area concurrently it is possible that up to five vessels may be present in the Operational Area, including the MODU on DP. SIMOPs involving the three petroleum activities is highly unlikely, and it is more likely that up to two activities would occur simultaneously. As a result, as described in **Section 6.5** it is more likely that a maximum of five vessels would be present in the Operational Area at one time.

The DP MODU is expected to have a similar thruster configuration to other modelled drill rigs, including the *Deepwater Millennium* and *West Aquarius*, with source levels of 196.1 dB re 1 µPa and 187.7 dB re 1 µPa, respectively. Accordingly, in a SIMOPs scenario with the DP MODU operating in the Operational Area concurrently with up to four vessels, the DP MODU would represent the loudest source of underwater acoustic emissions. By comparison, acoustic emissions from the pipelay and installation vessel *Skandi Singapore* operating on DP were estimated to have a source level of 189.1 dB re 1 µPa (Connell et al., 2021), and the *Skandi Hercules* construction anchor handling vessel operating on DP was estimated to have a source level of 181 dB re 1 µPa (Quijano and McPherson, 2021).

Acoustic monitoring studies of operations of DP semi-submersibles and drillships with associated vessel activity in deep waters of the North Atlantic demonstrated that the MODU represented the most significant source of acoustic emissions (Jiménez-Arranz et al., 2019; Delarue et al., 2021; Kowarski et al., 2021). This was the case even with significant vessel activity within a few kilometres from the MODU (Jiménez-Arranz et al., 2019) and is probably due to the fact that deep water MODUs would be using up to eight, high power azimuthal thrusters to maintain position. Whilst additional vessels on DP would contribute to the soundscape at close ranges to the source (i.e. within ~3-5 km), at greater ranges the MODU is the predominant contributor to the anthropogenic component of the underwater soundscape.

The assessment of potential impacts and risks of underwater acoustic emissions conducted for the Enfield Plug and Abandonment EP concluded that noise levels would drop below the continuous noise behavioural response threshold for marine mammals (120 dB re 1 µPa) within approximately 40-57 km, based on modelling of sound propagation loss for the *Deepwater Millennium* drillship in 500 m water depth (McPherson et al., 2013) and for the *West Aquarius* semi-submersible in 387 m water depth (Matthews et al., 2017). The measurement studies in deep waters of the North Atlantic outlined above demonstrated that sound levels recorded at 1 km from the MODUs were considerably lower than those predicted by the propagation loss modelling. Jiménez-Arranz et al. (2019) and Kowarski et al. (2021) recorded an average broadband sound level of 118 dB re µPa within 1 km of the MODU, compared to the predicted level of almost 140 dB re 1 µPa. Consequently, for the purposes of this cumulative assessment, a conservative maximum range of 40 km to the 120 dB re 1 µPa behavioural response threshold has been adopted.

A MODU and four additional vessels all operation on DP within the Operational Area would result in sound levels that exceed the 120 dB re 1 µPa behavioural response threshold within the following BIAs:

- pygmy blue whale migration BIA

- humpback whale migration BIA
- the northerly extent of the pygmy blue whale possible foraging BIA
- the dugong foraging (high density seagrass beds) BIA.

As described above, PTS and TTS thresholds for LF-cetaceans are not expected to be exceeded as it is unlikely that a migrating or foraging whale would remain within very close range (i.e. less than a few hundred metres) of the MODU or any project vessels for 24-hours. Potential impacts to individual whales within these BIAs would be limited to low level behavioural responses (e.g. avoidance) with no lasting effects. It is highly unlikely that noise levels within the pygmy blue whale foraging BIA from the combined activity of the MODU and up to four additional vessels would result in displacement of individuals from the foraging area. Kowarski et al. (2021) found that at a distance of 40 km from the *Stena Forth* drillship in ~650 m water depth, noise emissions from the drillship were difficult to detect, with a median broadband SPL of 109.7 dB re 1 µPa.

There is no overlap between the behavioural response onset zone and the humpback whale resting BIA within Exmouth Gulf, as the northern boundary of the BIA is >40 km from any of the drill centres within the Operational Area where the MODU would be operating.

Whilst the behavioural response onset zone overlaps a portion of the dugong foraging BIA around North West Cape, significant numbers of dugong are not expected to occur in this area, as there are no high density seagrass beds along the north-west coast of the peninsula. Dugong presence is likely to be limited to isolated individuals transiting through the area. Again, potential impacts to individual dugongs within this BIA would be limited to low level behavioural responses with no lasting effects.

Summary of Potential Impacts to environmental values

It is considered that noise generated by project vessels and positioning transponders will not result in a potential impact greater than localised impacts, 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				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[18]: • Project vessels will not travel faster 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.	F: Yes. CS: Minimal cost.	Implementation of these controls will not significantly reduce negligible impacts to marine fauna from underwater noise given outcomes of impact assessment.	Disproportionate. The cost/sacrifice outweighs the benefit gained. However, control has been adopted to minimise vessel collisions with marine fauna in **Section 6.9.6.**	Yes **C 14.1**

1 Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[15]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
• Project vessels will not travel faster 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.				
Good Practice				
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 Act 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 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	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
Undertake site-specific acoustic modelling	F: Yes. It is 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	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
Implementing a shutdown zone around acoustic surveying for the following fauna: • whales	F: Yes. However, as equipment is underwater at the seabed, effective implementation of zones	Negligible. No credible impact predicted to these species from acoustic surveying.	The source levels and frequency range of these devices are outside the	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[15]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
• marine turtles • whale sharks.	is challenging from topside observation. CS: Moderate. Requires the provision of a dedicated suitably trained crew member to undertake Marine Fauna Observations.		estimated frequency hearing range of identified protected species (whales, turtles and whale sharks), so costs are considered disproportionate to benefits.	
Professional Judgement – Eliminate				
Elimination of noise from the project vessels and helicopters.	F: No. The generation of noise from these sources cannot be eliminated due to operating requirements. Note: Operating vessels on DP may be a safety critical requirement. 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.	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.				

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), 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 project vessels, helicopters, acoustic survey activities, and positioning transponders is unlikely to result in a potential impact greater than localised behavioural impacts. These effects are not expected to be significant to marine fauna, and will have no lasting effect. BIAs within the Operational Area include the humpback whale migration BIA and pygmy blue whale migration BIA. Further opportunities to reduce the impacts have been investigated above. As demonstrated in **Section 6.10**, the residual impacts of routine acoustic emissions from project vessels in the Operational Area are 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 impacts. Therefore, Woodside considers standard operations appropriate to manage the impacts of noise from the Petroleum Activities Program to a level that is broadly acceptable.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 6 No impacts to marine fauna from noise emissions with a consequence level greater than F[16] during the Petroleum Activities Program.	**C 14.1** Refer to **Section 6.9.6**	**PS 14.1** Refer to **Section 6.9.6**	**MC 14.1.1** Refer to **Section 6.9.6**

[16] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors' (**Section 2.7.4**).

6.8.6 Routine and Non-routine Atmospheric Emissions

Context		
Project Vessels – **Section 3.7** IMR Activities – **Section 3.11** Decommissioning Activities **Section 3.12**	Physical Environment – **Section 4.4**	Stakeholder Consultation – **Section 5**

Impact Evaluation Summary

Source of Impact	*Environmental Value Potentially Impacted*						*Evaluation*						
	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 project vessels and helicopters.			X				A	F	-	-	LCS GP	Broadly acceptable	EPO 7

Description of Source of Impact

Atmospheric emissions refer to the discharges to the atmosphere of gases and particulates from an activity that have a recognised adverse effect on human health and/or flora and fauna. The main emissions responsible for these effects include carbon monoxide (CO), nitrogen oxides (NO_x), sulphur dioxide (SO_2), particulate matter less than 10 microns (PM10), non-methane volatile organic compounds (VOCs), BTEX (benzene, toluene, ethylbenzene and xylenes), which are specific VOCs of interest.

Greenhouse gas (GHG) emissions are defined as gases within the atmosphere that absorb long-wave radiation, and trap the heat reflected from the Earth's surface. The main gases responsible for this effect include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Other GHG include perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF6).

Internal combustion engines and incinerators

Project vessels include a number of offshore and general support vessels. For power generation, vessels may use diesel-powered generators and/or LNG. Atmospheric emissions will be generated by the project vessels from internal combustion engines (including all equipment and generators, which may be diesel powered and/or LNG powered) and incineration activities (including onboard incinerators) during the Petroleum Activities Program. Emissions will include SO_2, NO_x, ozone depleting substances, CO_2, particulates and volatile organic compounds (VOCs).

Impact Assessment

Fuel combustion and incineration on project vessels, 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. The air quality within the Operational Area is typical of an undisturbed tropical offshore environment and the ambient air quality in the offshore NWMR will be of high quality. Given the short duration and exposed location of project vessels (which will lead to the rapid dispersion of the low volumes of atmospheric emissions), atmospheric emissions from the Petroleum Activities Program have the potential to result in a localised reduction in air quality in the immediate vicinity of the release point, with no lasting effect.

Summary of Potential Impacts to Environmental Values

Given the adopted controls, it is considered that the release of a small volume of atmospheric emissions (including 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)[17]***	***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 7.1**
Good Practice				
Oil burner will operate efficiently to maximise combustion.	F: Yes. CS: Minimal cost. Standard practice.	This control results in a reduction in likelihood of atmospheric emissions impacting air quality. Consequence remains unchanged.	Benefits outweigh cost/sacrifice.	Yes **C 7.2**
Professional Judgement – Eliminate				
Do not combust fuel.	F: No. There are no 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				
None identified.				
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), Woodside considers the adopted controls appropriate to manage the potential impacts of release of atmospheric emissions (including greenhouse gases) within the Operational Area. 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, atmospheric emissions during the Petroleum				

1 Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[17]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Activities Program will not result in a potential impact greater than a temporary decrease in local air quality with low impact to the environment or human health and no lasting effects. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of the described emissions within the Operational Area to a level that is broadly acceptable.				

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 7.1** Marine Order 97 (Marine Pollution Prevention – Air Pollution) which details requirements for: • 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 7.1** 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 7.1.1** Marine Assurance inspection records demonstrate compliance with Marine Order 97.
	C 7.2 Oil burner will operate efficiently to maximise combustion.	**PS 7.2** Oil burner will have combustion efficiency greater than 99%.	**MC 7.2.1** Records demonstrate that oil burner is greater than 99% efficient.

6.8.7 Routine Light Emissions

Context	
Project Vessels – **Section 3.7**	Protected Species – **Section 4.6**

Impact Evaluation Summary

Source of Impact	Environmental Value Potentially Impacted						Evaluation						
	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/ Habitat	Species	Socioeconomic	Decision Type	Consequence/Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Routine light emissions from project vessels within the Operational Area.					X		A	F	-	-	LCS GP PJ	Broadly acceptable	EPO 8

Description of Source of Impact

Routine light emissions include light sources that alter the ambient light conditions in an environment. Project vessels will routinely use external lighting to navigate and conduct safe operations at night throughout the Petroleum Activities Program. Vessel lighting will also be used to communicate the vessel's presence to other marine users (i.e. navigation/warning lights). This lighting typically consists of bright white (i.e. metal halide, halogen, fluorescent) lights, and is not dissimilar to lighting used for other offshore activities, including fishing and shipping. Lighting is required for safely operating project vessels and cannot reasonably be eliminated.

The vessels that may be required for the Petroleum Activities Program in the Operational Area are outlined in **Section 3.7**. There is potential for SIMOPs to occur under this EP with other activities in WA-28-L (i.e. well P&A), which is covered under a separate EP. In the unlikely event activities under the two EPs occur concurrently it is possible that up to five vessels may be present in the Operational Area, including the MODU, resulting in cumulative light from five vessels. External lighting is located on the vessel decks, with most external lighting directed towards working areas such as the main decks. These areas are typically <20 m above sea level.

Lighting from vessels 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 lighting (including height above sea level) and environmental conditions (e.g. cloud cover).

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:* 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 phases of the moon. However, artificial lighting has the potential to create a constant level of light at night that can override these natural levels and cycles.
- *Orientation:* Some organisms (e.g. turtles, birds) may also use lighting from natural sources to orient themselves in a certain direction at night. If an artificial light source is brighter than a natural source, the artificial light may override natural cues, leading to disorientation.

The fauna within and immediately adjacent to the Operational Area are predominantly pelagic fish and zooplankton, with a low abundance of transient species such as marine turtles, whale sharks, cetaceans and migratory shorebirds and seabirds. There is no known critical habitat within the Operational Area for EPBC Act listed species. However, the Operational Area overlaps a BIA (breeding and foraging) for the wedge-tailed shearwater. As described in **Table 4-9** and shown in Figure 4-6, internesting buffer 'Habitat Critical to the survival of the species' for flatback, green, loggerhead and hawksbill turtles are located ~2 km, ~15 km, ~15 km and ~31 km, respectively, from the Operational Area. However, as outlined below, internesting adult female turtles are not impacted by artificial light emissions, and it is more relevant to consider separation distances between light sources and nesting Habitat Critical for turtles – the nesting locations as identified in Table 6 of the Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth of Australia, 2017).

At the closest point, the Operational Area is located:

- ~33 km from the nearest nesting locations for green turtles on the North West Cape
- ~37 km from the nearest nesting locations for loggerhead turtles on South Muiron Island
- ~52 km from the nearest nesting locations for hawksbill turtles on Peak Island
- ~63 km from the nearest nesting locations for flatback turtles on Flat Island.

Marine Turtles – Hatchlings

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).

As described above, the nearest nesting locations to the Operational Area are along the north-western extent of North West Cape (~33 km), and the western coastline of South Muiron Island (~37 km). The distance between project vessel light sources and the edge of visibility, or the visible horizon, was calculated using a manual calculation that takes atmospheric refraction into consideration (Young's method) as expressed by the formula $d = 3.86\sqrt{h}$, where 'd' is the distance to the visible horizon, and 'h' is the light source height in m. For lighting on a project vessel ~20 m above sea level, the distance to the visible horizon is approximately 16 km. Any lighting beyond this distance is below the horizon and direct light will not be visible. Therefore, direct light from project vessels will not reach any nesting locations.

For nesting locations at both North West Cape and South Muiron Island, the light source is located directly offshore in the same direction that emerging hatchlings would be heading in anyway during normal sea-finding behaviour, meaning that no significant misorientation or disorientation would occur. Since the Operational Area is located >33 km from turtle nesting locations in the region, the risk of dispersing hatchlings becoming attracted to direct light or sky glow from project vessels is not considered credible.

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

Marine Turtles – Adults

Although individuals undertaking behaviours such as internesting, migration, mating (adults) or foraging (adults and pelagic juveniles) may occur within Operational Area, marine turtles do not use light cues to guide these behaviours. Furthermore, there is no evidence, published or anecdotal, to suggest that internesting, mating, foraging or migrating turtles are impacted by light from offshore vessels. As such, light emissions from the vessels are unlikely to result in displacement of, or behavioural changes to individuals in these life stages (Pendoley Environmental [PENV], 2020).

Artificial lighting may affect where nesting adult turtles emerge onto the beach, the success of nest construction, whether nesting is abandoned, and the seaward return of adults (Salmon et al., 1995a, 1995b; Salmon and Witherington, 1995). Such lighting is typically from residential and industrial development at the coastline, rather than offshore from nesting beaches. As described above, the beaches on the tip of North West Cape (~33 km from the Operational Area) and South Muiron Island (~37 km from the Operational Area) are known nesting locations, however, light from the project vessels will not be visible as sky glow or light spill to nesting adult turtles. As such, vessel light sources will not discourage females from nesting, or affect nest site selection, and therefore will not displace females from nesting habitat.

The Operational Area does not contain any known Habitat Critical to the survival for any species of marine turtle, and no BIAs for marine turtles overlap with the Operational Area. It is acknowledged that marine turtles may be present transiting Operational Area in low densities; however, given the water depth (~400–600 m), marine turtles are unlikely to be foraging within the area and their presence will be limited to individuals temporarily transiting the area. As such, light emissions from project vessels are unlikely to result in more than localised behavioural disturbance to isolated transient individuals, with no lasting effect to the species.

Seabirds and 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 Operational Area may be occasionally visited by seabirds and migratory shorebirds; however, there is no emergent land that could be used for roosting or nesting habitat within the Operational Area. The nearest shoreline is North West Cape (31 km south-east of the Operational Area).

The Operational Area overlaps a foraging and breeding BIA for the wedge-tailed shearwater and is located approximately 36 km from the Muiron Islands, which is a significant breeding site for this species (Cannel et al., 2019).

Adult shearwaters are vulnerable to artificial lighting during the breeding cycle, when returning to and leaving the nesting colony to maintain nesting sites or forage. Foraging wedge-tailed shearwaters may be attracted to sources of light emissions to feed on fish drawn to the light; however, the species feeds predominantly during the day (Catry et al., 2009; Whittow 1997). Artificial light can also impact behaviour and adult nest attendance, 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). Shearwater 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).

The breeding period for the wedge-tailed shearwater is from August to March, with peak incubation and chick rearing during November (Cannel et al., 2019). During this period, adults were observed taking a combination of short (1–4 days) or long (6–30 days) foraging trips from the Muiron Islands towards the north-west (Cannel et al., 2019). During the breeding period, foraging adult wedge-tailed shearwaters were observed travelling up to around 1,000 km from the breeding colony (Cannell et al., 2019). While the Petroleum Activities program will temporally overlap with the breeding period, the Operational Area is not within an area that is regularly used for short-distance foraging trips from Muiron Islands during chick rearing (Cannel et al., 2019) nor does it represent a significant portion of the known wider foraging area for wedge-tailed shearwaters. Impacts to wedge-tailed shearwaters are therefore considered to be limited to negligible behavioural disturbance to isolated transient individuals, not significant to the population’s presence in important breeding and foraging habitat.

Other 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, given the mostly stationary nature of activities within Operational Area. Impacts are expected to be limited to temporary behavioural disturbance to isolated individuals, with no lasting effect or displacement from important habitat.

Other Marine Fauna

Lighting from ROV or vessel activities in the Operational Area may result in the localised aggregation of fish around the ROV or below the vessel. These aggregations of fish due to light are considered localised and temporary. Any long-term changes to fish species composition or abundance are 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 pygmy blue whales, humpback whales or whale sharks.

Potential Impacts to Values of the Ningaloo Coast WHP

The Ningaloo Coast WHP is located 17 km south of the Operational Area. The values of the Ningaloo Coast WHP are defined in Section 10 of the Master Existing Environment. Natural values include aggregations of whale sharks and marine mammals, and important nesting habitat for marine turtles and seabirds, including the wedge-tailed shearwater.

Important nesting sites for the wedge-tailed shearwater and marine turtles, including Muiron Islands, are within the Ningaloo Coast WHP. However, the nearest shoreline is over 30 km from the Operational Area and as such, sky glow and light spill from project vessels are not expected to reach the distances. The impact of light emissions to other marine fauna including whale sharks and marine mammals is considered to be negligible.

The Petroleum Activities Program is expected to be undertaken in a manner that is consistent with the management objectives for the Ningaloo AMP, Ningaloo Coast WHP and the North-west Marine Park Network. No long-term or ecologically significant impacts are predicted, and the values will be conserved and protected.

Cumulative Assessment

In addition to the Enfield subsea infrastructure removal Petroleum Activities Program there is also the potential for SIMOPs with other activities in WA-28-L (i.e. well P&A), which is covered under a separate EP. In the unlikely event activities under the two EPs occur concurrently it is possible that up to five vessels may be present in the Operational Area, including the MODU. The maximum distance of direct visibility for vessel lighting (16 km, as described above) will not be affected by the presence of multiple vessels. However, presence of the vessels will make a small contribution to the overall skyglow visible on the horizon from the coastline. Artificial light monitoring conducted for the proposed Ningaloo Lighthouse Resort Development found that sky glow from flaring on the two FPSOs currently operating off North West Cape (Pyrenees Venture and Ngujima-Yin) is visible at the turtle nesting beaches on the tip of North West Cape (PENV, 2021). It is possible that sky glow from vessels in the Operational Area could contribute to the cumulative sky glow from these facilities, which are located ~28 km and ~41 km, respectively, from turtle nesting beaches on North West Cape. However, any additional contribution to cumulative sky glow is considered to be very marginal, given the much lower elevation of vessel lighting compared to the flare towers on the FPSOs. Furthermore, the lighting impact assessment for the Ningaloo Lighthouse Resort Development concluded that “*Sea finding by turtle hatchlings emerging from regional nesting beaches was consistent across the monitored beaches with most hatchling fans successfully orienting seaward and appeared unaffected by the current levels of visible regional sky glow*.” (PENV, 2021). Any cumulative impacts to marine turtles from artificial light will therefore be limited to possible short-term behavioural impacts to isolated individuals offshore, with no lasting effect.

As outlined above, the Operational Area overlaps a foraging and breeding BIA for the wedge-tailed shearwater, and is located approximately 36 km from the Muiron Islands, which is a significant breeding site for this species. However, the

presence of up to five vessels in the Operational Area represents an incremental increase in vessel traffic in the area. The risk associated with collision from seabirds and shorebirds attracted to vessel lighting is considered to be low, given the mostly stationary nature of activities within Operational Area. While within the broader foraging area for wedge-tailed shearwaters, the Operational Area does not represent significant habitat and impacts are expected to be limited to temporary behavioural disturbance to isolated individuals, with no lasting effect or displacement from important habitat.
Summary of Potential Impacts to environmental values
Light emissions from project vessels will not result in an impact greater than a localised and temporary disturbance to fauna in the vicinity of the Operational Area with no lasting effect to any species (i.e. Environmental Impact – F).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[18]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified.				
Good Practice				
Where activities will occur during the breeding period for wedge-tailed shearwaters (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 report interactions	F: Yes, however a minimum level of lighting is required on the 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 8.1**
Professional Judgement – Eliminate				
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
Professional Judgement – Substitute				

1 Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[18]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
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 project vessels would result in considerable cost and time expenditure. Considerable logistical effort to source sufficient inventory of the range of light types onboard the project vessels.	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
Variation of the timing of the Petroleum Activities Program to avoid peak turtle nesting periods (December to March).	F: Yes. Avoidance of turtle nesting periods is technically feasible, although is not considered to be practicable. CS: Significant cost and schedule impacts due to delays in securing vessels for specific timeframes.	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: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	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), Woodside considers the potential impacts from routine light emissions from project vessels within the Operational Area to be ALARP. This includes consideration of the intermittent nature of light emissions for the duration of the Petroleum Activities Program, and the requirements for external lighting for safe operations. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks 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 project vessels may result in impacts limited to temporary behavioural disturbance to fauna within a localised area and with no lasting effect on any species. BIAs within the Operational Area include a foraging and breeding BIA for the wedge-tailed shearwaters. Further opportunities to reduce the impacts have been investigated above. 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. Therefore, Woodside considers standard operations				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[18]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
appropriate to manage the impacts and risks of routine light emissions to a level that is broadly acceptable.				

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 9 No impacts to marine fauna from light emissions with a consequence level greater than F[19] during the Petroleum Activities Program.	**C 9.1** Where activities will occur during the breeding period (August–April) for wedge-tailed shearwaters 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 report interactions.	**PS 8.1.1** Pre-mobilisation vessel inspections will identify vessel operational controls to minimise light to safety and/or navigation requirements.	**MC 8.1.1** Pre-mobilisation vessel inspection records include identification of vessel operational controls to minimise light to safety and/or navigation requirements.
		PS 8.1.2 Project vessels will use available block-out blinds on portholes and windows not necessary for safety and/or navigation when operating at night.	**MC 8.1.2** Vessel contractor procedures include requirement to use available block-out blinds not necessary for safety and/or navigation when operating at night.
		PS 8.1.3 Record observed bird trappings and collisions and implement care and release steps recommended in the International Association of Antarctica Tour Operators (IAATO) Guidelines to Minimize Seabirds Landing on Ships	**MC 8.1.3** Records demonstrate IAATO Guidelines implemented during trapping and collision incidents.

[19] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptor' (**Section 2.7.4**).

6.9 Unplanned Activities (Accidents, Incidents, Emergency Situations)

6.9.1 Quantitative Spill Risk Assessment Methodology

Quantitative hydrocarbon spill modelling was undertaken by Asia Pacific Applied Science Associates (RPS APASA), 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 APASA 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.

6.9.1.1 Hydrocarbon Characteristics

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 6.9.2** to **6.9.3**), and include:

- A vessel collision resulting in about 500 m³ of marine diesel instantaneously released.
- A bunkering incident scenario resulting in about 8 m³ of diesel instantaneously released.

The physical characteristics of marine diesel, as used in the hydrocarbon spill modelling studies, are provided in **Table 6-5**.

Table 6-5: Hydrocarbon characteristics

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	
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	-	-

6.9.1.2 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—adopting accepted contact thresholds that are documented to impact the marine environment—is used to define the EMBA.

Hydrocarbon thresholds are presented **Table 6-6** and described in the following subsections.

Table 6-6: Summary of thresholds applied to the quantitative hydrocarbon spill risk modelling results

Hydrocarbon Fate	Units	EMBA	Socio-cultural EMBA
Surface Hydrocarbons	g/m^2	10	1
Accumulated hydrocarbons	g/m^2	100	10
Entrained hydrocarbons	ppb	100	100
Dissolved aromatic hydrocarbons	ppb	50	50

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.

6.9.2 Unplanned Hydrocarbon Release: Vessel Collision

Context		
Project Vessels – **Section 3.7**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5** Protected Species – **Section 4.6** Socioeconomic and Cultural – **Section 4.9**	Stakeholder Consultation – **Section 4.9.7**

Risk Evaluation Summary													
Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence / Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Loss of hydrocarbons to marine environment due to a vessel collision (e.g. activity support vessels or other marine users).		X		X	X	X	A	D	1	M	LCS GP PJ RBA	Broadly Acceptable	EPO 9

Description of Source of Risk

Background

Project vessels will use marine diesel fuel. A typical project vessel (e.g. SCV, HLV, IMR, AHT vessel) is likely to have multiple isolated marine diesel tanks distributed throughout the hull of the vessel. Individual marine diesel tanks are typically less than 500 m^3 in volume; however for the purposes of a conservative indication of the risks associated with a vessel collision for the Petroleum Activities Program, Woodside has assumed a largest marine diesel tank volume of 500 m^3 for a project vessel. In the unlikely event of a vessel collision involving a project vessel during the Petroleum Activities Program, the vessel will have the capability to pump marine diesel from a ruptured tank to a tank with spare volume in order to reduce the potential volume of fuel released to the environment.

The marine diesel storage capacity of activity support vessels can also be in the order of 1000 m^3 (total) that is distributed through multiple isolated tanks typically located mid-ships and can range in typical size from 22 to105 m^3.

Project vessels will be intermittently present in the Operational Area for the duration of the Petroleum Activities Program. This intermittent presence in the area will result in a navigational hazard for commercial shipping within the immediate area (as discussed in **Section 4.9.5**).

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.

From a review of the ATSB marine safety and investigation reports, one vessel collision occurred in 2011–2012 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 activity support vessel off Barrow Island. Two other vessel collisions occurred in 2010, one in the port of Dampier, where an activity 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 connected 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 occurring.

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. 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 from the vessel potentially impacting an environmental receptor, several factors must align as follows:

- 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 probability of the chain of events described above aligning, to result in a breach of fuel tanks resulting in a spill that could potentially impact the marine environment, although credible, is considered highly unlikely. Given the offshore location of the Operational Area, vessel grounding is not considered a credible risk.

The environmental risk analysis and evaluation undertaken 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. The various scenarios considered damage to single and multiple fuel storage tanks in a project vessel due to various combinations of vessel-to-vessel collision scenarios. The scenarios considered comprised of a collision of the project vessel and support vessel with each other or with a third party vessel (i.e. commercial shipping, other petroleum related vessels and commercial fishing vessels). The likelihood of a collision was assessed as being remote, given standard vessel operations and equipment in place to prevent collision at sea, the standby role of a support vessel(s) (low vessel speed) and its operation in close proximity to the project vessel, and the construction and placement of storage tanks. The credible scenario identified is summarised in **Table 6-7.** For the purposes of this assessment a worst-case instantaneous loss of 500 m^3 from a diesel tank on the project vessels has been considered.

Table 6-7: Assessment of potential vessel spill scenarios

Scenario	Hydrocarbon Volumes	Preventative and Mitigation Controls	Credibility	Max. Possible Volume loss (m^3)
Breach of a vessel fuel tank due to collision with another vessel. Assume loss of largest single tank inventory only: • Collision of an offshore support vessel with a third-party vessel • Collision of an offshore support vessel with a third-party vessel.	The project vessels have multiple isolated tanks, largest volume of a single tank is ≤500 m^3.	Typically double wall, tanks which are located mid-ship (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 apply during such vessel movements.	**Credible** Project vessel – other vessel collision could potentially result in the release from a fuel tank.	500 m^3

Quantitative Hydrocarbon Risk Assessment

Modelling was undertaken by RPS APASA, on behalf of Woodside, to determine the fate of marine diesel released from a collision within the Operational Area. The modelling assessed the extent of marine diesel spill volume of 500 m^3 for all seasons, using an historic sample of wind and current data for the region. A total of 200 simulations in various seasons were modelled with each simulation tracked for 42 days.

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 approximately 50% by mass would be expected to evaporate over the first day or two (**Figure 6-1**). After this time the majority of the remaining hydrocarbon is entrained into the upper water column. In calm conditions, entrained hydrocarbons are likely to resurface. Seven days following the spill, approximately 45–50% would evaporate, 40–45% would entrain and approximately 10% would decay and a small proportion would be dissolved (**Figure 6-1**).

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 used in the modelling are given in **Table 6-8**.

Table 6-8: Characteristics of the marine diesel used in the modelling

Hydrocarbon Type	Initial Density (g/cm^3) at 25°C	Viscosity (cP @ 25°C)	Component BP (°C)	Volatiles <180	Semi volatiles 180–265	Low Volatility (%) 265–380	Residual (%) >380
				Non-Persistent			Persistent
Marine Diesel (surrogate for MGO)	0.829	4.0	% of total	6	34.6	54.4	5

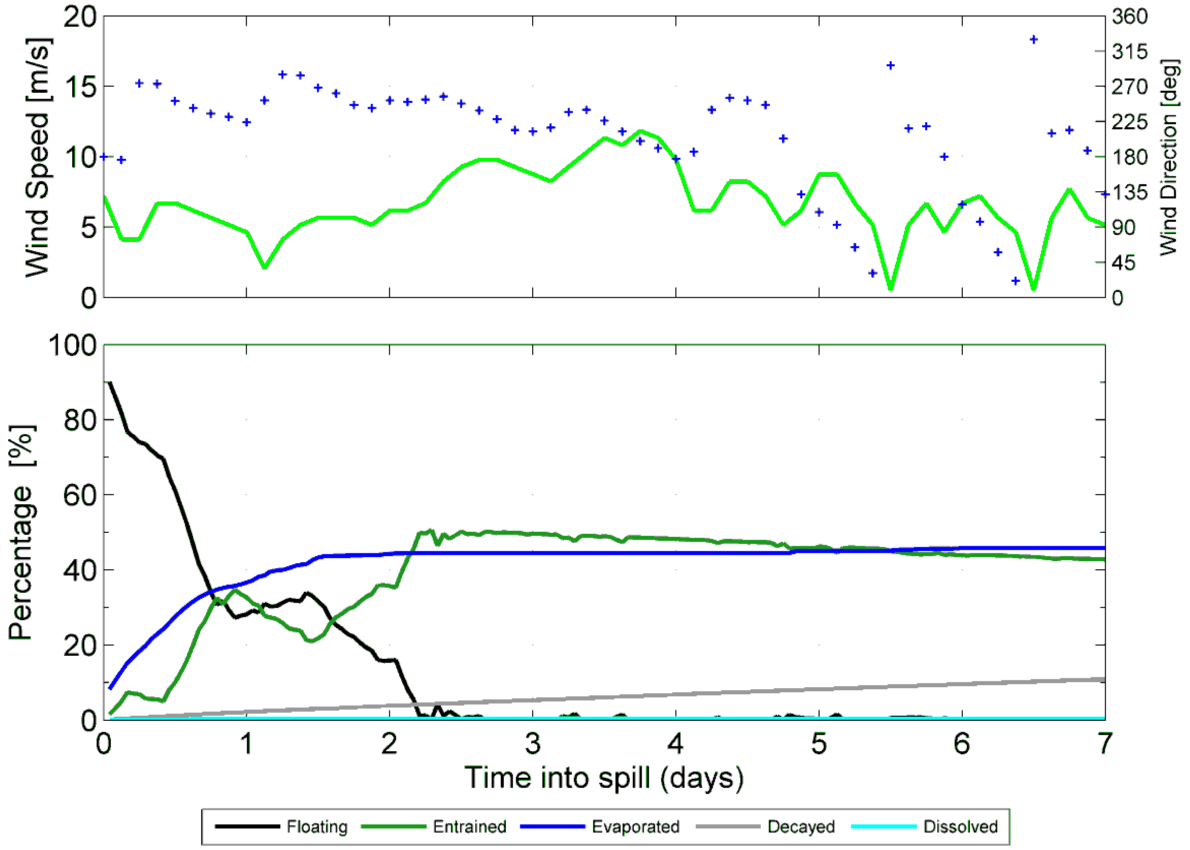


Figure 6-1: Proportional mass balance plot representing the weathering of marine diesel spilled onto the water surface as a one-off release (50 m^3 over one hour) and subject to variable wind at 27 °C water temperature and 25 °C air temperature

Impact Assessment

Potential Impacts Overview

Environment that May Be Affected

The overall EMBA for the Petroleum Activities Program is based on stochastic modelling, which compiles data from 200 hypothetical worst-case spills under a variety of weather and metocean conditions (as described in **Section 6.9.1**). Therefore, the EMBA covers a larger area than the area that would be affected during any one single spill event, and thus represents the total extent of all the locations where hydrocarbon thresholds could be exceeded from all modelling runs. The trajectory of a single spill would have a considerably smaller footprint.

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 discussed for each fate.

Surface hydrocarbons

Quantitative hydrocarbon spill modelling results for surface hydrocarbons are shown in **Table 6-9**. In the event that this scenario occurred, a surface hydrocarbon slick would form down current of the release location with the trajectory dependent on prevailing wind and current conditions at the time. The modelling indicates that the spill would be localised and confined to open water, extending up to approximately 150 km from the release location.

Entrained hydrocarbons

Quantitative hydrocarbon spill modelling results for entrained hydrocarbons are shown in **Table 6-9**. In the event that this vessel collision scenario occurred, the probability of contact by entrained oil at concentrations above 100 ppb is predicted to be highest at receptors associated with the Ningaloo coast and at the Gascoyne AMP (6.5% and 18%, respectively).

Dissolved hydrocarbons

Quantitative hydrocarbon spill modelling results for dissolved hydrocarbons are shown in **Table 6-9**. Dissolved hydrocarbons above threshold concentrations (>50 ppb) were predicted by modelling to occur at receptors associated with the Ningaloo and the Gascoyne AMPs.

Accumulated hydrocarbons

Quantitative hydrocarbon spill modelling results for accumulated hydrocarbons are shown in **Table 6-9**. Accumulated hydrocarbons above threshold concentrations (>100 g/m^2) were predicted by the modelling to occur at Ningaloo Reef and the Muiron Islands. The largest potential volume of oil accumulating on any shoreline is expected to be 196 m^3 at Ningaloo coast north. Large potential volumes are also potentially forecast at the Muiron Islands (38 m^3).

Table 6-9: Key receptor locations and sensitivities potentially contacted above impact thresholds by the vessel collision scenario with summary hydrocarbon spill contact (table cell values correspond to probability of contact [%])

Environmental setting	Location / name	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure (WM0000PG10055394))																													Probability of hydrocarbon contact (diesel) (%) Note: the probability is based on stochastic modelling of 200 hypothetical worst-case spills under a variety of weather and metocean conditions					
		Physical		Biological																						Socio-economic and Cultural										
		Water Quality	Sediment Quality	Marine Primary Producers			Other Communities / Habitats								Protected Species									Other Species		Fisheries – commercial	Fisheries – traditional				Socio-cultural EMBA		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	Seasnakes	Whale sharks	Sharks and rays	Sea birds and/or migratory shorebirds	Pelagic fish populations	Resident /Demersal Fish			Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Shipwrecks	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (1–10 g/m²)	Accumulated hydrocarbons (10–100 g/m²)	Surface hydrocarbon (≥10 g/m²)	Entrained hydrocarbon (≥100 ppb)	Dissolved aromatic hydrocarbon (≥50 ppb)	Accumulated hydrocarbons (>100 g/m²)
Offshore	Ningaloo AMP	✓						✓		✓					✓	✓			✓		✓	✓	✓	✓	✓	✓		✓	✓		4	1.5	2	6.5	0.5	N/A
	Gascoyne AMP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	11	8	5	18	1	N/A
	Shark Bay AMP/ WHA	✓	✓					✓							✓	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓		-	N/A	-	0.5	-	N/A
	Abrolhos Islands AMP	✓	✓	✓			✓	✓		✓						✓		✓	✓	✓		✓	✓	✓	✓			✓	✓		-	N/A	-	0.5	-	N/A
	Carnarvon Canyon AMP	✓	✓					✓		✓														✓	✓	✓		✓	✓		-	N/A	-	0.5	-	N/A
Islands	Muiron Islands (WHA, State Marine Park)	✓	✓	✓	✓		✓	✓		✓		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓		0.5	0.5	-	0.5	-	0.5
	Bernier and Dorre Islands	✓	✓	✓	✓	✓	✓					✓		✓			✓		✓			✓	✓	✓	✓			✓	✓		-	-	-	1	-	-
Mainland (nearshore waters)	Ningaloo coast (north, middle and south) (WHA, and State Marine Park)	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		4	1	2	6.5	0.5	0.5
	WA coastline	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		0.5	1.5	0.5	4.5		0.5

Potential impacts to environmental values
Summary of Potential Impacts to protected species
Marine Mammals (Cetaceans and Dugongs) Marine mammals 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 (DWH Natural Resource Damage Assessment Trustees, 2016). This may result in the irritation of sensitive membranes such as the eyes, mouth, digestive and respiratory tracts and organs, impairment of the immune system, neurological damage (Helm et al., 2015), reproductive failure, adverse health effects (e.g. lung disease, poor body condition) and potentially mortality (DWH Natural Resource Damage Assessment Trustees, 2016). In a review of cetacean observations relating to a number of large-scale hydrocarbon spills, Geraci (1988) found little evidence of mortality associated with hydrocarbon spills. However, it was concluded that exposure to oil from the DWH resulted in increased mortality to cetaceans in the Gulf of Mexico (DWH Natural Resource Damage Assessment Trustees, 2016). Geraci (1988) did identify behavioural disturbance (i.e. avoiding spilled hydrocarbons) in some instances for several species of cetacean, suggesting that cetaceans have the ability to detect and avoid 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 DWH spill, cetaceans were routinely seen swimming in surface slicks offshore (and nearshore) (Achinger Dias et al., 2017). Impacts to cetaceans depends on the exposure pathway; with exposure to entrained oil and surface slicks not expected to result in significant impacts due to the relatively volatile, non-persistent nature of the hydrocarbons. Direct toxic effects from external exposure are not expected to occur, although mucous membranes and eyes may become irritated. Indirect toxic effects, such as hydrocarbon ingestion through accumulation in prey may occur. Baleen whales feeding within entrained hydrocarbon plumes may ingest hydrocarbons, potentially resulting in toxic effects (particularly fresh hydrocarbons near the release location). Five threatened and migratory, and six migratory cetacean species were identified by a search of the EPBC Act Protected Matters Database, as potentially occurring in the EMBA (refer to **Section 4.6.3**). In the event of a vessel collision, there is potential that surface and entrained hydrocarbons exceeding threshold concentrations will be transported across the north and southbound migratory route (BIA) of humpback and pygmy blue whales. If a vessel collision occurred during June to September it would coincide with humpback whale migration through the waters off the North West Cape, and if a vessel collision occurring during April to July or October to January it would coincide with pygmy blue whale migration. While opportunistic feeding may occur during migration, it is considered rare, therefore, a vessel diesel spill could result in a disruption to a portion of the population but it is not predicted to impact on the overall population viability. Nearshore dolphin species (spotted bottlenose dolphin and Indo-Pacific humpback dolphin) and dugongs are known to reside or frequent nearshore waters, including the Ningaloo coast, which may be potentially impacted by surface, entrained and dissolved hydrocarbons exceeding threshold concentrations in the event of a vessel collision. A BIA for dugongs lies within the EMBA, approximately 28 km south of the Operational Area (**Section 4.6.3**). Given these species are known to exhibit site fidelity and are often resident, 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 worse affected areas. A loss of marine diesel from a vessel collision could result in a disruption to individual marine mammals transiting the EMBA. Such disruption could include behavioural impacts (e.g. avoidance of impacted areas), sub-lethal biological effects (e.g. skin irritation, irritation from ingestion or inhalation) and, in rare circumstances, death. Additionally, a hydrocarbon spill may have an impact on feeding habitats of dugongs and nearshore dolphin species, and result in a disruption to a portion of the local population. However, such disruptions or impacts are not predicted to impact on the overall population viability of the species within the EMBA. ***Marine Turtles*** Adult sea turtles exhibit no avoidance behaviour when they encounter hydrocarbon slicks (NOAA, 2010). Contact with surface slicks, or entrained hydrocarbon, can therefore, result in hydrocarbon adherence 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 pathway includes an increase in the production of white blood cells, and even a short exposure to hydrocarbons may affect the functioning of their salt gland (Lutcavage et al., 1995). Hydrocarbons in surface waters may also impact turtles when they surface to breathe and inhale toxic vapours. Their breathing pattern, involving large ‘tidal’ volumes and rapid inhalation before diving, results in direct exposure to petroleum vapours which are the most toxic component of the hydrocarbon spill (Milton and Lutz, 2003). This can lead to lung damage and congestion, interstitial emphysema, inhalant pneumonia and neurological impairment (NOAA, 2010). Contact with entrained hydrocarbons can result in hydrocarbon adherence to body surfaces causing irritation of mucous membranes in the nose, throat and eyes leading to inflammation and infection (Gagnon and Rawson, 2010).

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 on turtles during the breeding season at nesting beaches. Contact with gravid adult females or hatchlings may occur on nesting beaches (accumulated hydrocarbons) or in nearshore waters (entrained hydrocarbons) where hydrocarbons are predicted to make shoreline contact. Female turtles attempting to nest may avoid oiled beaches, or become oiled externally after contacting stranded hydrocarbons (Milton et al., 2010). Note that turtles typically nest well above the high tide level, beyond the high tide level where stranded hydrocarbons typically accumulate. Oiled nesting female turtles may be subject to acute and chronic toxic effects, including reduced reproductive success and mortality (Milton et al., 2010). Hatchling turtles may encounter stranded oil when exiting the nest, and surface and entrained oil upon reaching the sea. Hatchling turtles are expected to be more vulnerable to oil exposure than adult turtles, due to the relatively smaller size and greater portion of time spend at the sea surface (i.e. more likely to encounter floating oil) (Milton et al., 2010).

Due to the absence of potential nesting habitat and location offshore, the Operational Area is unlikely to represent important habitat for marine turtles (approximately 35 km from the Muiron Islands and the north Ningaloo coast and water depths of approximately 400 to 600 m deep). However, several marine turtle species utilise 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 Ningaloo coast. Marine turtles have distinct breeding seasons as detailed in **Section 4.6.2**. The nearshore waters of these turtle habitat areas may be exposed to surface, entrained and dissolved hydrocarbons exceeding threshold concentrations, and accumulated hydrocarbons above threshold concentrations. In the event that accumulated hydrocarbons (Ningaloo coast only) or entrained hydrocarbons reach the shoreline or internesting coastal waters (as predicted for the Ningaloo coast), there is the potential for impacts to turtles utilising the affected area.

During the breeding season, turtle aggregations near nesting beaches in the NWMR, within the EMBA, are most vulnerable due to greater turtle densities and potential impacts may occur at the population level but it is not expected to impact on overall population viability. Several important nesting areas were identified as potentially being subject to shoreline accumulation of hydrocarbons >100 g/m^2, including Ningaloo coast and Muiron Islands. While these are regionally significant nesting areas, all marine turtle species have significant nesting areas beyond the EMBA.

In the event of a vessel collision, a hydrocarbon spill may have a minor disruption to a portion of the population; however, there is no threat to overall population viability.

Seasnakes

Impacts to seasnakes from direct contact with hydrocarbons are likely to result in similar physical effects to those recorded for marine turtles and 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, seasnakes frequent the waters of the continental shelf area around offshore islands and potentially submerged shoals (water depths <100 m) and while individuals may be present in the EMBA (**Section 4.6.2**), their abundance is not expected to be high given the deepwater and offshore location of the activity. Therefore, a hydrocarbon spill may have a minor disruption to a portion of the population but there is no threat to overall population viability.

Sharks (including Whale Sharks) and Rays

Impacts to sharks and rays may occur through direct contact with hydrocarbons and contaminate the tissues and internal organs either through direct contact or via the food chain (consumption of prey). In the offshore environment, it is probable that pelagic shark species are able to detect and avoid surface waters underneath hydrocarbon spills by swimming into deeper water or away from the affected areas. Stochastic spill model outputs indicate potential impacts from entrained and/or dissolved aromatic hydrocarbons to the benthic communities of nearshore, subtidal communities of the Ningaloo coast, and it is considered that there is potential for habitat loss to occur. Nearshore shark and ray populations displaced or no longer supported due to habitat loss would be expected to redistribute to other locations. However, widespread habitat loss is unlikely and any impact on sharks and rays is predicted to be minor and only a temporary disruption.

A foraging BIA for the whale shark is located within the EMBA (refer to **Section 4.6.1.1**), approximately 8 km east of the Operational Area, representing an area where solitary whale sharks may forage during their migration from Ningaloo (primarily between September and November). Hydrocarbon contact may affect whale sharks through ingestion (entrained/dissolved hydrocarbons), particularly if 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 consists of 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). These feeding methods would result in potential for individuals that are present in worse affected spill areas to ingest potentially toxic amounts of entrained/dissolved aromatic hydrocarbons into their body. Large amounts of ingested hydrocarbons may affect their endocrine and immune system in the longer term. The presence of hydrocarbons may cause displacement of 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 entrained/dissolved aromatic hydrocarbons through the contamination of their prey. If the spill event were to occur during the spawning season, this important food supply (in worse 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. Individual whale sharks that have direct contact with hydrocarbons within the spill affected area may be impacted, but the consequences to migratory whale shark populations are likely to be minor.

Several threatened species of sawfish (*Pristis* spp.) were identified by a search of the EPBC Act Protected Matters Database, as potentially occurring in the EMBA (refer to **Section 4.6.1**). In the event of a vessel collision, a hydrocarbon spill may have a minor disruption to a portion of the population; however, there is no threat to overall population viability.

Seabirds and/or Migratory Shorebirds

Offshore waters are potential foraging grounds for seabirds associated with the coastal roosting and nesting habitat (Ningaloo and the Barrow/Montebello/Lowendal Island Group). The Operational Area overlaps with a breeding and foraging BIA for the wedge-tailed shearwater, and the EMBA overlaps with additional breeding and foraging BIAs for the Australian fairy tern and roseate tern, approximately 29 km south and 86 km south of the Operational Area, respectively.

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 plumage fouling and hypothermia (loss of thermoregulation), decreased buoyancy and potential to drown, inability to fly or feed, anaemia, pneumonia and irritation of eyes, skin, nasal cavities and mouths (AMSA, 2013; IPIECA, 2004) and result in mortality due to oiling of feathers or the ingestion of hydrocarbons. Longer-term exposure effects that may potentially impact seabird populations include a loss of reproductive success (loss of breeding adults) and malformation of eggs or chick (AMSA, 2013). Seabirds typically nest above the high water mark and as such, are not likely to encounter stranded hydrocarbons. The extent of the EMBA for a surface slick may result in impacts on feeding habitat, however this is not expected to result in a threat to the overall population viability of seabirds or shorebirds.

Migratory shorebirds may be exposed to stranded hydrocarbon when foraging or resting in intertidal habitats, however, direct oiling is typically restricted to relatively small portion of birds, and such oiling is typically restricted to the birds' feet. Unlike seabirds, shorebird mortality due to hypothermia from matted feathers is relatively uncommon (Henkel et al., 2012). Indirect impacts, such as reduced prey availability, may occur (Henkel et at. 2012).

Summary of potential impacts to habitats and communities

Coral Reefs

Exposure to entrained hydrocarbons has the potential to result in lethal or sub-lethal toxic effects to corals and other sensitive sessile benthos within the upper water column, including subtidal corals. Mortality in a number of coral species is possible and this would result in the reduction of coral cover and change in the composition of coral communities. Sub-lethal 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). In the unlikely event of a marine diesel spill occurring at the time of coral spawning at potentially affected coral locations or in the general peak period of biological productivity, there is potential for a reduction in successful fertilization 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 sub-lethal impacts and in some cases mortality. This is with particular reference to the 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 be entirely dependent on actual hydrocarbon concentration, duration of exposure and water depth of the affected communities.

The quantitative spill risk assessment and output EMBA indicate there would be a low probability for entrained and dissolved aromatic hydrocarbons (above threshold concentration) to contact shallow nearshore waters and therefore exposure of subtidal corals associated with the fringing reefs located at a number of mainland and island locations. Areas that may be contacted by entrained hydrocarbons and dissolved hydrocarbons include the Ningaloo coast. There is the potential for reefs along the Ningaloo coast to be exposed to entrained and/or dissolved aromatic hydrocarbons concentrations that are considered to induce toxicity effects, particularly for reproductive and juvenile stages of invertebrate and fish species.

Seagrass beds, Macroalgae and Mangroves

Seagrass and macroalgal beds occurring in the intertidal and subtidal zone may be susceptible to impacts from entrained/dissolved hydrocarbons. Toxicity effects can also occur due to absorption of soluble fractions of hydrocarbons into tissues (Runcie et al., 2010). The potential for toxicity effects of entrained hydrocarbons may be reduced by weathering processes that should serve to lower the content of soluble aromatic components before contact occurs. Exposure to entrained/dissolved aromatic hydrocarbons may result in mortality, depending on actual entrained/dissolved aromatic hydrocarbon concentration received and duration of exposure. Physical contact with entrained hydrocarbon droplets could cause sub-lethal stress, causing reduced growth rates and a reduction in tolerance to other stress factors (Zieman et al., 1984). Impacts on seagrass and macroalgal communities are likely to occur in areas where hydrocarbon threshold concentrations are exceeded.

Mangrove habitat and associated mud flats and salt marsh at Ningaloo coast (small habitat areas), have the potential to be exposed. Hydrocarbons coating prop roots of mangroves can occur from surface hydrocarbons when hydrocarbons are deposited on the aerial roots. Hydrocarbons deposited on the aerial roots can block the pores used to breathe or interfere with the trees' salt balance resulting in sub-lethal and potential lethal effects. Mangroves can also be impacted by entrained/dissolved aromatic hydrocarbons that may adhere to the sediment particles. 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 (National Oceanic and Atmospheric Administration [NOAA], 2014).

Entrained/dissolved hydrocarbon impacts may include sub-lethal stress and mortality to certain sensitive biota in these habitats, including infauna and epifauna. Larval and juvenile fish, and invertebrates that depend on these shallow subtidal and intertidal habitats as nursery areas, may be directly impacted due to the loss of habitats and/or lethal and sub-lethal in-water toxic effects. This may result in mortality or impairment of growth, survival and reproduction (Heintz et al., 2000). In addition, there is the potential for secondary impacts on shorebirds, fish, sea turtles, rays, and crustaceans that utilise these intertidal habitat areas for breeding, feeding and nursery habitat purposes.

Plankton and Fish Communities

There is the potential for plankton communities to potentially be impacted where entrained hydrocarbon threshold concentrations are exceeded. Communities are expected to recover quickly (weeks/months) due to high population turnover (ITOPF, 2011a). With the relatively small EMBA and the fast population turn-over of open water plankton populations, it is considered that any potential impacts would be low magnitude and temporary in nature.

Pelagic and demersal fish populations in the open water offshore environment of the Operational Area and EMBA are highly mobile and can move away from a marine diesel spill. The spill-affected area will likely be confined to the upper surface layers. It is therefore unlikely that fish populations would be exposed to hydrocarbon contamination. Fish populations are likely to be distributed over a wide geographical area so impacts on populations or species level are considered to be negligible. Given the above factors and the rapid dispersion of marine diesel, it is considered that any potential impacts to fish will be negligible.

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 sub-lethal impacts from exposure to hydrocarbons, particularly if a spill coincides with spawning seasons or if a spill reaches nursery areas close to the shore (e.g. seagrass and mangroves) (ITOPF, 2011a). Fish spawning mostly 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 unlikely event of a vessel collision there is potential for entrained hydrocarbons to occur in the surface water layers above threshold concentrations in nearshore waters including the Ningaloo coast. This, and the potential for possible lower concentration exposure for dissolved aromatic hydrocarbons, have the potential to result in lethal and sub-lethal impacts to a certain portion of fish larvae in affected areas, 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 supported by a recent study in the Gulf of Mexico which used juvenile abundance data 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 this 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). Any impacts to spawning and nursery areas are expected to be minor and short term, as would flow on effects to adult fish stocks into which larvae are recruited.

Summary of potential impacts to water quality

It is likely that water quality will be reduced at the hydrocarbon release location of the vessel collision to contamination levels above background levels and/or national/international quality standards; however, such impacts to water quality would be temporary and localised in nature due to the relatively small extent of the EMBA and the rapid dispersion of marine diesel. The potential impact is therefore expected to be low.

Summary of potential impacts to key ecological features

KEFs potentially impacted by a marine diesel spill from a vessel collision event are:

- Canyons that link the Cuvier Abyssal Plan with the Cape Range Peninsula
- Continental slope demersal fish communities
- Commonwealth waters adjacent to Ningaloo Reef

• Ancient coastline at 125 m depth contour • Exmouth Plateau • Wallaby Saddle • Ancient coastline at 90-120 m depth • Western demersal slope and associated fish communities • Perth Canyon and adjacent shelf break, and other west-canyons • Commonwealth marine environment surrounding the Houtman Abrolhos Islands • Western rock lobster The KEFs are primarily defined by seabed geomorphological features and/or indicate a potential for increased biological productivity and, therefore, ecological significance. The consequences of a hydrocarbon spill from a vessel collision may impact the values of the KEFs affected (for the values of each KEF see **Section 4.7**). Potential impacts to the above KEFs include impacts to demersal fish populations and reduced biodiversity. Impacts to benthic habitats are not predicted as hydrocarbons (surface, entrained and dissolved) will be limited to the upper layers of the water column. Most of 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 within surface water layers closest to the potential release location.
Summary of potential impacts to protected areas
The EMBA overlaps with a number of protected areas. The quantitative spill risk assessment results indicate that the open water environment protected within the Gascoyne AMP, Ningaloo AMP, Shark Bay AMP, Abrolhos Islands AMP and Carnarvon AMP may be affected by the released hydrocarbons (refer to **Table 6-9**). The Ningaloo State Marine Park and Muiron Islands Management Area are also located within the EMBA and may be affected by the release of hydrocarbons. Many of the protected areas identified contain marine fauna and biological communities, which are considered to be of important environmental value that the protected areas are intended to protect (**Section 4.8**). As outlined in the preceding sections, a hydrocarbon release from a vessel collision may impact upon a range of these values simultaneously, and different receptors in an affected area may recover at different rates. In the event of simultaneous impacts to environmental values within a protected area, the collective environment of the protected area may be compromised to a greater extent than the assessments of each individual value would indicate. Impact on the protected areas is discussed in the sections above for ecological the values and sensitivities and below for socio-economic values. Additionally, such hydrocarbon contact may alter stakeholder understanding and/or perception of the protected marine environment, given these represent areas largely unaffected by anthropogenic influences and contain biological diverse environments.
Summary of potential impacts to socio-economic values
Socio-economic A marine diesel spill is considered unlikely to cause significant direct impacts on the target species fished by the Commonwealth and State Fisheries (see **Section 4.9.2**) which overlap with the EMBA. Active fisheries within the EMBA primarily target demersal and benthic species (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 due is expected to only result in negligible impacts, considering the relatively small area of the EMBA and hydrocarbons are confined to the top 40 m of the water column. However, 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 on undertaking fishing within the area of the spill. A loss of hydrocarbons due to vessel collision during the Petroleum Activities Program may lead to exclusion of marine nature-based tourist activities at Ningaloo coast, 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. Given the nature of a marine diesel spill, impacts would be expected to be temporary in nature. There are a number of oil and gas facilities that occur within the EMBA (e.g. Ngujima Yin FPSO). Avoidance of surface hydrocarbons is a possible response by other vessels. However, such occurrences will likely be limited to close proximity to the release site and other oil and gas activities are unlikely to be impacted. Similarly, impacts to commercial shipping operations are unlikely to be impacted given the nearest shipping fairway is approximately 40 km north-west of the Operational Area. ***Cultural Heritage*** There are a number of historic shipwrecks identified in the vicinity of the Operational Area, with the closest to the Operational Area being the Beatrice, located approximately 12 km away. These heritage sites are located on the

seabed, and will not be directly impacted by a marine diesel spill as hydrocarbons (surface, entrained and dissolved) are confined to the upper layers of the water column. Accumulated hydrocarbons above threshold concentrations (>100 g/m^2) are predicted at Ningaloo coast. It is acknowledged that the area contains numerous Indigenous sites such as burial grounds, middens and fish traps that provide a historical account of the early habitation of the area and a tangible part of the culture of local Indigenous groups (CALM, 1990). Additionally, the Ningaloo coast is a designated World, National and Commonwealth heritage place (**Section 4.9.1**). Potential impacts to the Ningaloo coast have been discussed in the sections above.
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 would be minor and short-term in nature to water quality in comparison to background levels and/or international standards with minor and short-term 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 is defined as D, which equates to 'minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), 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				
500 m safety exclusion zone established around the offshore support vessels during decommissioning 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.	Controls based on legislative requirements – must be adopted.	Yes **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.	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.	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 9.2**
Marine Order 21 (safety and emergency arrangements) 2016, including:	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of interference with	Benefits outweigh cost/sacrifice. Control is also standard practice.	Yes **C 9.3**

[20] Qualitative measure

• 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.		other marine users and thus the likelihood of a collision.		
Comply with Marine Order 27 (Safety of navigation and radio equipment) 2016, including: • navigational systems and equipment mentioned in Regulations 19 and 20 of Chapter V of SOLAS for the vessel are type approved and installed on board vessels • navigational systems and equipment mentioned in Regulations 7 to 11 of Chapter IV of SOLAS are installed on board vessels • navigational systems and equipment are maintained in working order • navigational activities and incidents of importance to safety of navigation on the vessel are recorded.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirement to reduce the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted	Yes **C 9.4**
Good Practice				
Have a support vessel on standby during all activities to communicate with third-party vessels and help maintain a safety exclusion zone.	F: Yes. CS: Additional costs.	Given the legislative controls in place and the duration of the activities, using a support vessel will provide only a small reduction in the likelihood of a collision with a third party vessel.	Grossly disproportionate.	No
Develop SIMOPs management plan to manage permissions for all	F: Yes. CS: Minimal cost. Standard practice.	SIMOPs management plans between Woodside	Benefits outweigh cost/sacrifice.	Yes **C 9.5**

field entry activity and control of work between the three distinct decommissioning delivery streams.		operated vessels in the Operational Area will reduce the likelihood of a collision occurring.		
Notify AHO of activities and movements no less than four working weeks prior to the scheduled activity commencement date.	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 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.	Notifications were requested through consultation with relevant persons, as outlined in **Section 5**. Communicating the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of interfering with other marine users.	Benefits outweigh cost/sacrifice.	Yes **C 1.2**
Notify AMSA JRCC of activities and movements 24 to 48 hours before operations commence.	F: Yes. CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of a collision with a third party vessel.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes **C 1.3**
Notify relevant stakeholders for activities and movements that commence more than a year after EP acceptance.	F: Yes. CS: Minimal cost. Standard practice.	Communication of the Petroleum Activities Program to other marine users ensures they are informed and aware, thereby reducing the likelihood of a collision with a third party vessel.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes **C 1.4**
Notify AHO and AMSA 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.	Yes **C 1.5**

In the event of a spill, emergency response activities implemented in accordance with the OPEP (**Table 7-5**)	F: Yes CS: Costs associated with implementing response strategies, vary dependant on nature and scale of spill event. Standard practice.	Potentially reduces consequence by implementing response to reduce impacts to the marine environment	Control based on regulatory requirement – must be adopted.	Yes **C 9.6**
Arrangements supporting the activities in the OPEP (**Table 7-5**) 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 9.7**
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 undertaken (see details above)				
ALARP Statement On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the 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 unplanned loss of hydrocarbon as a result of a vessel collision represents a moderate current risk rating that is unlikely to result in potential impact greater than localised, minor and temporary disruption to a small proportion of the population and no impact on critical habitat or activity. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are consistent with the most relevant regulatory guidelines, good oil-field practice/industry best practice, and in some cases are above industry best practice and meet legislative requirements of (Marine Orders 30, 21 and 27). As demonstrated in **Section 6.10**, the residual risk of unplanned hydrocarbon release from vessel collision is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans, based on the adopted controls. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential risks. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of a loss of vessel structural integrity to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 9 No release of hydrocarbons to the marine environment due to a vessel collision associated with the Petroleum Activities Program.	**C 9.1** 500 m safety exclusion zone established around the offshore support vessels.	**PS 9.1** No adverse interactions between vessels.	**MC 9.1.1** Records of adverse interactions in 500 m safety exclusion zone with other marine users are recorded.
	C 9.2 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 9.2** Project vessels compliant with Marine Order 30 (prevention of collisions) 2016 (which requires vessels to be visible at all times) to prevent unplanned interaction with marine users.	**MC 9.2.1** Marine Assurance inspection records demonstrate compliance with standard maritime safety procedures (Marine Orders 21, 27 and 30).
	C 9.3 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 • AIS that provides other users with information about the vessel's identity, type, position, course, speed, navigational status and other safety-related data.	**PS 9.3** Project vessels compliant with Marine Order 21 (safety of navigation and emergency procedures) 2016 to prevent unplanned interaction with marine users.	
	C 9.4 Comply with Marine Order 27 (Safety of navigation and radio equipment) 2016, including: • navigational systems and equipment mentioned in Regulations 19 and 20 of Chapter V of SOLAS for the vessel are type approved and installed on board vessels	**PS 9.4** Project vessels compliant with Marine Order 27 (Safety of navigation and radio equipment) 2016.	

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	• navigational systems and equipment mentioned in Regulations 7 to 11 of Chapter IV of SOLAS are installed on board vessels • navigational systems and equipment are maintained in working order • navigational activities and incidents of importance to safety of navigation on the vessel are recorded.		
	C 9.5 Develop SIMOPs management plan to manage permissions for all field entry activity and control of work between the three distinct decommissioning delivery streams.	**P 9.5** SIMOPs management plan is in place where multiple campaigns occur concurrently within the Operational Area.	**MC 9.5.1** Records indicate a SIMOPs management plan has been created.
	C 9.6 In the event of a spill, emergency response activities implemented in accordance with the OPEP (**Table 7-5**).	**PS 9.6** In the event of a spill the OPEP requirements are implemented.	**MC 9.6.1** Completed incident documentation.
	C 9.7 Arrangements supporting the activities in the OPEP (**Table 7-5**) will be tested to ensure the OPEP can be implemented as planned.	**PS 9.7.1** Exercises/tests will be conducted in alignment with the frequency identified in **Table 7-7**.	**MC 9.7.1** Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 9.7.2 Woodside's procedure demonstrates a minimum level of trained personnel, for core roles in the OPEP, are maintained.	**PS 9.7.2** Emergency Management dashboard confirms that minimum level of personnel trained for core OPEP roles are available.
	C 1.1 Refer to **Section 6.8.1**	**PS 1.1** Refer to **Section 6.8.1**	**MC 1.1.1** Refer to **Section 6.8.1**
	C 1.2 Refer to **Section 6.8.1**	**PS 1.2** Refer to **Section 6.8.1**	**MC 1.2.1** Refer to **Section 6.8.1**
	C 1.3 Refer to **Section 6.8.1**	**PS 1.3** Refer to **Section 6.8.1**	**MC 1.3.1** Refer to **Section 6.8.1**
	C 1.4 Refer to **Section 6.8.1**	**PS 1.4** Refer to **Section 6.8.1**	**MC 1.4.1** Refer to **Section 6.8.1**
	C 1.5 Refer to **Section 6.8.1**	**PS 1.5** Refer to **Section 6.8.1**	**MC 1.5.1** Refer to **Section 6.8.1**
Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D.**			

6.9.3 Unplanned Hydrocarbon Release: Bunkering

Context		
Project Vessels – **Section 3.7**	Physical Environment – **Section 4.4** Protected Species – **Section 4.6**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary													
Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence / Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Loss of hydrocarbons to marine environment from bunkering within the Operational Area.		X			X		A	E	2	M	LCS GP PJ RBA	Broadly Acceptable	EPO 10

Description of Source of Risk

Credible Scenario

Bunkering of marine diesel for project vessels may occur within the Operational Area. Three credible scenarios for the loss of containment of marine diesel during bunkering operations were identified:

1. Partial or total failure of a bulk transfer hose or fittings during bunkering, due to operational stress or other integrity issues could spill marine diesel to the deck and/or into the marine environment. This would be in the order of less than 200 L, based on the likely volume of a bulk transfer hose (assuming a failure of the dry break and complete loss of hose volume).
2. Partial or total failure of a bulk transfer hose or fittings during bunkering, combined with a failure in procedure to shutoff fuel pumps, for a period of up to five minutes, resulting in approximately 8 m^3 marine diesel loss to the deck and/or into the marine environment.
3. Partial or total failure of a bulk transfer hose or fittings during helicopter refuelling could spill aviation jet fuel to the helicopter deck and/or into the marine environment. All helicopter refuelling activities are closely supervised and leaks on the helideck are considered to be easily detectable. In the event of a leak, transfer would be ceased immediately. The credible volume of such a release during helicopter refuelling would be in the order of <100 L.

Quantitative Spill Risk Assessment

Given the physical and chemical similarities, and the relatively small credible spill volumes, marine diesel is considered to be a suitable substitution for aviation jet fuel for the purpose of this environmental risk assessment. Woodside has commissioned RPS APASA to model a surface spill volume of 8 m^3 in the offshore waters of northwest Western Australia. The results of these models have indicated that exposure to surface hydrocarbons above the 10 g/m^2 threshold is limited to the immediate vicinity of the release site, with little potential to extend beyond 1 km. Therefore, it is considered that exposure to thresholds concentrations from an 8 m^3 surface spill from bunkering activities would be well within the EMBA for the vessel collision scenario detailed in **Section 6.9.2**. Given this, the offshore location of the Operational Area, and the fact that the same hydrocarbon type is involved for both scenarios, specific modelling for an 8 m^3 marine diesel release was not undertaken for this Petroleum Activities Program.

Hydrocarbon Characteristics

Refer to **Section 6.9.2** for a description of the characteristics of marine diesel, including detail on the predicted fate and weathering of a spill to the marine environment.

Impact Assessment				
Potential impacts to environmental values				
Previous modelling studies for 8 m^3 marine diesel releases, spilt at the surface as result of bunkering activities, indicated that the potential for exposure to surface hydrocarbons exceeding 10 g/m^2 was confined to within the immediate vicinity (approximately 1 km) of the release sites. Therefore, it is considered that there is no potential for contact with sensitive receptor locations above surface (10 g/m^2), entrained (100 ppb) or dissolved (50 ppb) threshold concentrations from an 8 m^3 spill of marine diesel within the Operational Area.				
Summary of Potential Impacts to environmental values				
The potential biological and ecological impacts associated with much larger hydrocarbon spills are presented in **Section 6.9.2** and further detail on impacts specific to a spill of marine diesel from a bunkering loss are provided below. The biological consequences of such a small volume spill on identified open water sensitive receptors relate to the potential for minor impacts to megafauna (marine mammals and whale sharks), plankton and fish populations (surface and water column biota) that are within the spill affected area and no impacts to commercial fisheries are expected. Refer to **Section 6.9.2** (potential impacts of unplanned hydrocarbon release to the marine environment from vessel collision) for the detailed potential impacts; however, the extent of the EMBA associated with a marine diesel spill from loss during bunkering will be much reduced in terms of spatial and temporal scales, and hence, potential impacts from bunkering are considered very minor and short-term (<1 year).				
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 SOPEP/ SMPEP (as appropriate to vessel class).	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of a spill entering the marine environment. Although no significant reduction in consequence could result, the overall risk is reduced.	Controls based on legislative requirements – must be adopted.	Yes **C 10.1**
Good Practice				
Bunkering equipment controls: • All hoses that have a potential environmental risk following damage or failure shall be linked to the vessel's preventative maintenance system. • All bulk transfer hoses shall be tested in accordance with Original Equipment Manufacturer recommendations and re-certified annually as a minimum. • There shall be dry-break couplings and flotation on fuel hoses. • There shall be an adequate number of appropriately stocked, located and maintained spill kits.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of a spill occurring. Although no significant reduction in consequence could result, the overall risk is reduced.	Benefits outweigh cost/sacrifice.	Yes **C 10.2**

[21] Qualitative measure

Ensure contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: • A completed Permit to Work (PTW) and/or Job Safety Analysis (JSA) shall be implemented for the hydrocarbon bunkering/ refuelling operation. • Gauges, hoses, fittings and the sea surface shall be visually monitored during the operation. • Hoses shall be visually inspected as per vessel procedures prior to commencement. • Bunkering/refuelling will commence in daylight hours. If the transfer is to continue into darkness, the JSA risk assessment must consider lighting and the ability to determine if a spill has occurred. • Hydrocarbons shall not be transferred in marginal weather conditions.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of a spill occurring. Although no significant reduction in consequence could result, the overall risk is reduced.	Benefits outweigh cost/sacrifice.	Yes **C 10.3**
Mitigation: oil spill response	Refer to **Appendix D.**			
Professional Judgement – Eliminate				
No refuelling of helicopter on project vessels.	F: No. Given the distance of the Operational Area from the airports suitable for helicopter operations, and the endurance of available helicopters, eliminating helicopter refuelling is not feasible. Helicopter flights cannot be eliminated, and may be required in emergency situations. CS: Not assessed, control cannot feasibly be implemented.	Not considered – control not feasible.	Not considered – control not feasible.	No
Project vessels brought into port to refuel.	F: No. Does not eliminate the fuel transfer risk. It is not operationally practical to transit project vessels back to port for refuelling, based on the frequency of the refuelling	Eliminates the risk in the Operational Area; however, moves risk to another location. Therefore, no overall benefit.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No

	requirements and distance from the nearest port (Dampier 150 km). CS: Significant due to schedule delay and vessel transit costs and day rates.			
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, Woodside considers the adopted controls appropriate to manage the impacts and risks of a bunkering spill. 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 Loss of hydrocarbons to marine environment during bunkering has been evaluated as having a low current risk rating that is unlikely to result in potential impact greater than minor and temporary exceedance over national/international water quality standards and a localised, minor and temporary disruption to a small proportion of the population and no impact on critical habitat or activity of protected species. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. As demonstrated in **Section 6.10**, the residual risk of unplanned hydrocarbon release from bunkering is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans, based on the adopted controls. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential risks. The potential impacts and risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of the described emissions to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 10 No unplanned loss of hydrocarbons to the marine environment from bunkering greater than a consequence	**C 10.1** Marine Order 91 (marine pollution prevention – oil) 2014, requires SOPEP/ SMPEP (as appropriate to vessel class).	**PS 10.1** Appropriate initial responses prearranged and drilled in case of 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 Bunkering equipment controls: • All hoses that have a potential environmental risk following damage or failure shall be linked to the vessel's preventative maintenance system. • All bulk transfer hoses shall be tested in accordance with Original Equipment Manufacturer recommendations and re-certified annually as a minimum.	**PS 10.2.1** Ensure equipment identified as having integrity damage is replaced prior to failure.	**MC 10.2.1** Records confirm the vessel bunkering equipment is subject to systematic integrity checks as per vessels preventative maintenance schedule.
		PS 10.2.2 Minimise inventory loss in the event of a failure.	**MC 10.2.2** Records confirm presence of dry break of couplings, ESD, and flotation on fuel hoses.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
level of E[22] during the Petroleum Activities Program.	• There shall be dry-break couplings and flotation on fuel hoses. • There shall be an adequate number of appropriately stocked, located and maintained spill kits.	**PS 10.2.3** Ensure adequate resources are available to allow implementation of SOPEP.	**MC 10.2.3** Records confirm presence of spill kits.
	C 10.3 Ensure contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: • A completed PTW and/or JSA shall be implemented for the hydrocarbon bunkering/ refuelling operation. • Gauges, hoses, fittings and the sea surface shall be visually monitored during the operation. • Hoses shall be visually inspected as per vessel procedures prior to commencement. • Bunkering/refuelling will commence in daylight hours. If the transfer is to continue into darkness, the JSA risk assessment must consider lighting and the ability to determine if a spill has occurred. • Hydrocarbons shall not be transferred in marginal weather conditions.	**PS 10.3** Comply with Contractor procedures for managing bunkering/helicopter refuelling operations.	**MC 10.3.1** Records demonstrate bunkering/refuelling performed in accordance with contractor bunkering procedures.
Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are presented in **Appendix D.**			

[22] Defined as ‘Slight, short term local impact (<1 year), on species, habitat but not affecting ecosystem function), physical or biological attributes’ (**Section 2.7.4**).

6.9.4 Unplanned Discharges: Deck and Subsea Spills

Context		
Project Fluids – **Section 3.13** Project Vessels – **Section 3.7**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5** Protected Species – **Section 4.6**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary													
Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence / Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Accidental discharge of hydrocarbons/chemicals from project vessel 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 stored hydrocarbons/chemicals or from equipment. Storage areas on project vessels are typically set up with effective primary and secondary bunding to contain any deck spills, and can store hydrocarbons/chemicals in various volumes (20 L, 205 L; up to 4000-6000 L). Releases from equipment are typically due to hydraulic hose failure, located either within bunded areas, or outside of bunded or deck areas (e.g. on cranes over water). Helicopter refuelling may also take place within the Operational Area, on the helipad of project vessels. 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. Recovered infrastructure such as manifolds and flowlines may contain residual hydrocarbons (refer to **Section 3.12.2**). Any residual hydrocarbons remaining following recovery could be released to the vessel deck, within bunded areas. Subsea spills can result from a loss of containment of fluids from equipment, including the ROVs. Hydraulic fluid is supplied to the ROV through hoses containing approximately 20L of fluid. Hydraulic lines to ROV arms or other tooling may become caught, resulting in minor leaks to the marine environment. Small volume hydraulic leaks may occur from subsea equipment operating via hydraulic controls (subsea control fluid). These include the diamond cutting wire, bolt tensioning equipment, ROV tooling etc. • 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. • The relatively small, planned discharges associated with the Petroleum Activities Program are not expected to have impacts beyond the Operational Area.

Impact Assessment
Potential impacts to environmental values
Water Quality Accidental spills of hydrocarbons or chemicals from project vessels will decrease the water quality in the immediate area of the spill; however, the open water location and relatively small unplanned volumes of hydrocarbons/chemicals released will result in rapid dilution close to the source of discharge. Given the occasional nature of unplanned deck and subsea discharges, the small volumes, and the offshore location of the Operational Area, any changes to water quality are expected to have no lasting effects.

Marine Fauna
As a result of a change in water quality, further impacts to ecological receptors may occur, which include injury or mortality to marine fauna resulting from exposure to toxins in the released chemicals. The potential biological and ecological impacts associated with hydrocarbon spills are presented in **Sections 6.9.2 to 6.9.3**. 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 Sections 6.9.2 to 6.9.3**. Physical coating of marine fauna and sub-lethal or lethal toxic effects from hydrocarbons/chemicals are considered unlikely given the low volumes of potential discharge, short exposure times and the rapid dilution and dispersion of discharges once entering the marine environment. 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.
Summary of Potential Impacts to environmental values
Given the adopted controls, it is considered that minor unplanned accidental deck or subsea 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)[23]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 91 (marine pollution prevention – oil) 2014, requires SOPEP/ SMPEP (as appropriate to vessel class).	F: Yes. 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 11.1**
Good Practice				
Where there is potential for loss of primary containment of oil and chemicals on project vessels, deck drainage will be collected via a closed drainage system.	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**
Maintain and locate spill kits in close proximity to hydrocarbon storage areas and deck areas for use to contain and recover deck spills.	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 11.2**
Project vessels have self-containing hydraulic oil drip/spill 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 11.3**

[23] Qualitative measure

Recovered infrastructure that may contain residual hydrocarbons will be placed on deck in a bunded area.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of any leakage of residual hydrocarbons from entering the marine environment. The consequence is unchanged.	Benefits outweigh cost/sacrifice.	Yes **C 11.4**
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				
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 vessels.	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), 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. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are consistent with the most relevant regulatory guidelines and good oil-field practice/industry best practice. The residual risk of unplanned loss of chemicals/hydrocarbons from projects vessels is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans, based on the adopted controls. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential risks. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of minor unplanned deck and subsea spills to a level that is broadly acceptable.

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[24] during the Petroleum Activities Program.	**C 10.1** See **Section 6.9.3**	**PS 10.1** See **Section 6.9.3**	**MC 10.1.1** See **Section 6.9.3**
	C 11.1 Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily.	**PS 11.1** Failure of primary containment in storage areas does not result in loss to the marine environment.	**MC 11.1.1** 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 6.8.3**	**PS 4.3** See **Section 6.8.3**	**MC 4.3.1** See **Section 6.8.3**
	C 11.2 Maintain and locate spill kits in close proximity to hydrocarbon storage areas and deck areas for use to contain and recover deck spills.	**PS 11.2** Spill kits to be available for use to clean up deck spills.	**MC 11.2.1** Records confirms spill kits are present, maintained and suitably stocked.
	C 11.3 Project vessels have self-containing hydraulic oil drip/spill management system.	**PS 11.3** Contain any on-deck spills of hydraulic oil.	**MC 11.3.1** Records demonstrate Project vessels are equipped with a self-containing hydraulic oil drip/spill management system.
	C 11.4 Recovered infrastructure that may contain residual hydrocarbons will be placed on deck in a bunded area.	**PS 11.4** Contain any on-deck spills of residual hydrocarbon.	**MC 11.4.1** Records demonstrate that recovered infrastructure that may contain residual hydrocarbons is kept in a bunded area.
	C 5.2 See **Section 6.8.4**	**PS 5.2** See **Section 6.8.4**	**MC 5.2.1** See **Section 6.8.4**
Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in **Appendix D**.			

[24] Defined as ‘No lasting effect (<1 month). Localised impact not significant to environmental receptor’ (**Section 2.7.4**).

6.9.5 Planned and Unplanned Discharges: Loss of Solid Hazardous and Non-hazardous Wastes

Context		
Project Vessels – **Section 3.7**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5** Protected Species – **Section 4.6**	Stakeholder Consultation – **Section 5**

Risk Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence / Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Accidental loss solid of hazardous or non-hazardous wastes to the marine environment (excludes sewage, grey water, putrescible waste and bilge water) within the Operational Area.		X			X		A	F	2	L	LC S GP PJ	Broadly Acceptable	EPO 12
Inappropriate disposal of waste generated from infrastructure removal		X	X	X	X	X							
Generation and disposal of waste from infrastructure removal		X	X	X	X	X		E	-	-			EPO 13

Description of Source of Risk

Project vessels generate a variety of solid wastes which have the potential to be lost overboard to the marine environment. These include packaging and domestic wastes such as aluminium cans, bottles, paper and cardboard. Wastes on-board are managed in accordance with the on-board waste management plan, and some wastes may be incinerated. Based on industry experience, waste items lost overboard are typically wind-blown rubbish such as container lids, cardboard, light plastics, etc. Typically, such losses occur during back loading activities, periods of adverse weather and incorrect waste storage.

Infrastructure recovery will also generate industrial waste mainly comprising of steel, plastics and smaller quantities of other materials (**Sections 3.6** and **3.13**) that will require onshore handling and disposal at licensed facilities. The Enfield subsea infrastructure was tested for contamination (**Section 3.8**). Tests confirmed there were no NORMS present and that mercury levels were below all thresholds for special waste disposal (WA Landfill Waste Class I threshold of mercury contaminated waste is 0.2 mg/kg or below (DWER, 2019)). Wastes generated from decommissioning of subsea infrastructure could contribute to the increasing pressure on local landfills if not managed appropriately through consideration of the waste hierarchy and alternate means of disposal to landfill. There is also the potential for recovered infrastructure to be incorrectly classified and disposed of inappropriately leading to contamination of waste streams.

Impact Assessment

Potential impacts to environmental values

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 or mortality of individual animals.

Water Quality
The accidental loss of hazardous solid wastes, such as paint cans, oily rags etc., can cause a localised change in water quality through the release of contaminants, toxins and chemicals. Given the likely small volumes of any unplanned hazardous solid waste discharge, and the intermittent nature of the event, changes in water quality are likely to be temporary and highly localised, and rapidly return to background levels.
Marine Fauna
The unplanned discharge of solid wastes can result in injury or mortality to marine fauna, through contamination or physical injury. Ingestion or entanglement of marine fauna has the potential to cause physical harm and subsequently mortality by inhibiting feeding or foraging behaviours. The EPBC Act lists the injury and fatality to vertebrate marine life by ingestion or entanglement in harmful marine debris as a key threatening process (DoEE, 2018). Furthermore, the Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans identifies EPBC Act-listed species for which adverse effects of marine debris are scientifically documented (DoEE, 2018). Marine turtles and seabirds in particular may be at risk from plastics, which are mistaken for food, or may cause entanglement (DOEE, 2017; DoEE, 2018). Ingested plastics can cause damage to internal tissues and potentially prevent feeding activities, having a lethal effect on the individual. Marine debris has been identified as a threat in the Recovery Plan for Marine Turtles in Australia 2017-2027 (DOEE, 2017).
Several migratory and threatened species were identified as potentially occurring within the Operational Area, however the temporary or permanent loss of solid waste materials into the marine environment is not expected to have a significant impact to species including fish, birds, marine mammals and marine reptiles, given the type, size and frequency of wastes which could occur during the limited presence of vessels within the Operational Area, and the transient nature of the species present. Impacts will not occur at a population level, nor result in the decrease of the quality of the habitat such that the extent of these species is likely to decline.
While the threat abatement plan for impacts of marine debris on vertebrate marine life does not list explicit management actions for non-related industries (DEWHA, 2009), management controls will reduce the risk of unplanned discharge of solid waste.
Indirect impacts from generation and disposal of waste from infrastructure removal
Incorrect classification of waste could result in inappropriate disposal of hazardous decommissioning wastes that could contaminate non-hazardous waste streams onshore. This has the potential to result in contamination to air, soil and water during disposal. Given the sampling of the Enfield subsea infrastructure has not identified NORMor mercury at levels that represent a possible risk to contamination (**Section 3.8**), incorrect disposal of hazardous waste onshore could result in negligible impacts to the environment on a near-field scale (i.e. limited to the disposal site/facility).
The increasing pressure on landfills globally from planned disposal of infrastructure is considered a significant environmental and social challenge and can result in indirect impacts to biodiversity, air and water pollution. Decommissioning wastes generated from Enfield subsea infrastructure removal will result in a slight contribution domestically and negligible contribution globally to increasing landfill capacity.
Summary of Potential Impacts to environmental values
Given the adopted controls, it is considered that the accidental discharge of solid waste and disposal of waste generated from infrastructure removal described will result in short-term localised impacts not significant to environmental receptors, with no lasting effect. The social-cultural impact from the generation and disposal of waste will be limited to slight, short-term increased pressures on waste facilities.

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[25]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Legislation, Codes and Standards				
Marine Order 95 – Pollution prevention – Garbage (as appropriate to vessel class), which prescribes matters necessary to give effect to Annex V of MARPOL, which prohibits the discharge of all garbage into the sea, except as provided otherwise.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduces the likelihood of an unplanned release. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 12.1**

[25] Qualitative measure

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[25]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Marine Order 94 – Packaged harmful substances, which requires: • Vessels carrying harmful substances in packaged form must comply with 2 to 5 of MARPOL Annex III, with respect to stowage requirements. • A vessel Master may only wash a substance overboard if: – the physical, chemical and biological properties of the substance have been considered, and – washing overboard is considered the most appropriate manner of disposal, and – the Vessel Master has authorised the washing overboard.	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 12.2**
Disposal of any hazardous waste associated with the subsea infrastructure will comply with relevant State and Commonwealth legislation: • Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 • WA Environmental Protection (Controlled Waste) Regulations 2004.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of incorrect disposal of infrastructure. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes **C 12.3**
Good Practice				
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 12.4**

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[25]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Project vessel ROV, crane or support vessel may be used to attempt recovery of solid wastes lost overboard. • where safe and practicable for 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, ROV availability and suitable weather).	F: Yes, however it may not always be practicable. Assessed on a case by case situation. CS: Minimal cost. Standard practice.	No reduction in likelihood, as this is an unplanned event. Since the equipment may be recovered, a reduction in consequence is possible.	Benefit outweighs cost sacrifice.	Yes **C 12.5**
Implement an infrastructure disposal and resource recovery strategy that: • monitors and tracks waste from recovery to end state • considers the waste hierarchy when determining appropriate end state for waste • describes contingency procedures for dealing with contaminants offshore and onshore.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the risk of unsuitable disposal through efficient use of resources and reduces the risk of an unplanned contamination of waste streams during disposal.	Benefit outweighs cost/sacrifice.	Yes **C 13.1**
Undertake engagement with waste contractors to identify potential waste disposal pathways.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the risk of unsuitable disposal through efficient use of resources.	Benefit outweighs cost/sacrifice.	Yes **C 13.2**
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), Woodside considers the adopted controls appropriate to manage the impacts and risks of accidental discharges of solid waste. 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, given the adopted controls, accidental discharge of solid waste represents a low current risk rating that is unlikely to result in a potential impact above localised, not significant to environmental receptors with no lasting effect. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet legislative requirements. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of these discharges to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 12 No unplanned releases of solid hazardous or non-hazardous waste to the marine environment greater than a consequence level of F[26] during the Petroleum Activities Program.	**C 12.1** Marine Order 95 – marine pollution prevention—garbage (as appropriate to vessel class), prescribes matters necessary to give effect to Annex V of MARPOL, which prohibits the discharge of all garbage into the sea, except as provided otherwise.	**PS 12.1** Project vessels compliant with Marine Order 95.	**MC 12.1.1** Records demonstrate project vessels are compliant with Marine Order 95.
	C 12.2 Marine Order 94 (where relevant to vessel class) – packaged harmful substances, which requires: • Vessels carrying harmful substances in packaged form must comply with 2 to 5 of MARPOL Annex III, with respect to stowage requirements. • A Vessel Master may only wash a substance overboard if: – the physical, chemical and biological properties of the substance have been considered, and – washing overboard is considered the most appropriate manner of disposal, and – the Vessel Master has authorised the washing overboard.	**PS 12.2** Compliance with Marine Order 94 (where relevant to vessel class) – packaged harmful substances which provides information about preventing harmful substances carried by regulated Australian vessels, from entering the marine environment.	**MC 12.2.1** Records demonstrate any non-compliance with Marine Order 94 are documented.
	C 12.3 Disposal of any hazardous waste associated with the subsea infrastructure will comply with relevant State and Commonwealth legislation:	**PS 12.3.1** Disposal of any hazardous waste associated with the subsea infrastructure is compliant with the Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 and WA Environmental Protection	**MC 12.3.1** Records demonstrate disposal of hazardous waste associated with the subsea infrastructure was compliant with relevant Commonwealth and State legislation.

[26] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors' (**Section 2.7.4**).

	• Commonwealth Hazardous Waste (Regulation of Exports and Imports) Act 1989 • WA Environmental Protection (Controlled Waste) Regulations 2004.	(Controlled Waste) Regulations 2004.	
	C 12.4 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.	**PS 12.4** Hazardous and non-hazardous waste will be managed in accordance with the Project Vessel waste arrangements.	**MC 12.4.1** Records demonstrate compliance against Project Vessel waste arrangements.
	C 12.5 Project vessel ROV, crane or support vessel may be used to attempt recovery of solid wastes lost overboard. • where safe and practicable for 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, ROV availability and suitable weather).	**PS 12.5** Any solid waste dropped to the marine environment recovered where safe and practicable to do so.	**MC 12.5.1** Records detail the recovery attempt consideration and status of any object/waste lost to the marine environment.
EPO 13 Waste disposed to landfill will be minimised in accordance with the principles of the waste hierarchy.	**C 13.1** Implement an infrastructure disposal and resource recovery strategy that: • monitors and tracks waste from recovery to end state • considers the waste hierarchy when determining appropriate end state for waste • describes contingency procedures for dealing with contaminants offshore and onshore.	**PS 13.1.1** Decommissioning waste generated from infrastructure removal is managed in accordance with the infrastructure disposal and resource recovery strategy.	**MC 13.1.1** Records demonstrate compliance against an infrastructure disposal and resource recovery strategy.
	C 13.2 Undertake engagement with waste contractors to identify	**PS 13.2.1** Engagement with relevant waste contractors to identify potential waste disposal pathways will be undertaken	**MC 13.2.1** Records demonstrating relevant waste contractors have been engaged.

	potential waste disposal pathways.	prior to inform preparation of an infrastructure disposal and resource recovery strategy.	

6.9.6 Physical Presence: Vessel Collision with Marine Fauna

Context														
Project Vessels – **Section 3.7**							Protected Species – **Section 4.6**							
Risk Evaluation Summary														
Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***							
	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 and threatened and migratory marine fauna within the Operational Area.					X		A	E	1	L	LCS GP PJ	Broadly Acceptable	EPO 14

Description of Source of Impact
The project vessels operating in and around the Operational Area may present a potential hazard to cetaceans and other protected marine fauna such as pygmy blue whales, humpback whales, whale sharks and marine turtles. Vessel movements can result in collisions between the vessel (hull and propellers) and marine fauna, potentially resulting in superficial injury, serious injury that may affect life functions (e.g. movement and reproduction) and mortality. 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) and the type of animal potentially present and their behaviours. Project vessels would typically be stationary or moving at low speeds when supporting the Petroleum Activities Program. Up to two vessels will be present in the Operational Area for decommissioning activities.

Impact Assessment

Unplanned interactions with marine fauna have the potential to occur within the Operational Area. There are a number of EPBC listed species with the potential to occur within the Operational Area (**Section 4.6**). The BIAs that overlap with the Operational Area are summaried below:

- A pygmy blue whale migration BIA overlaps the Operational Area. Pygmy blue whale presence is likely to be higher during April–July and October–January, during northern and southern migrations.
- A humpback whale migration BIA overlaps the Operational Area. Humpback whale presence is likely to be higher during July and late August/September, during northern and southern migrations.

Marine Mammals

Cetaceans are naturally inquisitive marine mammals. The reaction of cetaceans to the approach of a vessel is quite variable. Some species remain motionless when close to a vessel, while others are known to be curious and often approach ships that have stopped or are slow moving, although they generally do not approach and sometimes avoid faster moving ships (Richardson et al., 1995). The Whale and Dolphin Conservation Society (WDCS, 2006), indicates that some cetacean species, such as humpback whales, can detect and change course to avoid a vessel.

Collisions between vessels and marine mammals are more frequent in areas where important habitats coincide with high vessel traffic (WDCS, 2006). In Australia, the majority of vessel strikes to known species involved humpback whales, followed by southern right and sperm whales (Peel et al., 2018). Prior to collision, cetaceans demonstrated varying behaviours, with some reported as being asleep/unmoving, whereas others exhibited a 'last-second flight response' (Peel et al., 2018; Laist et al., 2001). Individual cetaceans engaged in behaviours such as feeding, mating or nursing may also be more vulnerable to vessel collisions when distracted by these activities (DoEE, 2016).

The likelihood of vessel/whale collision being lethal is influenced by vessel speed—the greater the speed at impact, the greater the risk of mortality (Jensen and Silber, 2004; Laist et al., 2001). Vanderlaan and Taggart (2007) found that the chance of lethal injury to a large whale as a result of a vessel strike increases from about 20% at 8.6 knots to 80% at 15 knots. Project vessels within the Operational Area are likely to be travelling <8 knots (and will often be stationary), therefore, the chance of a vessel collision with protected species resulting in a lethal outcome is considered unlikely, as fauna can move away from project vessels. 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 (Vanderlaan and Taggart, 2007). Vessel-whale collisions at this speed are uncommon and 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 positioned amongst whales (Jensen and Silber, 2004).

No known key cetacean aggregation areas (resting, breeding or feeding) are located within or immediately adjacent to the Operational Area; however, this area does overlap the migration BIAs for humpback and pygmy blue whales (**Section 4.6.3**). The Petroleum Activities Program could occur at any time throughout the year (all seasons); therefore, it is possible that activity will overlap with these whale migration periods (**Section 4.6.5**). During this time an increased number of individuals or small groups of pygmy blue or humpback whales may be present whilst transiting through the area. 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 unlikely.

There are several dugong BIAs in Exmouth Gulf, 28 km south-east of the Operational Area. The National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Fauna 2017 (DoE, 2017) has recognised vessel strikes as a key threat to dugongs. Studies in Queensland demonstrated that dugongs spend approximately 47% of their time within 1.5 m of the surface, and calves spend 13% of their time travelling or resting on their mother's back (Hodgson, 2004). When approached by a vessel, dugongs have failed to flee or avoid a vessel until impact is inevitable (Groom et al., 2004). Given the absence of suitable dugong habitat, distance from known BIAs, and speed of vessels travelling through the Operational Area, collisions with dugongs are considered unlikely.

Marine Reptiles

The Recovery Plan for Marine Turtles in Australia 2017-2027 (DoEE 2017), and the National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Fauna 2017 (DoE, 2017) have recognised vessel strikes as a key threat to marine turtles. A review of vessel strike data in Queensland between 1999-2002 found that at least 65 turtles were killed annually as a result of vessel collision (Hazel and Gyuris, 2006). Green turtles comprised the majority of records, followed by loggerhead turtles, and 72% of cases were involving adult of sub-adult turtles (Hazel and Gyuris, 2006). In Australian waters, all species of marine turtle have been involved in vessel strikes (DoEE, 2016).

The effect of vessel speed and turtle flee response can be significant. A study in 2007 found that 60% of green turtles fled from vessels travelling at 2.2 knots (4 km/h), whereas only 4% fled from vessel travelling at 10.2 knots (19 km/h). Whilst fleeing, 75% of turtles moved away from the vessels track, 8% swam along the track and 18% crossed in front of the vessel. The study concluded that most turtles would be unlikely to avoid vessels travelling at speeds greater than around 2.2 knots (Hazel et al., 2007; DoEE, 2017). Furthermore, the relatively small size of turtles and the significant time spent below the surface makes their observation by vessel operators extremely difficult or impossible. Green turtles observed by Hazel et al. (2009) generally only exposed the dorsal-anterior part of the head above the surface of the water and never for longer than two seconds.

The Operational Area is considered unlikely to represent an important habitat for marine turtles, with water depths of 400-600 m, and an absence of potential nesting or foraging habitats (i.e. no emergent islands, reef habitat or shallow shoals). Given the duration of activities within Operational Area and the slow speeds at which project vessels operate, collisions with transiting individual turtles are considered unlikely.

Fish, Sharks and Rays

Vessel strikes are recognised as a key threat to recovery by the Approved Conservation Advice for whale sharks (TSSC, 2015). Whale sharks are at risk from vessel strikes when feeding at the surface or in shallow waters (where there is limited option to dive). The defined foraging BIA (northward from Ningaloo along the 200 m isobath) is located approximately 8 km east of the Operational Area, and whale sharks may traverse the Operational Area between March to November during their migration. Given the duration of activities within Operational Area and the slow speeds at which project vessels operate, collisions with transiting individual whale sharks are considered unlikely.

Smaller fish may also be at risk of injury or mortality from vessels through being caught in thrusters during station keeping operations (i.e. DP). However, this is unlikely given the low presence of individuals, combined with the avoidance behaviour commonly displayed during station keeping operations.

Cumulative Assessment

Although not planned, there is potential for SIMOPs to occur with other activities in WA-28-L (i.e. well P&A), which is covered under a separate EP (**Section 6.5**). It the event of SIMOPs up to five vessels may be present in the Operational Area.

It is unlikely that cumulative vessel movements in the Operational Area will result in collisions with marine fauna. The Operational Area does not represent significant habitat for marine fauna such as foraging or breeding habitat and individuals are expected to be transitory. Given the avoidance behaviour commonly displayed by whales, whale sharks and turtles and the low operating speed of the vessels (generally <8 knots or stationary, unless operating in an emergency), the consequence of any impacts will be limited to slight with no population-level effects.

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)***[27]	***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: • Project vessels will not travel faster than six knots within 300 m of a dolphin 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 faster 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. **Exception:** the above does not apply to project vessels operating under limited/constrained manoeuvrability, and in the event of an emergency.	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 14.1**
Good Practice				
Variation of the timing of the Petroleum Activities Program to avoid migration and foraging periods.	F: Not feasible. Timing of all activities is currently not determined, and due to vessel availability and operational requirements, conducting activities during migration/ nesting	Not considered – control not feasible	Not considered – control not feasible.	No

1 Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***[27]	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
	seasons may not be able to be avoided. CS: Not considered – control not feasible.			
Professional Judgement – Eliminate				
Non identified.				
Professional Judgement – Substitute				
None 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 on and monitor compliance with Part 8 of the EPBC Regulations.	F: Yes, however vessel bridge crews already maintain a constant watch during operations, and crew complete specific cetacean observation training. CS: Additional cost of MFOs considered unnecessary.	Given support vessel bridge crews already maintain a constant watch during operations, 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), Woodside considers the adopted controls appropriate to manage the impacts and risks of potential vessel collision with protected marine fauna. 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, given the adopted controls, vessel collision with marine fauna represents a low risk rating that is unlikely to result in a potential impact to fauna greater than slight and short-term, with no population-level effects. BIAs within the Operational Area include humpback whale and pygmy blue whale migration BIAs. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet the requirements of Part 8 (Division 8.1) of the EPBC Act Regulations 2000. The residual risk of vessel collision with marine fauna is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans (Section 3.2 of the Master Existing Environment), based on the adopted controls. Regard has been given to relevant conservation advice during the assessment of potential risks. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of vessel collision with marine fauna to a level that is broadly acceptable.

<table>
<tr><th colspan="4">Environmental Performance Outcomes, Standards and Measurement Criteria</th></tr>
<tr><th>Outcomes</th><th>Controls</th><th>Standards</th><th>Measurement Criteria</th></tr>
<tr>
<td rowspan="2">EPO 14
No vessel strikes with protected marine fauna (whales, whale sharks, turtles) during the Petroleum Activities Program.</td>
<td rowspan="2">C 14.1
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures:
Project vessels will not travel faster than six knots within 300 m of a dolphin 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.
Vessels will not travel faster 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.
Exception: the above does not apply to project vessels operating under limited/constrained manoeuvrability, and in the event of an emergency.</td>
<td>PS 14.1
Compliance with EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans and application of these regulations to whale sharks and marine turtles.</td>
<td>MC 14.1.1
Records demonstrate no breaches of EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans and application of these regulations to whale sharks and marine turtles.</td>
</tr>
<tr>
<td>PS 14.2
All vessel strike incidents with cetaceans, whale sharks and marine turtles will be reported in the National Ship Strike Database (as outlined in the Conservation Management Plan for the Blue Whale—A Recovery Plan under the EPBC Act 1999, Commonwealth of Australia, 2015).</td>
<td>MC 14.2.1
Records demonstrate reporting cetacean, whale sharks and marine turtles ship strike incidents to the National Ship Strike Database.</td>
</tr>
</table>

6.9.7 Physical Presence: Dropped Object Resulting in Seabed Disturbance

Context	
Project Vessels – **Section 3.7**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5**

Risk Evaluation Summary													
Source of Impact	***Environmental Value Potentially Impacted***						***Evaluation***						
	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 15

Description of Source of Risk
Dropped Objects There is the potential for objects to be dropped overboard from 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. However, there is also potential for larger equipment to be dropped during the activity, particularly during recovery from the seabed. The manifolds are the largest pieces of infrastructure that could potentially be dropped during recovery, with a maximum footprint of 8.5 m x 8.5 m. The spatial extent in which dropped objects can occur is restricted to the Operational Area. As described in **Section 6.7.2**, the Operational Area contains 18 wells that are currently suspended. The wells are planned to be permanently plugged prior to subsea infrastructure removal activities (**Section 6.5**). However, there is potential for some wells to still be in a suspended state. Should a dropped object result in damage to a suspended well, a hydrocarbon spill is possible, albeit highly unlikely. This scenario has been assessed in the Enfield Plug and Abandonment EP (accepted by NOPSEMA on 14 October 2021) and is not addressed further in this EP. However, controls for prevention of dropped objects as a result of the Enfield subsea infrastructure decommissioning Petroleum Activities Program are outlined in the ALARP assessment below.

Impact Assessment
The seafloor within the Operational Area is generally composed of sand, silt, clays and fines, with isolated areas of hard substrate in the form of isolated boulders. Epifauna and infauna are sparsely distributed and generally heterogeneous, comprising of crustaceans, octocorals, sponges and echinoderms reflective of the wider region (Sections 4 and 5 of the Master Existing Environment). In the unlikely event of the 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 to the area beneath the object, but would also be long-term. The temporary or permanent loss of dropped objects into the marine environment is not likely to have a significant environmental impact, as the benthic communities associated with the Operational Area are of low sensitivity and are broadly represented throughout the NWMR. The Operational Area overlaps one KEF, the canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF. The ecological values of the KEF are described in Section 9 of the Master Existing Environment, and include the potential of enhanced productivity due to upwelling and increased connectivity between the continental shelf and the

deep ocean. While the Operational Area overlaps a small portion of the KEFs, the ecological functions of the KEFs are not predicted to be impacted by the Petroleum Activities Program. Given the nature and scale of risks and consequences from dropped objects, seabed sensitivities associated with the Operational Area will not be significantly impacted. Further, considering the types 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 Values
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)[28]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified.				
Good Practice				
The project vessel work procedures for lifts, bulk transfers and cargo loading, which require: • The security of loads to be checked prior to 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.	F: Yes. CS: Minimal cost. Standard practice.	Occurs after a dropped object event and therefore no change to the likelihood. Since the object may be recovered, a reduction in consequence is possible.	Benefits outweigh cost/sacrifice.	Yes **C 15.1**
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. No change in consequence will occur.	Benefits outweigh cost/sacrifice.	Yes **C 15.2**
Project vessel ROV, crane or support vessel may be used to attempt recovery of solid wastes lost overboard. • Where safe and practicable for this activity, will consider:	F: Yes, however it may not always be practicable. Assessed on a case by case situation. CS: Minimal cost. Standard practice.	No reduction in likelihood, as this is an unplanned event. Since the equipment may be recovered, a reduction in consequence is possible.	Benefit outweighs cost sacrifice.	Yes **C 12.5**

1 Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[28]***	***Benefit/Reduction in Impact***	***Proportionality***	***Control Adopted***
• 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).				
Infrastructure with potential to cause damage to well infrastructure within the Operational Area resulting in a loss of well control will be cut and walked to beyond a calculated drop radius before being recovered.	F: Yes. CS: Minimal cost. Standard practice.	Ensuring infrastructure is lifted beyond a calculated drop radius that could damage wells reduces the likelihood of damage to live infrastructure.	Benefit outweighs cost sacrifice.	Yes **C 15.3**
Professional Judgement – Eliminate				
None identified.				
Professional Judgement – Substitute				
None identified.				
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), Woodside considers the adopted controls appropriate to manage the impacts and risks from dropped objects. 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, given the adopted controls, dropped objects represent a consequence to benthic community/habitat structure limited to no lasting effect. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks to marine sediment from dropped objects to an acceptable level.				

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 consequence level of F[29] during the Petroleum Activities Program.	**C 15.1** The project vessel work procedures for lifts, bulk transfers and cargo loading, which require: • The security of loads to be checked prior to 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.	**P.S 15.1** Lifts, bulk transfers and cargo loading managed in compliance with the work procedures, including implementation of PTW and JSA systems.	**MC 15.1.1** Records demonstrate adherence to requirements of work procedures and in accordance with PTW and JSA systems.
	C 15.2 Project vessel inductions include control measures and training for crew in dropped object prevention.	**P.S 15.2** Awareness of requirements for dropped object prevention.	**MC 15.2.1** Records show dropped object prevention training is provided on project vessels.
	C 15.3 Infrastructure with potential to cause damage to well infrastructure within the Operational Area resulting in a loss of well control will be cut and walked to beyond a calculated drop radius before being recovered.	**P.S. 15.3** Infrastructure is recovered outside calculated drop radius around live wells.	**MC 15.3.1** Records demonstrate drop radii are calculated for any infrastructure removed in proximity to live wells, and infrastructure is recovered outside these radii.
	C 12.5 Refer to **Section 6.9.5**	**PS 12.5** Refer to **Section 6.9.5**	**MC 12.5** Refer to **Section 6.9.5**

[29] Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors' (**Section 2.7.4**).

6.9.8 Physical Presence: Accidental Introduction of Invasive Marine Species

Context		
Project Vessels – **Section 3.7**	Physical Environment – **Section 4.4** Habitats and Biological Communities – **Section 4.5** Protected Species – **Section 4.6**	Stakeholder Consultation – **Section 5**

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***						***Evaluation***						
	Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/ Habitat***	***Species***	***Socio-economic***	***Decision Type***	***Consequence / Impact***	***Likelihood***	***Current Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Introduction of invasive marine species (IMS) within the Operational Area.				X	X		A	D	0	L	LCS	Broadly Acceptable	EPO 16

Description of Source of Risk

Vessel Operations

During the Petroleum Activities Program, vessels will be transiting to and from the Operational Area, and may mobilise from an Australian port or directly from international waters. 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.), although commercial vessels typically maintain anti-fouling coatings to reduce the build-up of fouling organisms.

Project vessels have the potential to introduce invasive marine species (IMS) to the Operational Area from international waters, Australian waters and coastal waters, through marine fouling (containing IMS) on vessels as well as within high risk ballast water discharge. Organisms can also be drawn into ballast tanks during onboarding of ballast water as cargo is loaded or to balance vessels under load. Cross contamination between vessels can also occur (e.g. IMS translocated between project vessels) during times when vessels need to be alongside each other.

Immersible Equipment

IMS could be present as biofouling on immersible equipment (e.g. ROVs) and could be translocated to the Operational Area and transferred directly to the seafloor or subsea structures where they could establish.

Impact Assessment

Potential impacts to environmental 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 can survive, reproduce, and establish founder populations. However, not all NIMS introduced into an area will thrive or cause demonstrable impacts (i.e. become IMS). Most 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.

NIMS can be translocated from a donor to a recipient location by two mechanisms - within a ship's ballast water or as biofouling on a vessel's submerged surfaces or internal systems. During the Petroleum Activities Program, vessels undertaking activities will be transiting to and from the Operational Area, potentially including mobilising from beyond Australian waters, including project vessels (**Section 3.7**).

All vessels are subject to some level of marine fouling. Organisms attach to the vessel hull, particularly 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.). Commercial vessels typically maintain anti-fouling coatings to reduce the build-up of fouling organisms. Organisms can also be drawn into ballast tanks during onboarding of ballast water required to maintain safe operating conditions.

During the Petroleum Activities Program, project vessels have the potential to introduce IMS to the Operational Area through biofouling (containing IMS) on vessels, as well as ballast water exchange. Cross-contamination between vessels can also occur (e.g. IMS translocated between project vessels) during times when vessels need to be alongside each other.

Summary of Potential Impacts to Environmental Values

To assess the impacts and risks of IMS introduction associated with the Petroleum Activities Program, Woodside conducted a risk and impact evaluation of the different aspects of a marine pest translocation. The results of this assessment are presented in **Table 6-10.**

As a result of this assessment, Woodside has assessed the potential consequence and likelihood after implementing the identified controls. This assessment concluded that the highest potential consequence is a ‘D’ and the likelihood is ‘Remote’ (0), resulting in an overall ‘Low’ risk.

Table 6-10: Evaluation of risks and impacts from marine pest translocation

IMS Introduction Location	Credibility of Introduction	Consequence of Introduction	Likelihood
Introduced to the Operational Area and establish on the seafloor or subsea structures.	**Not Credible** The deep offshore open waters of the Operational Area are located away from shorelines (>12 nm from a shore) and in waters >400 m deep; therefore, they are not conducive to the settlement and establishment of IMS.		
Introduced to the Operational Area and establish on a project vessel.	**Credible** There is potential for the transfer of marine pests between project vessels while in the Operational Area.	**Environment – Not credible** The translocation of IMS from a colonised project vessel to shallower environments via natural dispersion is not considered credible, given the distances of the Operational Area from nearshore environments (i.e. >12 nm and >400 m water depth). Therefore, there is no credible environmental risk and the assessment is limited to Woodside’s reputation. **Reputation – D** If IMS were to establish on a project vessel, this could potentially impact the vessel operationally by fouling intakes, resulting in translocation of an IMS into the Operational Area and, depending on the species, potentially transferring an IMS to other vessels. If IMS were transferred to another vessel, this would likely result in the quarantine of the vessel until eradication could occur (through cleaning and treating infected areas), which would be costly to perform. Such introduction would be expected to have minor impact on Woodside’s reputation, particularly with Woodside’s contractors, and would likely have a reputational impact on future proposals.	**Remote (0)** Interactions between project vessels will be limited during the Petroleum Activities Program, with minimum 500 m exclusion zones in force around project vessels, and interactions limited to short periods alongside (i.e. during backloading, bunkering activities). There is also no direct contact (i.e. they are not tied up alongside) during these activities. Spread of marine pests via ballast water or spawning in the open ocean environment is also considered remote.
Transfer between project vessels and by extension	**Not Credible** This risk is considered so remote that it is not credible for the purposes of the activity.		

from project vessels to other marine environments beyond the Operational Area (i.e. transfer of IMS from other project vessels to a support vessel and then to another environment).	The transfer of a marine pest between project vessels was already considered remote, given the offshore open ocean environment. Project vessels are located in an offshore, open ocean, deep environment, where IMS survival is implausible. Furthermore this marine pest once transferred would need to survive on a new vessel with good vessel hygiene (i.e. has been through Woodside's risk assessment process), and survive the transport back from the Operational Area to shore. If it was to survive this trip, it would then need to establish a viable population in nearshore waters.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[30]***	***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 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 16.1**
Good Practice				
Woodside's IMS risk assessment process[31] will be applied to project vessels and relevant immersible (ROVs) equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors: For vessels: • vessel 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	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 16.2**

[30] Qualitative measure

[31] 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).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[30]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• 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 • 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.	F: No. Given vessels must be used to implement the project, 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				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[30]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Source project vessels based in Australia only.	F: Potentially. Limiting activities to only use local project vessels could potentially pose a significant risk in terms of time and duration of sourcing a vessel, as well as the ability of the local vessels to perform the required tasks. For example, there are limited construction and heavy lift vessels based in Australian waters. While the project will attempt to source support vessels locally, it is not always possible. Availability cannot always be guaranteed when considering competing oil and gas activities in the region. In addition, sourcing Australian based vessels only will cause increases in cost due to pressures of vessel availability. CS: Significant cost and schedule impacts due to restrictions of vessel hire opportunities.	Sourcing vessels from within Australia will reduce the likelihood of IMS from outside Australian waters; however, it does not reduce the likelihood of translocation of species native to Australia but alien to the Operational Area and NWMR, or of IMS that have established elsewhere in Australia. The consequence is unchanged.	Disproportionate. Sourcing vessels from Australian waters may result in a reduction in the likelihood of IMS introduction to the Operational Area; however, the potential cost of implementing this control is grossly disproportionate to the minor environmental gain (or reducing an already remote likelihood of IMS introduction) potentially achieved by using only Australian based vessels. Consequently, this risk is considered not reasonably practicable.	No
IMS Inspection of all vessels.	F: Yes. Approach to inspect vessels could be a feasible option. CS: Significant cost and schedule impacts. In addition, the IMS risk assessment process is seen to be more cost effective, as this control allows Woodside to manage the introduction of marine pests through biofouling, while targeting its efforts 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 outweighs the benefit gained, as other controls will be implemented to achieve an ALARP position.	No
Professional Judgement – Engineered Solution				
None identified				
ALARP Statement				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[30]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A), Woodside considers the adopted controls appropriate to manage the impacts and risks of IMS introduction. 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, given the adopted controls, translocation of marine pests will not result in a potential impact greater than minor, short-term impact on species or habitat within the Operational Area. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of invasive marine species to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 16 No introduction and establishment of invasive marine species into the Operational Area as a result of the Petroleum Activities Program.	**C 16.1** 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.	**PS 16.1** Project vessels will manage ballast water in accordance with Australian Ballast Water Management Requirements.	**MC 16.1.1** Ballast Water Records System maintained by vessels which verifies compliance against Australian Ballast Water Management Requirements.
	C 16.2 Woodside's IMS risk assessment process[32] will be applied to project vessels and relevant immersible equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors: For vessels: • vessel 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	**PS 16.2.1** Before entering the Operational Area, project vessels and relevant immersible equipment are determined to be low risk[33] of introducing IMS of concern, and maintain this low risk status to mobilisation.	**MC 16.2.1** Records of IMS risk assessments maintained for all project vessels and relevant immersible equipment entering the operational area to undertake the Petroleum Activities Program.
		PS 16.2.2 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 16.2.2** Records confirm that the IMS risk assessments undertaken by an Environment Adviser or IMS inspector (as relevant).

[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).

[33] 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.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
	• 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 • 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.		

6.10 Recovery Plan and Threat Abatement Plan Assessment

As described in **Section 1.10.1.3**, NOPSEMA will not accept an EP that is 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 (**Section 2.9**). 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 (DOEE, 2017).
- Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a).
- Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) (Commonwealth of Australia, 2013).
- Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014 (Commonwealth of Australia, 2014).
- Sawfishes and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015).
- Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (DOEE, 2018).

Table 6-11 lists the objectives and (where relevant) the action areas of these plans, and also describes whether these objectives/action areas are applicable to government, the Titleholder, and/or the Petroleum Activities Program. For those objectives/action areas applicable to the Petroleum Activities Program, the relevant actions of each plan have been identified, and an evaluation has been conducted as to whether impacts and risks resulting from the activity are clearly inconsistent with that action or not. The results of this assessment against relevant actions are presented in **Table 6-12** to **Table 6-17**.

Table 6-11: 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			
1. 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		
2. The management of marine turtles is supported	Y		
3. Anthropogenic threats are demonstrably minimised	Y	Y	Y
4. 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			
B1. Determine trends in index beaches	Y	Y	Y

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
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
Australian Sea Lion Recovery Plan			
Overarching Objective			

EPBC Act Part 13 Statutory Instrument	**Applicable to:**		
	Government	***Titleholder***	***Petroleum Activities Program***
To halt the decline and assist the recovery of the Australian sea lion throughout its range in Australian waters by increasing the total population size while maintaining the number and distribution of breeding colonies with a view to: • Improving the population status leading to the future removal of the Australian sea lion 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 species in the future			
Specific Objectives			
1. Mitigate interactions between fishing sectors (commercial, recreational and Indigenous) and the Australian sea lion to enable the recovery of all breeding colonies	Y		
2. Mitigate the impacts of marine debris on Australian sea lion populations	Y	Y	Y
3. Mitigate the impacts of aquaculture operations on Australian sea lion populations	Y		
4. Investigate and mitigate other potential threats to Australian sea lion populations, including disease, vessel strike, pollution and tourism	Y	Y	Y
5. Continue to develop and implement research and monitoring programs that provide outputs of direct relevance to the conservation of the Australian sea lion	Y	Y	
6. Increase community involvement in, and awareness of, the recovery program	Y		
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			
4. Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters	Y		
5. Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	**Titleholder**	**Petroleum Activities Program**
6. Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
7. Where practicable, minimise the impact of shark control activities on the grey nurse shark	Y		
8. Investigate and manage the impact of ecotourism on the grey nurse shark	Y		
9. Manage the impact of aquarium collection on the grey nurse shark	Y		
10. Improve understanding of the threat of pollution and disease to the grey nurse shark	Y	Y	Y
11. 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	
12. Continue to develop and implement research programs to support the conservation of the grey nurse shark	Y		
13. 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: • 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	Y	Y	Y
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

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	*Titleholder*	*Petroleum Activities Program*
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
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 6-12: Assessment against relevant actions of the Marine Turtles 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 – no relevant actions	Refer **Section 6.9.7** **Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to marine turtles.	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	Refer **Sections 6.8.3, 6.8.4, 6.9.2, 6.9.3, 6.9.4, and 6.9.5,** **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 • F-Pil – Manage artificial light from onshore and offshore sources to ensure biologically	Refer **Section 6.8.7** **Not inconsistent assessment**: The assessment of light emissions has considered the potential impacts to green, loggerhead and 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 isolated transient individuals, which is unlikely to result in displacement of adult turtles from	**EPO 8** **C 8.1** **PS 8.1, 8.1.2, 8.1.3**

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
		important behaviours of nesting adults and emerging/dispersing hatchlings can continue	internesting or nesting habitat critical to the survival of marine turtles. Controls adopted to minimise impacts to wedge-tailed shearwaters from light emissions may reduce any potential disturbance to 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 – no relevant actions	**Not inconsistent assessment**: Woodside contributes to Action Area B1 via its support of the Ningaloo Turtle Program[34].	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	Refer **Section6.8.5.** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to green, loggerhead and flatback turtles. Vessel and transponder 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.				

[34] http://www.ningalooturtles.org.au/media_reports.html

Table 6-13: 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 6.8.5.** **Not inconsistent assessment**: The assessment of acoustic emissions has considered the potential impacts to pygmy blue whales. Acoustic emissions from project vessels will not cause injury to any blue whale. If the Petroleum Activities Program overlaps with either northbound or southbound migration, individuals may deviate slightly from the migratory route, but will continue on their migration and will not be displaced from the possible foraging area at Ningaloo. Controls applied to manage vessel collision with marine fauna may further reduce impact from noise emissions; however, reduction is expected to be negligible.	**EPO 14** **C 14.1** **PS 14.1, 14.2**
	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 6.9.6.** **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 overlaps with either northbound or southbound migration, individuals may deviate slightly from 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 14** **C 14.1** **PS 14.1, 14.2**
	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[35]).	N/A

[35] 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

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
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.				

Table 6-14: Assessment against relevant actions of the Australian Sea Lion Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Australian Sea Lion Recovery Plan	**Objective 4:** Investigate and mitigate other potential threats to Australian sea lion populations, including disease, vessel strike, pollution and tourism.	**Action 4.1**: Improve the understanding of – and where necessary mitigate- the threat posed to Australian sea lion populations by illegal killings, vessel strike, pollution and oil spills.	Refer **Sections 6.9.2** and **6.9.3** **Not inconsistent assessment**: The species was identified to potentially occur within the EMBA and therefore the assessment of accidental release of hydrocarbons has considered the potential risks to Australian sea lions.	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.**
Assessment Summary The Australian Sea Lion 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 6-15: 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 **Section 6.9.5** **Not inconsistent assessment**: The assessment of accidental release of solid hazardous and non-hazardous wastes has	**EPO 12** **C 12.1-12.5** **PS 12.1-12.5**

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
			considered the potential risks to grey nurse sharks.	
			Refer **Sections 6.9.2** and **6.9.3**. **Not inconsistent assessment**: The species was identified to potentially occur within the EMBA and therefore the assessment of accidental release of hydrocarbons has considered the potential risks to grey nurse sharks.	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.**

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 6-16: 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 **Section Sections 6.9.2**and **6.9.3**. **Not inconsistent assessment**: The species was identified to potentially occur within the EMBA and therefore the assessment of accidental release of 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 6.9.5**. **Not inconsistent assessment:** The assessment of accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to sawfish and river sharks.	**EPO 12** **C 12.1-12.5** **PS 12.1-12.5**
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 6-17: 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 6.9.5**. **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.	**EPO 12** **C 12.1-12.5** **PS 12.1-12.5**
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 change 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	
Asset Manager	• Ensures compliance with Woodside's HSE Policy, all relevant environmental legislative requirements and environmental operational controls as detailed in this EP. • Liaises with regulatory authorities as required.
Integrated Project Manager	• Establishes EP compliance expectation with Delivery Managers for their teams and contractors. • Provides resources (financial/personnel) to Delivery Managers so that environmental risk mitigations can be put into place. Ensures resources are available to deliver this EP. • Controls work into Operational Area, as per SIMOPs document. • Coordinates vessel movements in field, with Delivery Manager, in compliance with SIMOPs Plan document. • Communicates environmental incidents to the Project Environment Adviser and ensures follow up actions are carried out. • Consults with the Project Environment Adviser to develop corrective actions addressing any environmental issues in relation to the Petroleum Activities Program
Delivery Manager	• Monitor and manage the Petroleum Activities Program so it is performed as per the relevant standards and commitments in this EP. • Manage change requests for the activity and notify the Project Environment Adviser in a timely manner of any scope changes. • Ensures all chemical components and other fluids that are be used have been reviewed by the Project Environmental Adviser. • Verify that contractors meet environmental related contractual obligations • Ensure contractor complies with requirements of the SIMOPs document. • Manages interface between offshore operations and those supporting onshore. • Ensures review of daily, weekly and monthly reporting from project vessels. • Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's HSE Reporting and Investigation Procedure • Ensures the importance of appropriate levels of training, competency and environmental awareness are communicated amongst the project vessel personnel. • Ensures action items from environmental audits are completed.

Title (role)	Environmental Responsibilities
Woodside Project Environment Adviser	• Verifying Decommissioning and Project Team understands legislative and regulatory requirements, EPs and the WMS. • Developing, review and control revisions of the EP and maintaining in accordance with EP commitments. • Assisting in implementing and facilitating environmental improvement plans. • Ensuring appropriate personnel have access to the EP and understand the outcomes, standards and measurement criteria and their environmental responsibilities for the activity. • Liaising with applicable regulatory authorities and stakeholders as required. • Developing and maintaining environmental training inductions, awareness refreshers and environment toolbox topics for deployment to offshore personnel. • Coordinating environmental monitoring and reporting requirements from the EP including environmental performance and compliance reporting. • Participating in environmental audits/inspections to ensure regular checking of compliance with the EP. Communicating findings to management and assisting with closeout of audit actions. • Assisting with review, investigation and reporting of environmental incidents. • Preparation and delivery/dissemination of environmental training material.
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.
Woodside Marine Assurance Lead	• 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.
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.
Vessel-based Personnel	

Title (role)	Environmental Responsibilities
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 Site Representative. • Ensure corrective actions for incidents or breaches are developed, communicated to the Woodside Site Representative, and tracked to close-out in a timely manner. Ensure close-out of actions is communicated to the Woodside Site Representative.
Vessel Logistics Coordinators	• Ensure waste is managed on the relevant support vessels and sent to shore as per the relevant WMP.
Vessel HSE Advisers	• Support the Woodside Site Representative to ensure the controls detailed in this EP relevant to offshore activities are implemented on the project vessels, and help collect and record evidence of implementation (other controls are implemented and evidence collected onshore). • Support the Woodside Site Representative to ensure the EPOs are met and the PSs detailed in this EP are implemented on the project vessels. • Support the Woodside Site Representative 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.
Offshore Supervisor (Contractor)	• Confirm activities are performed in accordance with this EP, as detailed in the Woodside-approved Contactor 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 Site Representative or Vessel Master.

Title (role)	Environmental Responsibilities
Woodside Site Representative	• Support the Delivery Manager and Asset Manager to ensure the controls detailed in this EP relevant to offshore activities are implemented on the offshore support vessel, and help collect and record evidence of implementation (other controls are implemented and evidence collected onshore). • Support the Delivery Manager and Asset Manager to ensure the EPOs are met and the PSs detailed in this EP are implemented on the offshore support vessel. • Support the Delivery Manager and Asset 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.

It is the responsibility of Woodside and contractors to implement the Woodside Corporate Health, Safety and Environment Policy **(Appendix A**) in their areas of responsibility and to ensure 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 sets out 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 and Environment Policy
- EP importance/structure/implementation/roles and responsibilities
- main environmental aspects/hazards and potential environmental impacts and related performance outcomes
- oil spill preparedness and response
- monitoring and reporting on performance outcomes and standards using measurement criteria
- incident reporting.

7.4.3 Activities Program Specific Environmental Awareness

Before commencing subsea decommissioning activities associated with the Petroleum Activities Program, a pre-activity meeting will be held on-board the project vessels with all relevant personnel. The pre-activity meeting provides an opportunity to reiterate specific environmental sensitivities or commitments associated with the activity. Relevant sections of the pre-activity meeting will also be communicated to the support vessel personnel. Attendance lists are recorded and retained.

During operations, regular HSE meetings will be held on the project vessels. During these meetings, recent environmental incidents are reviewed and awareness material presented.

7.4.4 Management of Training Requirements

All personnel on the 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, to ocean and atmosphere
- monitoring of progress against the Subsea and Developments/Projects 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 record 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 Subsea Decommissioning Activities

The following internal auditing will be performed for the subsea decommissioning activities:

- Pre-mobilisation inspection/audit report will be conducted by a relevant person (before commencing). The scope of the audits is risk-based and specific to the relevant activity, but will generally focus on aspects relating to ensuring appropriate understanding of environmental commitments and the operational readiness of the activity scope, including appropriate environmental controls in place. All offshore support vessels associated with the above scopes will be audited by Woodside. Support or transport vessels will be assessed on a risk-based approach, but will be audited via the primary subsea installation contractor's process.
- At least one operational compliance audit relevant to applicable EP commitments will be conducted by a Woodside Environment Adviser for the subsea decommissioning activities. The audit may be conducted offshore or office-based, subject to the duration of the activity and logistics of performing the audit offshore for short duration scopes.
- Contractor-specific HSE audits will also be conducted of the general support vessels. The audits will consider the implementation of HSE management, risk management, as well as pre-mobilisation and offshore readiness.
- Vessel-based HSE inspections will be conducted fortnightly by vessel HSE personnel. Each inspection will focus on a specific risk area relevant to the project activity and a formal report will be issued (for example, bunkering controls, chemical and discharge management, cetacean reporting, etc).

The internal audits and reviews, combined with the ongoing monitoring described in **Section 7.5.1**, and collection of evidence for MC are used to assess EPOs and standards.

As part of Woodside's Environmental Management System (EMS) and/or assurances processes, activities may also be periodically selected for environmental audits as per Woodside's internal auditing process. Audit, inspection and review findings relevant to continuous improvement of environmental performance are tracked through the Environmental Commitments and Actions Register.

This Environmental Commitments and Actions Register is used to track subsea support vessel and subsea activity compliance with EP commitments, including any findings and corrective actions.

Non-conformances identified will be reported and/or tracked in accordance with **Section 7.8.3** and **Section 7.8.4**.

7.5.2.2 Marine Assurance

Woodside's marine assurance is managed by the Marine Assurance Team of the Logistics Function in accordance with Woodside's Marine Offshore Vessel Assurance Procedure. The Woodside process is based on industry standards and consideration of guidelines and recommendations from recognised industry organisations such as Oil Companies International Marine Forum and International Maritime Contractors Association.

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 management system assessment (OVMSA).
- DP system verification.
- Vessel inspections.
- Offshore vessel inspection database (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:

1. Woodside Marine Vessel Inspection.
2. Oil Companies International Marine Forum (OCIMF) OVID Inspection.
3. International Marine Contractors Association (IMCA) Common Marine Inspection Document (CMID) Inspection.
4. 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 vessel inspection cannot be completed. This is not a regular occurrence and is typically used when the requirements of the assurance process are unable to be met or the processes detailed are not applicable to a proposed vessel(s). The Marine Vessel Risk Assessment will be conducted by the Marine Assurance Specialist, where the vessel meets the short term hire prerequisites.

The risk assessment is a semi-quantitative method of determining what further assurance process activity, if any, is required to assure a vessel for a particular task or role. The process compares the level of management control a vessel is subject to against the risk factors associated with the activity or role.

Several factors are assessed as part of a vessel risk assessment, including:

- Management control factors:
  - Company audit score (i.e. management system)
  - vessel HSE incidents
  - vessel Port State Control deficiencies
  - instances of Port State Control vessel detainment
  - years since previous satisfactory vessel inspection
  - age of vessel
  - contractors' prior experience operating for Woodside.
- Activity risk factors:
  - people health and safety risks (a function of the nature of the work and the area of operation)
  - environmental risks (a function of environmental sensitivity, activity type and magnitude of potential environment damage (e.g. largest credible oil spill scenario))
  - value risk (likely time and cost consequence to Woodside if the vessel becomes unusable)
  - reputation risk
  - exposure (i.e. exposure to risk based on duration of project)
  - industrial relations risk.

The acceptability of the vessel or requirement for further vessel inspections or audits is based on the ratio of vessel score to activity risk. If the vessel management control is not deemed to appropriately manage activity risk, a satisfactory company audit and/or vessel inspection may be required before awarding work.

The risk assessment is valid for the period a vessel is on hire and for the defined scope of work.

7.5.3 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 HSE Event Reporting and Investigation Procedure which includes 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 2.8**). 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 Environment Function, senior management regularly monitor and review environmental performance and the effectiveness of managing environmental risks and performance. Within each Function and Business Unit Leadership Team (e.g. Subsea and Developments/Projects), managers review environmental performance regularly, including through quarterly HSE review meetings.

Woodside's Environment Team (Developments/Projects/Decommissioning) will perform six-monthly reviews of the effectiveness of the implementation strategy and associated tools. This will involve reviewing the:

- Subsea decommissioning environment KPIs (leading and lagging)
- 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 including:

- event investigations
- event bulletins
- after campaign review conducted, including review of environmental incidents as relevant
- ongoing communication with vessel operators
- formal and informal industry benchmarking
- cross asset learnings
- engineering and technical authorities discipline communications and sharing.

7.5.4.3 Review of Impacts, Risks and Controls Across the Life of the EP

In the unlikely case that activities described in this EP do not occur continuously or sequentially, before recommencing activities after a cessation period greater than 12 months, impacts, risks and controls will be reviewed.

The process will identify or review impacts and risks associated with the newly-commencing activity, and will identify or review controls to ensure impacts and risks remain/are reduced to ALARP and acceptable levels. Information learned from previous activities conducted under this EP will be considered. Controls which have previously been excluded on the basis of proportionality will be reconsidered. Any required changes will be managed by the MOC process outlined below (**Section 7.6**).

7.6 Management of Change and Revision

7.6.1 EP Management of Change

Management of changes are managed in accordance with Woodside's Environmental Approval Requirements Australia Commonwealth Guideline. Management of changes relevant to this EP, concerning the scope of the activity description (**Section 3**) including: review of advances in technology at stages where new equipment may be selected such as vessel contracting; changes in understanding of the environment, 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 2.7**) 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 subsea decommissioning activities are prepared and issued to key support personnel and stakeholders, by relevant managers responsible for the subsea activity. The report provides performance information about subsea decommissioning 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. 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 Environment 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.

7.8.2.4 General Direction 812 Reporting

To meet Directions 3 and 4 in Schedule 1 of General Direction 812, Woodside will undertake sediment sampling (**Section 3.12.7**) and will analyse the ROV images and other data from the "as left" survey (**Section 3.12.6**). The results will inform what, if anything, needs to be done to provide for the conservation and protection of natural resources in the licence area, and make good any damage to the seabed or subsoil in the licence area caused by any person engaged or concerned in the operations. The details will be provided in a report to NOPSEMA in accordance with **Table 7-3**.

Table 7-3: General Direction reporting requirements

Report	Recipient	Frequency	Content
Compliance with Directions 3 & 4 of General Direction 812	NOPSEMA	On or before 31 December 2025	Demonstrates how Woodside has provided for the conservation and protection of the natural resources in the licence area relevant to the Enfield Development Project. Demonstrates how Woodside has made good any damage to the seabed or subsoil in the licence area caused by any person engaged or concerned in the operations in relation to the Enfield Development Project.

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

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 2-4**)
- 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 2-4**).

The environmental risk assessment (**Section 6**) for the Petroleum Activities Program has not identified any risks with a potential consequence level of C+ for environment. The incident that has the potential for the greatest level of impact is an accidental hydrocarbon release resulting from a vessel collision (Consequence level of D).

Any such incidents represent potential events which would be reportable incidents. Incident reporting is performed with consideration of NOPSEMA (2014) guidance stating, 'if in doubt, notify NOPSEMA', and assessed on a case-by-case basis to determine if they trigger a reportable incident as defined in this EP and by the Regulations.

Notification

NOPSEMA will be notified of all reportable incidents, according to the requirements of Regulations 26, 26A and 26AA of the Environment Regulations. Woodside will:

- Report all reportable incidents to the regulator (orally) ASAP, but within two hours of the incident or of its detection by Woodside
- Provide a written record of the reported incident to NOPSEMA, the National Offshore Petroleum Titles Administrator (NOPTA) and the Department of the responsible State Minister (DMIRS) ASAP after orally reporting the incident
- Complete a written report for all reportable incidents using a format consistent with the NOPSEMA Form FM0831 – Reportable Environmental Incident (**Appendix E**) which must be submitted to NOPSEMA ASAP, but within three days of the incident or of its detection by Woodside
- Provide a copy of the written report to the NOPTA and DMIRS, within seven days of the written report being provided to NOPSEMA.

AMSA will be notified of oil spill incidents ASAP after their occurrence, and DAWE notified if MNES are to be affected by the oil spill incident.

7.8.4.2 Recordable Incidents

Definition

A recordable incident as defined under Regulation 4 of the Environment Regulations is an incident arising from the activity that 'breaches an environmental performance outcome or environmental performance standard, in the EP that applies to the activity, that is not a reportable incident'.

Notification

NOPSEMA will be notified of all recordable incidents, according to the requirements of Regulation 26B(4), no later than 15 days after the end of the calendar month using the NOPSEMA Form – Recordable Environmental Incident Monthly Summary Report 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 7-4** describes the incident reporting requirements that also apply in the Operational Area.

Table 7-4: 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	DAWE	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	DAWE	Within seven days of becoming aware	Secretary of the DAWE	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 Enfield Plug and Abandonment Oil Pollution 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 activity 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 7-5**.

Table 7-5: 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.
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**)

Content	Environment Regulations Reference	Document/Section Reference
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 7-6: 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 Hydrocarbon Spill Response Team Competency Dashboard reflects the competencies required for each oil spill role (IMT/operational).

7.9.3 Emergency Response Preparation

The CICC, based in Woodside's head office in Perth, is the onshore coordination point for an offshore emergency. The CICC is staffed by a roster of appropriately skilled personnel available on call 24 hours a day. The CICC, under the leadership of the CICC Leader, supports the site-based Incident Management Team (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. The ERP 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:

- 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 project 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** this EP, cover spill response for this Petroleum Activities Program.

The Security and Emergency Management Function is responsible for managing Woodside's hydrocarbon spill response equipment and for maintaining oil spill preparedness and response documentation. In the event of a major spill, Woodside will request that AMSA (administrator of the National Plan) provides support to Woodside through advice and access to equipment, people and liaison. The interface and responsibilities, as defined under the National Plan, are described in the Woodside Oil Pollution Emergency Arrangements (Australia). AMSA and Woodside have a Memorandum of Understanding in place to support Woodside in the event of an oil spill.

The Oil Pollution First Strike Plan provides immediate actions required to commence a response (**Appendix I**).

The project vessels will have SOPEPs in accordance with the requirements of MARPOL 73/78 Annex I. These plans outline responsibilities, specify procedures and identify resources available in the event of a hydrocarbon or chemical spill from vessel activities. The Oil Pollution First Strike Plan is intended to work in conjunction with the SOPEPs, if hydrocarbons are released to the marine environment from a vessel.

Woodside has established EPOs, performance standards and MC to be used for oil spill response during the Petroleum Activities Program, as detailed in **Appendix D**.

7.9.5 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 or 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 ICC 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 7-7**. 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 7-7: Testing of response capability

Response Category	Scope	Response Testing Frequency	Response Testing Objective
Level 1 Response	Exercises are project-/ activity-specific	At least one Level 1 First Strike drill must be conducted during an 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 months hire period thereafter.	• Comprehensive exercises test elements of the Oil Pollution First Strike Plan (**Appendix I**). • Emergency drills are scheduled to test other aspects of the Emergency Response Plan.
Level 2 Response	Exercises are vessel 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 MODU/vessel per campaign must be conducted within the first month of commencing the activity and then at every 6 months 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.
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

Woodside is required to test hydrocarbon spill response arrangements as per regulations 8B and 8C of the Environment Regulations. 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:

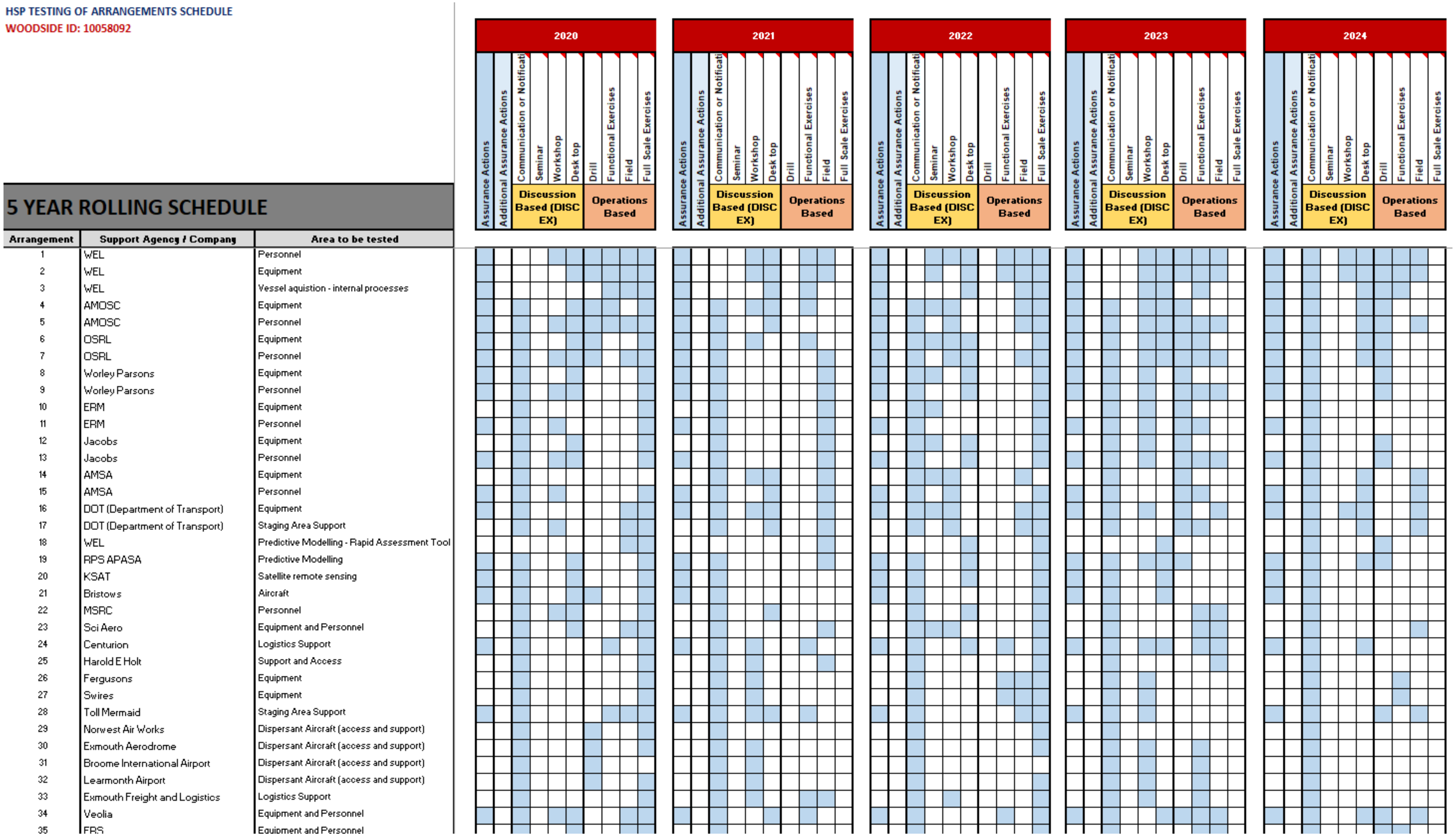
- ensure relevant responders, contractors and key personnel understand and practise their assigned roles and responsibilities
- test response arrangements and actions to validate response plans
- ensure lessons learned are incorporated into Woodside's processes and procedures and improvements are made 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 7-7**, 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 Emergency Management Institute Handbook. If a spill occurs, enacting these arrangements will underpin Woodside's ability to implement a response across its petroleum activities. **Figure 7-1** shows a condensed snapshot of Woodside's 5-year rolling Testing of Arrangements Schedule.



HSP TESTING OF ARRANGEMENTS SCHEDULE

WOODSIDE ID: 10058092

5 YEAR ROLLING SCHEDULE

2020 | 2021 | 2022 | 2023 | 2024

Assurance Actions | Additional Assurance Actions | Discussion Based (DISC EX): Communication or Notificati, Seminar, Workshop, Desk top | Operations Based: Drill, Functional Exercises, Field, Full Scale Exercises

Arrangement	Support Agency / Company	Area to be tested
1	WEL	Personnel
2	WEL	Equipment
3	WEL	Vessel aquistion - internal processes
4	AMOSC	Equipment
5	AMOSC	Personnel
6	OSRL	Equipment
7	OSRL	Personnel
8	Worley Parsons	Equipment
9	Worley Parsons	Personnel
10	ERM	Equipment
11	ERM	Personnel
12	Jacobs	Equipment
13	Jacobs	Personnel
14	AMSA	Equipment
15	AMSA	Personnel
16	DOT (Department of Transport)	Equipment
17	DOT (Department of Transport)	Staging Area Support
18	WEL	Predictive Modelling - Rapid Assessment Tool
19	RPS APASA	Predictive Modelling
20	KSAT	Satellite remote sensing
21	Bristows	Aircraft
22	MSRC	Personnel
23	Sci Aero	Equipment and Personnel
24	Centurion	Logistics Support
25	Harold E Holt	Support and Access
26	Fergusons	Equipment
27	Swires	Equipment
28	Toll Mermaid	Staging Area Support
29	Norwest Air Works	Dispersant Aircraft (access and support)
30	Exmouth Aerodrome	Dispersant Aircraft (access and support)
31	Broome International Airport	Dispersant Aircraft (access and support)
32	Learmonth Airport	Dispersant Aircraft (access and support)
33	Exmouth Freight and Logistics	Logistics Support
34	Veolia	Equipment and Personnel
35	FRS	Equipment and Personnel

Figure 7-1: Indicative 5-yearly testing of arrangements schedule

(Snapshot of a selection of oil spill response arrangements tested annually; Note: schedule is subject to change; additional detail is included in the live document)

Numbered hydrocarbon spill arrangements listed in the rows of the schedule are taken from the support plans and operational plans described in Section 1.4 of **Appendix D**. 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. About 75 hydrocarbon spill preparedness arrangements are tested annually across the eight planned exercises, as described above.

The vertical columns under each year in **Figure 7-1** relate to an individual exercise or additional assurance actions that are conducted over the 5-year rolling schedule. The sub-heading for the column describes the standard method of testing (e.g. discussion exercise, desktop exercise), and the blue cells indicate the arrangements that could be tested for each method.

Arrangements in the schedule are tested at least once a year; however, 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) (refer to the first and second vertical columns for each year in **Figure 7-1**).

7.9.7.2 Exercises, Objectives, and KPIs

Exercises are designed to cumulatively provide assurance for all arrangements within Woodside's Testing of Arrangements Schedule annually across all facilities. Exercise-initiating scenarios are derived from the worst-case credible scenarios as described in the relevant facility's First Strike Plans.

Objectives and KPIs for each exercise are determined by reviewing:

- The Testing of Arrangements Schedule, which identifies which arrangements can be tested for each testing method (**Section 7.9.7.1**).
- The objectives and KPIs master generic plan, which summarises generic objectives and KPIs that could be tested for specific response strategies, based on industry good practice guidance (i.e. IPIECA) for testing oil spill arrangements.
- The oil spill ALARP commitments register, which summarises all spill response commitments from accepted EPs (e.g. timings, numbers) for different response strategies, and considers priority commitments and worst-cast spill scenarios.
- Actions undertaken from recommendations from previous exercises, where relevant.

The required capabilities, number of personnel, equipment, and timeframes (i.e. arrangements) form specific KPIs during an exercise. Where this is the case, the ALARP commitments register indicates the specific response strategy performance standards to use/test the arrangements against. Where relevant the most stringent performance standard across all in-force EPs is used as the KPI. After each exercise, a report is produced that includes recommendations for improvements, which are then converted to actions and tracked in the Testing of Arrangements Register.

Additional assurance actions are also routinely undertaken outside formal exercises (e.g. response audits, no-notice drills), which support testing of these arrangements. Evidence and outcomes from additional assurance actions are used, where relevant, to support testing individual arrangements, including from external sources (e.g. evidence of suppliers testing their own arrangements).

7.9.7.3 Cyclone and Dangerous Weather Preparation

As the timing of some activities associated with the Petroleum Activities Program are not yet determined, it is possible subsea decommissioning activities will overlap with the cyclone season (November to April, with most cyclones occurring between January and March). If conducting activities in cyclone season, the 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 project vessels will receive daily forecasts from the Bureau of Meteorology. If a cyclone (or severe weather event) is forecast, the path and its development will be plotted and monitored using the BoM data. If there is the potential for the cyclone (severe weather event) to affect the Petroleum Activities Program, the CCP will be actioned. If required, vessels can transit from the proposed track of the cyclone (severe weather event).

8. REFERENCES

[ARPANSA] Australian Radiation Protection and Nuclear Safety Agency, 2008. Management of Naturally Occurring Radioactive Material (NORM). Radiation Protection Series Publication No. 15. Commonwealth of Australia, Canberra.

[ATSB] Australian Transport Safety Bureau, 2011. Annual Report. Commonwealth of Australia, 2011.

[CALM] Department of Conservation and Land Management, 1990, Dampier Archipelago Nature Reserves Management Plan 1990-2000, Western Australian Department of Conservation and Land Management.

[CALM] Department of Conservation and Land Management, 2005. Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005-2015. Western Australian Department of Conservation and Land Management.

[DAWE] Department of Agriculture, Water and the Environment, 2021. Species Profile and Threats Database. Australian Government. Accessed at Species Profiles (SPRAT) (environment.gov.au).

[DoE] Department of the Environment, 2015. Wildlife Conservation Plan for migratory shorebirds. Commonwealth of Australia, 2017.

[DOEE] Department of Environment and Energy, 2016. National Strategy for Mitigating Vessel Strike of Marine Mega-fauna. Commonwealth of Australia, 2016.

[DoEE] Department of the Environment and Energy, 2017. Recovery Plan for Marine Turtles in Australia. Department of the Environment and Energy, Commonwealth of Australia, 2017.

[DoEE] Department of the Environment and Energy, 2018.Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia’s coasts and oceans. Commonwealth of Australia, 2018.

[DPIRD] Department of Primary Industries and Regional Development, 2018. Draft Management Plan for the Pilbara Crab Managed Fishery. Fisheries Management Paper No. 290. Government of Western Australia, 2018.

[DSEWPaC] Department of Sustainability, Environment, Water, Population and Communities, 2012a. Marine bioregional plan for the North-west Marine Region. Commonwealth of Australia, Canberra.

[DSEWPaC] Department of Sustainability, Environment, Water, Population and Communities, 2012b. Marine bioregional plan for the North Marine Region. Commonwealth of Australia, Canberra.

[DPIRD] Department of Primary Industries and Regional Development, 2021.Fishcube data

[DWER] Department of Water and Environmental Regulation, 2019. Landfill Waste Classification and Waste Definitions 1996 (as amended 2019), under the Environmental Protection Act 1986. Government of Western Australia, December 2019.

[IMO] International Maritime Organization, 2011. Guidelines for the control and management of ships’ biofouling to minimize the transfer of invasive aquatic species (the Biofouling Guidelines).

[IOGP] International Association of Oil and Gas Producers, 2016. Managing Naturally Occurring Radioactive Material (NORM) in the oil and gas industry. Report No. 412, Version 2, March 2016.

[NMFS] National Marine Fisheries Service. 2014. Marine Mammals: Interim Sound Threshold Guidance (webpage). National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guid ance.html.

[NRC] National Research Council, 2003. Ocean Noise and Marine Mammals. Washington, DC: The National Academies Press. https://doi.org/10.17226/10564

[NSF] National Science Foundation (U.S.), [USGS] U.S. Geological Survey, and [NOAA] National Oceanic and Atmospheric Administration (U.S.) 2011. Final Programmatic Environmental Impact Statement/Overseas. Environmental Impact Statement for Marine Seismic Research, Funded by the National Science Foundation or Conducted by the U.S. Geological Survey. National Science Foundation, Arlington, VA.

Achinger Dias, L., Litz, J., Garrison, L., Martinez, A., Barry, K., Speakman, T., 2017. Exposure of cetaceans to petroleum products following the Deepwater Horizon oil spill in the Gulf of Mexico. Endangered Species Research 33: 119-125.

Australian Maritime Safety Authority (AMSA), 2013. The Effects of Maritime Oil Spills on Wildlife including Non-avian Marine Life. Australian Maritime Safety Authority, Canberra, ACT.

Bartol, S.M., Musick, J.A., 2003. Sensory biology of sea turtles. In: Biology of Sea Turtles, Vol. 2. Lutz, P.L., Musick, J.A., Wyneken, J. (Eds.), pp. 79-102. Boca Raton, FL: CRC Press.

Beiras, R., Bellas, J., Cachot, J., Cormier, B., Cousin, X., Engwalld, M., Gambardella, C., Garaventa, F., Keiter, S., Le Bihanic, F., López-Ibáñez, S., Piazza, V., Rial, D., Tato, T., and Vidal-Liñá, L. 2018. Ingestion and contact with polyethylene microplastics does not cause acute toxicity on marine zooplankton. *Journal of Hazardous Materials* 360: 452-460

BMT Oceanica, 2016. Offshore canyons of Western Australia: Cape Range Canyon literature review and Enfield Canyon 2015 environment survey (Report No. 1247_003/2 Rev 1). BMT Oceanica Pty Ltd, Perth.

Bond, T., Prince, J., Partridge, J. C., White, D., & McLean, D. L., 2018. The value of subsea pipelines to marine biodiversity. In *Offshore Technology Conference Asia*. OnePetro.

Cannel, B., Hamilton, S., Driessen, J., 2019. Wedge-tailed shearwater foraging behaviour in Exmouth region. Report for Woodside Energy Ltd. University of Western Australia and Birdlife Australia, 36pp.

Catry, T., Ramos, J.A., Le Corre, M., Phillips, R.A., 2009. Movements, at-sea distribution and behaviour of a tropical pelagic seabird: the wedge-tailed shearwater in the western Indian Ocean. Marine Ecology Progress Series 391: 231-242

Chevron, 2015. Gorgon Gas Development and Jansz Feed Gas Pipeline: Long term Marine Turtle Management Plan. Vol. Revision 1, Amendment 3. Perth, Western Australia. pp 215.

Cianchetti-Benedetti M., Becciu, P., Massa, B., Dell'Omo, G., 2018. Conflicts between tourist recreational activities and breeding shearwaters: short-term effect of artificial light and sound on chick weight. European Journal of Wildlife Research, 64, doi:10.1007/s10344-018-1178-x.

Commonwealth of Australia, 2006. A Guide to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0. Department of the Environment and Heritage, Canberra, Australia.

Commonwealth of Australia, 2014. Program Report: Strategic assessment of the environmental management authorisation process for petroleum and greenhouse gas storage activities, administered by the National Offshore Petroleum Safety and Environmental Management Authority under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*.

Commonwealth of Australia, 2015. Conservation Management Plan for the Blue Whale. A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, Canberra, Australia

Commonwealth of Australia, 2020. National Light Pollution Guidelines (NLPG) for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds, Commonwealth of Australia 2020.

Danovaro, R., Gambi, C., Dell'Anno, A., Corinaldesi, C., Fraschetti, S., Vanreusel, A., Vincx, M., Gooday, A.J., 2008. Exponential decline of deep-sea ecosystem functioning linked to benthic biodiversity loss. Current Biology 18(1): 1-8

Delarue, J. J-Y., Wilson, C.C., Kowarksi, K., Lawrence, C. & Martin, S.B., 2021. ExxonMobil Canada Ltd Flemish Pass Exploratory Drilling Operations: Soundscape Characterization, Marine Mammal Occurrence, and Potential Effects of Underwater Noise Emissions on Cetaceans. Document 02151, Version 3.1. Technical report by JASCO Applied Sciences for Wood PLC.

Double, M., Gales, N., Jenner, K., Jenner, M., 2010. Satellite tracking of south-bound female humpback whales in the Kimberley region of Western Australia. Australian Marine Mammal Centre, Hobart.

Double, M., Jenner, K., Jenner, M., Ball, I., Childerhouse, S., Loverick, S., Gales, N., 2012a. Satellite tracking of northbound humpback whales (*Megaptera novaeangliae*) off Western Australia. Australian Marine Mammal Centre, Hobart.

Double M.C., Jenner, K.C.S., Ball, I., Laverick, S., Gales, N., 2012b. Satellite tracking of pygmy blue whales (*Balaenoptera musculus brevicausa*) off Western Australia.

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.

Environment Australia, 2002. Ningaloo Marine Park (Commonwealth Waters) Management Plan. Federal Register of Legislative Instruments F2007B00971. Commonwealth of Australia, Canberra.

Erbe, C., 2012. Effects of Underwater Noise on Marine Mammals. In: Popper A.N., Hawkins A. (eds) The Effects of Noise on Aquatic Life. Advances in Experimental Medicine and Biology. 730: 17-22.

Erbe, C., Reichmuth, C., Cunningham, K., Lucke, K., Dooling, R., 2015. Acoustic Masking in Marine Mammals: A review and Research Strategy. Report to the, International Association of Oil and Gas Producers' Joint Industry Program.

Erbe, C., Dunlop, R., Dolman, S., 2018. Effects of Noise on Marine Mammals. Effects of Anthropogenic Noise on Animals. Springer Handbook of Auditory Research, vol 66, pp 277-309.

Finneran, J.J., E.E. Henderson, D.S. Houser, K. Jenkins, S. Kotecki, and J. Mulsow. 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical report by Space and Naval Warfare Systems Center Pacific (SSC Pacific). 183 p. https://apps.dtic.mil/dtic/tr/fulltext/u2/a561707.pdf.

Fodrie, F.J., Heck Jr., K. L., 2011. Response of coastal fishes to the Gulf of Mexico oil disaster. PLoSONE 6(7): e21609. https://doi.org/10.1371/journal.pone.0021609.

Foley, C., Feiner, Z., Malinich, T., and Höök, T. 2018. A meta-analysis of the effects of exposure to microplastics on fish and aquatic invertebrates. *Sci Total Envior.* 631-632: 550-559

Foote, A.D., Osborne, R.W., Hoelzel, A.R., 2014. Whale-call Response to Masking Boat Noise. Nature 428 (910).

Frick, W.E., Roberts P.J.W., Davis L.R., Keyes, J., Baumgartner, D.J., George, K.P. 2001. *Dilution Models for Effluent Discharges*. 4th Edition (Visual Plumes) – DRAFT. U.S. EPA Environmental Standards Division.

Fristrup, K.M. et al., Hatch, L.T., Clark, C.W.,2003. Variation in humpback whale (*Megaptera novaengliae*) song length in relation to low-frequency sound broadcasts. The Journal of the Acoustc Society of America 113 (3411).

Gagnon M.M., Rawson, C.A., 2010. Montara Well Release: Report on necropsies from a Timor Sea green sea turtle. Curtin University, Perth, Western Australia.

Gaston, K. J., Duffy, J. P., Gaston, S., Bennie, J., Davies, T. W., 2014. Human alteration of natural light cycles: Causes and ecological consequences. Oecologia, 176: 917– 931.

Geiling, N., 2014. Arctic Shipping: Good for invasive species, bad for the rest of nature. Smithsonian. Available at: http://www.smithsonianmag.com/science-nature/global-warmings-unexpected-consequence-invasivespecies-180951573/?no-ist. Accessed 10-Apr-2019.

Geraci, J.R., 1988. Physiological and toxicology effects on cetaceans. In: Synthesis of effects of oil on marine mammals, Chapter 5. J.R. Geraci and D.J. St. Aubin, eds. OCS Study MMS 88-0049 prepared by Battelle Memorial Institute for USDOI, MMS, Atlantic OCS region, under contract no. 14-120001-30293.

Groom, R.A., Lawler, I.R. & Marsh, H., 2004. The risk to dugongs of vessel strike in the Southern Bay Islands area of Moreton Bay. Report to Queensland Parks and Wildlife Service.

Hannay, D.E. & Racca, R.G., 2005. Acoustic Model Validation. Document Number: 0000-S-90-04-T-7006-00-E. Revision 02. Technical report for Sakhalin Energy Investment Company Ltd. by JASCO Research Ltd. http://www.sakhalinenergy.com/en/documents/doc_33_jasco.pdf.

Hazel, J., Gyuris, E., 2006. Vessel-related mortality of sea turtles in Queensland, Australia. Wildlife Research 33(2):149–154.

Hazel, J., Lawler, I.R., Marsh, H., Robson, S., 2007. Vessel speed increases collision risk for the green turtle Chelonia mydas. Endangered Species Research 3: 105–113.

Hazel, J. Lawler, I.R., Hamann, M., 2009. Diving at the shallow end: Green turtle behaviour in nearshore foraging habitat. Journal of Experimental Marine Biology and Ecology 371: 84- 92.

Heintz, R.A., Rice, S.D., Wertheimer, A.C., Bradshaw, R.F., Thrower, F.P., Joyce, J.E., Short, J.W., 2000. Delayed effects on growth and marine survival of pink salmon *Oncorhynchus gorbuscha* after exposure to crude oil during embryonic development. Marine Ecology Progress Series 208: 205–216.

Helm, R.C, Costa, D.P, DeBruyn, T.D, O'Shea, T.J, Wells, R.S, Williams, T.M., 2015. Overview of effects of oil spills on marine mammals. In: Fingas M (ed) Handbook of oil spill science and technology, 1st edn. John Wiley & Sons, Hoboken, NJ, p 455−475.

Henkel, J.R., Sigel, B.J., Taylor, C.M., 2012. Large-scale impacts of the Deepwater Horizon oil spill: can local disturbance affect distant ecosystems through migratory shorebirds? BioScience 62(7): 676-685.

Heyward, A., Rees, M., 2001. Enfield/Laverda ROV-based deepwater benthos survey. Australian Institute of Marine Science, Townsville.

Heyward, A., Rees, M., Wolff, C., 2001a. Vincent-Enfield-Laverda field report on initial deepwater benthos sampling survey. Australian Institute of Marine Science, Townsville.

Heyward, A., Rees, M., Wolff, C., Smith, L., 2001b. Exploration of biodiversity – data report on benthic habitats and biological collections from an initial benthic survey conducted in the region of WA-271-P. Australian Institute of Marine Science, Perth.

Hodge, W., Limpus, C.J., & Smissen, P., 2007. Queensland turtle conservation project. Hummock Hill Island nesting turtle study December 2006. Conservation technical and Data Report. Environmental Protection Agency, Queensland.

Hodgson, A., J., 2004. Dugong behaviour and responses to human influences. Thesis submission November 2004, James Cook University.

IPIECA, 2014. Mercury management in petroleum refining. An IPIECA Good Practice Guide. London, UK.

International Petroleum Industry Environmental Conservation Association (IPIECA), 2004. A Guide to Oiled Wildlife Response Planning. International Petroleum Industry Conservation Association Report Series, no. 13.

International Tanker Owners Pollution Federation (ITOPF), 2011a. Effects of oil pollution on the marine environment. Technical Paper 13. International Tanker Owners Pollution Federation Limited, London, United Kingdom.

International Tanker Owners Pollution Federation (ITOPF), 2011b. Effects of oil pollution on fisheries and mariculture. Technical Paper 11. International Tanker Owners Pollution Federation Limited, London, United Kingdom.

Jarman, S., & Wilson, S., 2004. DNA-based species identification of krill consumed by whale sharks. Journal of Fish Biology 65: 586–591.

Jenner, K.C.S., Jenner, M-N.M., & McCabe, K.A., 2001. Geographical and temporal movements of humpback whales in Western Australia. Australian Petroleum Production and Exploration Association (APPEA) Journal 41: 749–765.

Jensen, A., & Silber, G., 2004. Large whale ship strike database (NOAA Technical Memorandum No. NMFS-OPR). National Marine Fisheries Service, Silver Spring.

Jiménez-Arranz, G., Glanfield, R., Banda, N., & Wyatt, R., 2017. Review of existing data on underwater sound produced by the oil and gas industry. Report by Seiche Ltd. prepared for the E&P Sound & Marine Life (JIP).

Jimenez-Arranz, G., Hedgeland, D., Cook, S., Banda, N., Johnston, P. & Oliver, E., 2019. Acoustic characterisation of a mobile offshore drilling unit. Proceedings of Meetings on Acoustics 37, 0700 https://doi.org/10.1121/2.0001193

Kamrowski, R. L., Limpus, C., Jones, R., Anderson, S., & Hamann, M., 2014. Temporal changes in artificial light exposure of marine turtle nesting areas. Global Change Biology 20, 2437-2449.

Kowarski, K.A., Wilson, C.C. Delarue, J.J.-Y. & Martin, S.B., 2021. Flemish Pass Acoustic Monitoring: Ambient Characterization and Marine Mammal Monitoring near a Mobile Offshore Drilling Unit. Document 02528, Version 2.0. Technical report by JASCO Applied Sciences for Wood Environment and Infrastructure Solutions.

Laddich, F., & Fay, R.R., 2013. Auditory evoked potential audiometry in fish. Reviews in Fish Biology and Fisheries. (23), pp. 317-364.

Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S., & Podesta, M., 2001. Collisions between ships and whales. Marine Mammal Science 17: 35–75.

Last, P.R., Lyne, V., Yearsley, G., Gledhill, D., Gomon, M., Rees, T., & White, W., 2005. Validation of national demersal fish datasets for the regionalisation of the Australian continental slope and outer shelf (>40m depth). National Oceans Office, Hobart.

Lenhardt, M.L., 1994. Seismic and very low frequency sound induced behaviours in captive loggerhead marine turtles (*Caretta Caretta*). Pages 238-241 in Bjorndal, K.A., Bolten, A.B., Johnson, D.A. & Eliazar, P.J., eds. Proceedings of the fourteenth annual symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Longcore, T., & Rich. C., 2004. Ecological light pollution. Frontiers in Ecology and the Environment 2(4): 191-198

Lutcavage, M.E, Lutz, P.L, Bossart, G.D., & Hudson, D.M., 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. Archives of Environmental Contamination and Toxicology 28:417–422.

McCauley, R., 1998. Radiated underwater noise measured from the drilling rig Ocean General, rig tenders Pacific Ariki and Pacific Frontier, fishing vessel Reef Venture and natural sources in the Timor Sea, Northern Australia. (Report No. C98-20). Centre for Marine Science and Technology, Curtin University of Technology, Perth.

McCauley, R., 2005. Underwater sea noise in the Otway Basin – drilling, seismic and blue whales, Oct-Dec 2003, in: Howell, E. (Ed.), A Compilation of Recent Research into the Marine Environment. Australian Petroleum Exploration Association, Canberra, pp. 18–19.

McCauley, R., 2011. Woodside Kimberley Sea Noise Logger Program, September 2006 to June 2009: Whales, fish and man made noise. For Woodside Energy. Project CMST 861. Report R2010-50_3 (unpublished)

McCauley, R. & Jenner, C., 2001. The underwater acoustic environment in the vicinity of Vincent and Enfield petroleum leases, North West Cape, Exmouth WA (Report No. R2001-22). Centre for Marine Science and Technology, Curtin University of Technology, Perth.

McCauley, R., Fewtrell, J., Duncan, A., Jenner, C., Jenner, M.-N., Penrose, J., Prince, R., Adhitya, A., Murdoch, J. and McCabe, K., 2000. Marine seismic surveys: a study of environmental implications. APPEA Journal 40, 749–765.

McCauley, R., & Jenner, C., 2010. Migratory patterns and estimated population size of pygmy blue whales (*Balaenoptera musculus brevicauda*) traversing the Western Australian coast based on passive acoustics. Paper SC/62/SH26 presented to the IWC Scientific Committee, 2010 (unpublished).

McIntyre, A.D. & Johnston, R., 1975. Effects of nutrient enrichment from sewage in the sea. In Discharge of Sewage from Sea Outfalls: Proceedings of an International Symposium Held at Church House, London, 27 August to 2 September 1974 (p. 131).

McLean, D.L., Taylor, M.D., Partridge, J.C., Gibbons, B., Langlois, T.J., Malseed, B.E., Smith, L.D., & Bond, T., 2018. Fish and habitats on wellhead infrastructure on the north west shelf of Western Australia. Continental Shelf Research, 164, pp.10-27.

McLean, D. L., Taylor, M. D., Ospina, A. G., & Partridge, J. C., 2019. An assessment of fish and marine growth associated with an oil and gas platform jacket using an augmented remotely operated vehicle. *Continental Shelf Research*, *179*, 66-84.

McLean, D. L., Vaughan, B. I., Malseed, B. E., & Taylor, M. D., 2020. Fish-habitat associations on a subsea pipeline within an Australian Marine Park. *Marine environmental research*, *153*, 104813.

Meekan, M., & Radford, B., 2010. Migration patterns of Whale sharks; A summary of 15 satellite tag tracks from 2005 to 2008. Report to the Browse Joint Venture Partners. Australian Institute of Marine Science, Perth (21pp).

Milton, S. L., & Lutz, P. L., 2003. Physiology and genetic responses to environmental stress. In The Biology of Sea Turtles, vol. 2 (eds P. L. Lutz, J. A. Musick and J. Wyneken), pp. 163-197. Boca Raton: CRC Press.

Milton, S., Lutz, P., & Shigenka, G., 2010. Oil toxicity and impacts on sea turtles (Chapter 4). In: Shigenka, G (Ed.) Oil and sea turtles; Biology, planning, and response. Office of Response and Restoration, National Oceanic and Atmospheric Administration (NOAA), pp. 35-47

Mitkus, M., Nevitt, G.A., & Kelber, A., 2018. Development of the Visual System in a Burrow-Nesting Seabird: Leach's Storm Petrel. Brain Behaviour Evolution 91: 4–16.

Montagna, P.A., Baguley, J.G., Cooksey, C., Hartwell, I., Hyde, L.J., Hyland, J.L., Kalke, R.D., Kracker, L.M., Reuscher, M., & Rhodes, A.C.E., 2013. Deep-sea benthic footprint of the Deepwater Horizon blowout. PloS ONE 8: e70540. Doi:10.1371/journal.pone.0070540.

Möller, L.M., Attard, C.R., Bilgmann, K., Andrews-Goff, V., Jonsen, I., Paton, D., & Double, M.C., 2020. Movements and behaviour of blue whales satellite tagged in an Australian upwelling system. Scientific Reports, 21165 (10).

National Marine Fisheries Service (US) (NMFS), 2018. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. US Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59. 167 p.

National Oceanic and Atmospheric Administration (NOAA), 2010. Oil and Sea Turtles: Biology, Planning and Response. National Oceanic and Atmospheric Administration, Washington.

National Oceanic and Atmospheric Administration (NOAA), 2014. Oil spills in mangroves: Planning & response considerations. National Oceanic and Atmospheric Administration, Washington.

National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), 2019. Environmental Bulletin #1: Oil spill modelling. National Offshore Petroleum Safety and Environmental Management Authority, A652993, 7 pp.

Neff, J., Lee, K., DeBlois, & E.M., 2011. Produced water: overview of composition, fates, and effects, in: Lee, K., Neff, J. (Eds.), Produced Water. Springer, New York, pp. 3–54.

Negri, A.P., & Heyward, A.J., 2000. Inhibition of fertilization and larval metamorphosis of the coral *Acropora millepora* (Ehrenberg, 1834) by petroleum products. Marine Pollution Bulletin 41(7-12): 420-427.

Noad, M.J., & Cato, D.H., 2007. Swimming speeds of singing and non-singing humpback whales during migration. Marine Mammal Science. 23(3), 481-495.

Pangerc, T., Robinson, S., Theobald, P., & Galley, L., 2016. Underwater sound measurement data during diamond wire cutting: First description of radiated noise. Proceedings of Mettings Acoustic, 27(1).

Patterson, H., Bromhead, D., Galeano, D., Larcombe, J., Woodhams, J., & Curtotti, R., 2021, Fishery status reports 2021, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/vahf-ng93

Patterson, H., Williams, A., Woodhams, J., & Curtotti, R., 2019, Fishery status reports 2019, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/5d80431de3fae.Paulay, G., Kirkendale, L., Lambert, G., & Meyer, C., 2002. Anthropogenic biotic interchange in a coral reef ecosystem: A case study from Guam. Pacific Science 56(4):403–422.

Peel, D., Smith, J. N., & Childerhouse, S., 2018. Vessel strike of whales in Australia: the challenges of analysis of historical incident data. *Frontiers in Marine Science*, *5*, 69.

Pendoley Environmental (PENV), 2020. Scarborough Desktop Lighting Impact Assessment. Report prepared for Advisian (on behalf of Woodside Energy). Available in Appendix K.

Pendoley Environmental (PENV), 2021. Ningaloo Lighthouse Resort Development: Artificial Light Assessment and Management Plan. Prepared by Pendoley Environmental Pty Ltd for Northwest Resorts, April 2021. 102 pp.

PJOil and Gas UK, 2014. Guidance on risk related decision making (Issue No. 2). United Kingdom Offshore Operators Association, London.

Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W. T., Gentry, R., Halvorsen, M. B., Løkkeborg, S., Rogers, P., Southall, B. L., Zeddies, D., & Tavolga, W. N., 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report*. ASA S3/SC1.4 TR-201.4 prepared by ANSI Accredited Standards Committee.

Popper, A.N., & Hawkins, A.D., 2019. An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes. Journal of Fish Biology. 94(5):692-713.

Richardson, W.J., Greene Jr, C.R., Malme, C.I., Thomson, D.H., 1995. Marine Mammals and Noise. Academic Press, San Diego.

Rodríguez, A., Burgan, G., Dann, P., Jessop, R., Negro, J.J., Chiaradia, A. (2014). Fatal Attraction of Short-Tailed Shearwaters to Artficial Lights. PLoS ONE 9(10): e110114.

Rodríguez, A., Holmes, N.D., Ryan, P.G., Wilson, K-J., Faulquier, L., Murillo, Y., Raine, A.F., Penniman, J.F., Neves, V., Rodríguez, B., Negro, J.J., Chiaradia, A., Dann, P., Anderson, T., Metzger, B., Shirai, M., Deppe, L., Wheeler, J., Hodum, P., Gouveia, C., Carmo, V., Carreira, G.P., Delgado-Alburqueque, L., Guerra-Correa, C., Couzi, F-X., Travers, M., Corre, M.L., 2017. Seabird mortality induced by land-based artificial lights. Conservation Biology 31: 986–1001.

Rolland, M.R., Parks, S.E., Hunt, K.E., Castellote, M., Corkeron, P.J., Nowacek, D.P., Wasser, S.K., and Kraus, S. (2012). Evidence that ship noise increases stress in right whales. The Royal Society. 279(1737).

Runcie, J., Macinnis-Ng, C., Ralph, P., 2010. The toxic effects of petrochemicals on seagrassess - literature review. Institute for Water and Environmental Resource Management, University of Technology Sydney, Sydney.

Kent, C. S., McCauley, R. D., Duncan, A., Erbe, C., Gavrilov, A., Lucke, K., & Parnum, I. (2016). Underwater Sound and Vibration from Offshore Petroleum Activities and their Potential Effects on Marine Fauna: An Australian Perspective.Salmon, M., Reiners, R., Lavin, C., Wyneken, J., 1995a. Behavior of loggerhead sea turtles on an urban beach. I. Correlates of nest placement. Journal of Herpetology 560–567.

Salmon, M., Witherington, B.E., 1995a. Artificial lighting and seafinding by loggerhead hatchlings: evidence for lunar modulation. Copeia 931–938.

Salmon, M., Wyneken, J., Fritz, E., & Lucas, M., 1992. Seafinding by hatchling sea turtles: role of brightness, silhouette and beach slope as orientation cues. Behaviour 122:56-77.

Salmon, M., Tolbert, M.G., Painter, D.P., Goff, M., & Reiners, R., 1995b. Behavior of loggerhead sea turtles on an urban beach. II. Hatchling orientation. Journal of Herpetology 568–576.

Sanderfoot, V., & Holloway, T., 2017. *Air Pollution impacts on avian species via inhalation exposure and associated outcomes*. Environmental Research Letters 12: 8.

Schianetz, K., Jones, T., Kavanagh, L., Walker, P.A., Lockington, D., & Wood, D., 2009. The practicalities of a Learning Tourism Destination: a case study of the Ningaloo Coast. International Journal of Tourism Research 11: 567–581. Doi:10.1002/jtr.729

Shell, 2010. *Prelide Floating LNG Project EIS Supplement-Response to Submissions*. Shell Development (Australia) Proprietary Limited. EPBC 2008/4146.

Sitkiewicz, S., Hetrick. W., Leonard, K., and Wisdom, S. 2018. 2018 Harvest Alaska Cook Inlet Pipeline Project Monitoring Program Marine Mammal Monitoring and Mitigation Report. Prepared for Harvest Alaska, LLC, 3800 Centerpoint Drive, Suite 1400, Anchorage, Alaska 99503 Submitted to National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, 1315 East West Highway, Silver Spring, MD 20910. Prepared by Fairweather Science, 301 Calista Court, Anchorage, AK 99518. November 26, 2018.

Simmonds, M., Dolman, S., & Weilgart, L. (eds), 2004. Oceans of noise – A Whale and Dolphin Conservation Society Science Report, Wiltshire, United Kingdom.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P., & Tyack, P.L., 2019. Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals* 45(2): 125-232.

Stevens, J., Last, P.R., White, W.T., McAuley, R.B., & Meekan. M.G., 2009. Diversity, abundance and habitat utilization of sharks and rays. Final report to Western Australian Marine Science Institute. CSIRO

Strain, L. 2018. Brownlip Abalone. Status of Australian Fish Stocks Report. Available at: SAFS Report 2018 (fish.gov.au)

Taylor, J.G., 2007. Ram filter-feeding and nocturnal feeding of whale sharks (*Rhincodon typus*) at Ningaloo Reef, Western Australia. Fisheries Research 84: 65-70.

Taylor, KG and Macquaker, JHS 2011. Iron Minerals in Marine Sediments Record Chemical Environments. Elements 7(2): 113–118.

Telfer, T.C., Sincock, J. L., Byrd, G.V., & Reed, J.R., 1987. Attraction of Hawaiian seabirds to lights: conservation efforts and effects of moon phase. Wildlife Society Bulletin 15: 406–413.

Threatened Species Scientific Committee (TSSC). 2015d. *Approved Conservation Advice for Rhincodon typus (whale shark)*. Threat Department of Sustainability, Environment, Water, Population and Communities. Department of the Environment and Energy. Accessed at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66680-conservation-advice-01102015.pdf. (Accessed 10 October 2018).

Twatchman Snyder & Byrd, Inc. and Centre for Energy Studies, Louisiana State University. (2004). Operational and Socioeconomic Impact of Nonexplosive Removal of Offshore Structures. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-074. 50p.

Vanderlaan, A.S.M., & Taggart, C.T., 2007. Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science 23: 144–156. Doi:10.1111/j.1748-7692.2006.00098.x

Walker, D.I., & McComb, A.J. 1990. Salinity Response of the Seagrass *Amphibolis antarctica* (*Labill*.) Sonder et Aschers.: An Experimental Validation of Field Results. Botany Department. University of Western Australia. 36: pp359-366.

Wang, X., Duan, J., Li, Y., Zhang, J., Ma, S. and Baorong Hou, B. 2005. Corrosion of steel structures in sea-bed sediment. Bulletin of Materials Science, Vol. 28, No. 2, pp. 81–85. Indian Academy of Sciences.

Warner, G., & McCrodan, A., 2011. Underwater sound measurements (Chapter 3). In: Hartin, K.G., Bisson, L.N., Case, S.A., Ireland, D.S., Hannay, D. (Eds.). Marine mammal monitoring and mitigation during site clearance and geotechnical surveys by Statoil USA E&P Inc. in the Chukchi Sea, August-October 2011: 90 day report. LGL Rep. P1193. Rep. from LGL Alaska Research Associates Inc., LGL Ltd., and JASCO Research Ltd. For Statoil USA E&P Inc., Nat. Mar. Fish. Serv., and U.S. Fish and Wild. Serv. 202 pp plus appendices.

Weilgart, L.S. (2007). The impacts of anthropogenic ocean noise on cetaceans and implications for management. Canadian Journal of Zoology. 85(11).

Whale and Dolphin Conservation Society (WDCS). (2006). Vessel collisions and cetaceans: what happens when they don't miss the boat. *A WDCS Science Report*.

Whittow, G.C., 1997. Wedge-tailed shearwater (*Puffinus pacificus*). In: Poole, A. (Ed.) The birds of North America Online, Vol. 305. Ithaca, NY: Cornell Lab of Ornithology.

Williamson, M., & Fitter, A., 1996. The Characteristics of Successful Invaders, Biological Conservation, vol. 78, pp. 163-170.

Woodside Energy Limited, 2011. Browse LNG Development Draft Upstream Environmental Impact Statement (No. EPBC Referral 2008/4111). Woodside Energy Limited, Perth.

Zieman, J.C., Orth, R., Phillips, R.C., Thayer, G., & Thorhaug, A., 1984. The effects of oil on seagrass ecosystems. In: Cairns, J. Jr. and Buikema, A. L. Jr. (Eds.) Restoration and Management of Marine Ecosystems Impacted by Oil. Butterworth, Boston, pp.37- 64.

Zykov, M., 2013. Underwater sound modelling of low energy geophysical equipment operations. JASCO Document 00600, Version 2.0. Technical Report by JASCO Applied Sciences for CSA Ocean Sciences Inc.

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
%	Percent
@	At
°C	Degrees Celsius
3D	Three-dimensional
ABARES	Australian Bureau of Agricultural and Resource Economics
ABWJ	Abrasive Water Jet
AFMA	Australian Fisheries Management Authority
AHO	Australian Hydrographic Office
AHT	Anchor handling tug(s)
AIIMS	Australasian Inter-service Incident Management System
AIMS	Australian Institute of Marine Science
AIS	Automatic Identification System
ALARP	As low as reasonably practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
API	American Petroleum Institute
ASAP	As soon as possible
AS/NZS	Australian Standard/New Zealand Standard
ATSB	Australian Transport Safety Bureau
BIA	Biologically Important Area
BoM	Bureau of Meteorology
BOP	Blowout Preventer
BP	Boiling Point
BTEX	Benzene, toluene, ethylbenzene and xylenes
C	Control
CAES	Catch and Effort System
CALM	Former Western Australian Department of Conservation and Land Management (now DBCA)

Acronym	Description
CCP	Cyclone Contingency Plan
CEFAS	United Kingdom Centre for Environment, Fisheries and Aquaculture Science
CFA	Commonwealth Fisheries Association
CH_4	Methane
CHP	Commonwealth Heritage Place
CICC	Corporate Incident Communication Centre
cm^3	Cubic centimetre
CMID	Common Marine Inspection Document
CMT	Crisis Management Team
CO	Carbon monoxide
CO_2	Carbon dioxide
COABIS	Component Orientated Anomaly Based Inspection System
CRR	Current risk rating
cP	Centipoise
CS	Cost Sacrifice
CV	Company Value
DAA	Western Australian Department of Aboriginal Affairs
DAWE	Commonwealth Department of Agriculture, Water and the Environment
dB re 1 µPa	Decibels relative to one micropascal; the unit used to measure the intensity of an underwater sound
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 DAWE)
DP	Dynamic positioning
DPIRD	Western Australian Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now DAWE)
EMBA	Environment that may be affected
EMS	Environmental Management System
ENVID	Environment Identification (study)
EP	Environment Plan

Acronym	Description
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)	Negligible
FPSO	Floating production, storage, and offtake
g	Gram
g/cm^3	Density
g/m^2	Grams per square metre
GHG	Green House Gas
GP	Good Practice
ha	Hectare
HAZID	Hazard identification (study)
HDXRF	High-Definition X-Ray Florescence
HF	High frequency
HFCs	Hydrofluorocarbons
HLV	Heavy Lift Vessel
HOCNF	Harmonised offshore chemical notification format
HP	High Pressure
HQ	Hazard Quotient
HSE	Health, Safety, and Environment
HSP	Hydrocarbon Spill Preparedness
IAATO	International Association of Antarctica Tour Operators
IAP	Incident Action Plan
IAPP	International Air Pollution Prevention
ICC	Incident Coordinate Centre
ICLDP	Incident and Crisis Leadership Development Program
IMCA	International Marine Contractors Association
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organisation
IMR	Inspection, Maintenance and Repair
IMR	Inspection, maintenance and repair

Acronym	Description
IMS	Invasive Marine Species
IMT	Incident Management Team
IPIECA	International Petroleum Industry Environmental Conservation Association
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
LCS	Legislation, Codes and Standards
LF	Low-frequency
LNG	Liquefied Natural Gas
m	Metre
m2	Square metre
m3	Cubic metre
MARPOL	The International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978.
MC	Measurement Criteria
MEG	Monoethylene glycol
MFO	Marine Fauna Observer
mg	Milligram
mLAT	Magnetic latitude
MNES	Matters of National Environmental Significance
MoC	Management of Change
MPA	Marine Protected Area
MSIN	Marine Safety Information Notification
MSS	Marine Seismic Survey
N_2O	Nitrous Oxide

Acronym	Description
n.d.	No date
N/A	Not Applicable
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 Title Administrator
NORM	Naturally Occurring Radioactive Material
NOx	Nitrogen oxides
NRC	North Rankin Complex
NTM	Notices to mariners
NWMR	North-west Marine Region
OCIMF	Oil Companies International Marine Forum
OCNS	Offshore Chemical Notification Scheme
OIW	Oil in water
OPEP	Oil Pollution Emergency Plan
OPGGS Act	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
OSPRMA	Oil Spill Preparedness and Response Mitigation Assessment
OSR	Oil Spill Response
OSREC	Oil Spill Response Skills Enhancement Course
OSRO	Oil Spill Response Organisation
OVID	Off-shore Vessel Inspection Database
OVMSA	Offshore Vessel Safety Management System Assessment
P&A	Plugging and Abandonment
PBAs	Pre-emptive Baseline Areas
PENV	Pendoley Environmental
PFCs	Perfluorocarbons
PJ	Professional Judgement
PLF	Pilbara Line Fishery

Acronym	Description
PM10	Particulate matter less than 10 microns
PMST	Protected Matters Search Tool
PPA	Pilbara Ports Authority
ppb	Parts per billion
ppm	Parts per million
PS	Performance Standard
PTS	Permanent threshold shift
PTW	Permit to Work
RBA	Risk-based Analysis
RCC	Rescue Coordination Centre
RMS	Root Mean Square
RMS SPL	Root Mean Square Sound Pressure Level
ROV	Remotely operated vehicle
RPS	RPS Group
SCV	Subsea Construction Vessel
SF6	Sulphur hexafluoride
SIMAP	Spill Impact Mapping and Analysis program
SIMOPs	Simultaneous Operations
SMPEP	Spill Monitoring Program Execution Plan
SO_2	Sulphur dioxide
SOLAS	Safety Of Life At Sea
SOPEP	Ship Oil Pollution Emergency Plan
SPL	Sound Pressure Level
SSPL	Subsea and pipelines
SV	Societal Value
t	tonne
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
TTS	Temporary threshold shift
UK	United Kingdom
USBL	Ultra-short baseline
VLS	Vertical Lay System
VOC	Volatile Organic Compound
WA	Western Australia

Acronym	Description
WAFIC	Western Australian Fishing Industry Council
WCC	Woodside Communication Centre
WCBD	Well Control Bridging Document
WDCS	Whale and Dolphin Conservation Society
WEL	Woodside Energy Limited
WHA	World Heritage Area
WHP	World Heritage Place
WLS	Woodside Learning Services
WMS	Woodside Management System
WOCS	Workover Control System
WORS	Workover Riser System
XT	Xmas Tree

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

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.

APPENDIX B RELEVANT REQUIREMENTS

This appendix refers to Commonwealth Legislation related to the project. Western Australian State Legislation relevant to an accidental release of hydrocarbons in WA State waters is outlined in the Julimar Phase 2 Drilling and Subsea Installation Oil Pollution Emergency Plan.

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 - Mobile offshore drilling units* • *Marine order 57 - Helicopter operations* • *Marine order 60 - Floating offshore facilities* • *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 MODU 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.

Commonwealth Legislation	Legislation Summary
Protection of the Sea (Powers of Intervention) Act 1981	This Act authorises the Commonwealth to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and provides legal immunity for persons acting under an AMSA direction.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 *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 prevention—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

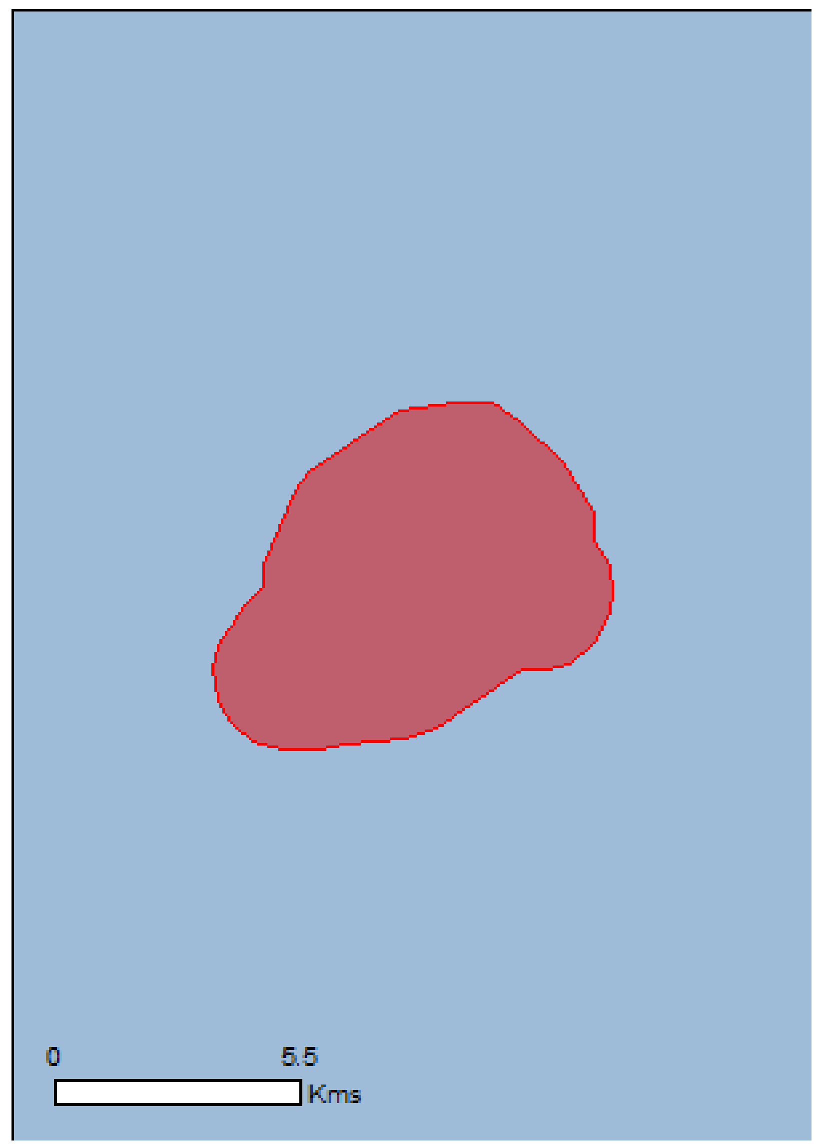
EPBC Act Protected Matters Report

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.

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.

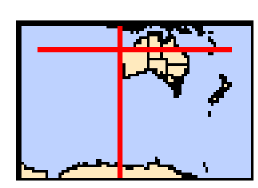
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 05/07/21 15:18:41



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:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	17
Listed Migratory Species:	32

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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	28
Whales and Other Cetaceans:	27
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	1

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 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

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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	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	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may 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 may occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	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	Species or species habitat likely to occur

Name	Threatened	Type of Presence
		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	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 known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
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
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known 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
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

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

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 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
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Reptiles		
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
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
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
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
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		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	Congregation or aggregation known to occur within area

Name	Threatened	Type of Presence
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	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	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat 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 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 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]	Vulnerable	Species or species habitat 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

Name	Status	Type of Presence
		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
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 (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

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
Canyons linking the Cuvier Abyssal Plain and the	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
-21.4667 113.9657,-21.4807 113.9595,-21.4847 113.9594,-21.4878 113.9554,-21.492 113.9532,-21.4946 113.951,-21.4997 113.9492,-21.506 113.9503,-21.51 113.9531,-21.5133 113.9574,-21.5151 113.9629,-21.5149 113.9708,-21.5139 113.9758,-21.5132 113.9877,-21.5108 113.9945,-21.5002 114.0112,-21.4998 114.0165,-21.499 114.0211,-21.4949 114.0258,-21.4897 114.0292,-21.4854 114.0297,-21.4806 114.029,-21.4762 114.0261,-21.4706 114.0262,-21.4609 114.0194,-21.4536 114.0111,-21.4502 114.0055,-21.45 113.998,-21.4518 113.9869,-21.4633 113.9685,-21.4667 113.9657

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.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Australian Government
Department of Agriculture, Water and the Environment

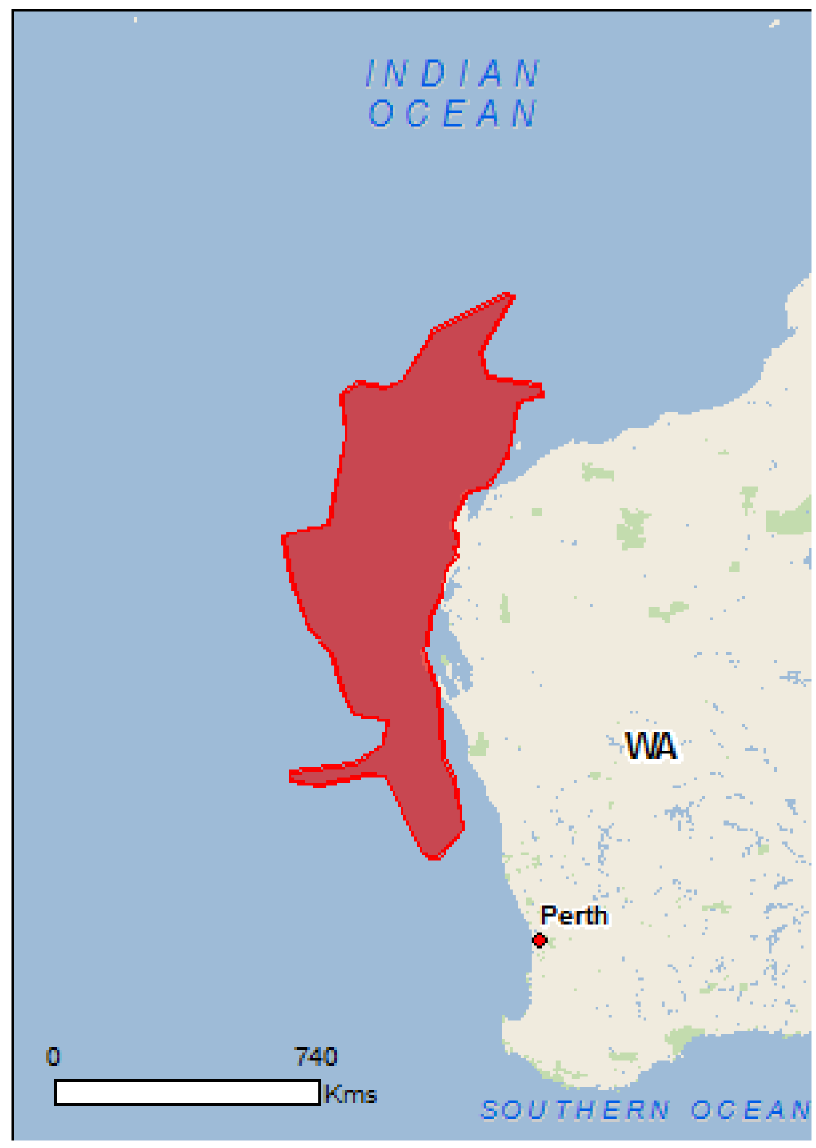
EPBC Act Protected Matters Report

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.

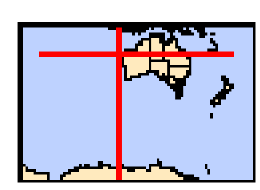
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 22/09/21 15:35:48



Coordinates
Buffer: 5.0Km



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:	2
National Heritage Places:	5
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	61
Listed Migratory Species:	77

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:	5
Commonwealth Heritage Places:	3
Listed Marine Species:	147
Whales and Other Cetaceans:	38
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	12

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	17
Regional Forest Agreements:	None
Invasive Species:	15
Nationally Important Wetlands:	4
Key Ecological Features (Marine)	11

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Shark Bay, Western Australia	WA	Declared property
The Ningaloo Coast	WA	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
Shark Bay, Western Australia	WA	Listed place
The Ningaloo Coast	WA	Listed place
Historic		
Batavia Shipwreck Site and Survivor Camps Area 1629 - Houtman Abrolhos	WA	Listed place
Dirk Hartog Landing Site 1616 - Cape Inscription Area	WA	Listed place
HMAS Sydney II and HSK Kormoran Shipwreck Sites	EXT	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
South-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Breeding 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 tenuirostris Great Knot [862]	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 known to occur within area

Name	Status	Type of Presence
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	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
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Malurus leucopterus leucopterus White-winged Fairy-wren (Dirk Hartog Island), Dirk Hartog Black-and-White Fairy-wren [26004]	Vulnerable	Species or species habitat likely to occur within area
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
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour known 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	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Turnix varius scintillans Painted Button-quail (Houtman Abrolhos) [82451]	Vulnerable	Species or species habitat likely to 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 lesueur Burrowing Bettong (Shark Bay), Boodie [66659]	Vulnerable	Species or species habitat known to occur within area
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat known to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may 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
Lagorchestes hirsutus bernieri Rufous Hare-wallaby (Bernier Island) [66662]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes hirsutus dorreae Rufous Hare-wallaby (Dorre Island) [66663]	Vulnerable	Species or species habitat known to occur within area
Lagostrophus fasciatus fasciatus Banded Hare-wallaby, Merrnine, Marnine, Munning [66664]	Vulnerable	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur

Name	Status	Type of Presence
		within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Breeding known to occur within area
Perameles bougainville bougainville Western Barred Bandicoot (Shark Bay) [66631]	Endangered	Species or species habitat known 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
Pseudomys fieldi Shark Bay Mouse, Djoongari, Alice Springs Mouse [113]	Vulnerable	Species or species habitat likely 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 likely 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
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Egernia stokesii badia Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	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	Foraging, feeding or related behaviour known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
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]		Foraging, feeding or related behaviour 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
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	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
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely 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	Foraging, feeding or related behaviour 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	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area

Name	Threatened	Type of Presence
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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	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 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 known to 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

Name	Threatened	Type of Presence
		habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		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 alba Sanderling [875]		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
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	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 known 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
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		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
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area

Name	Threatened	Type of Presence
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known 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 ADMIN & HF TRANSMITTING
Defence - EXMOUTH VLF TRANSMITTER STATION
Defence - LEARMONTH - AIR WEAPONS RANGE
Defence - LEARMONTH RADAR SITE - VLAMING HEAD EXMOUTH

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
Historic		
HMAS Sydney II and HSK Kormoran Shipwreck Sites	EXT	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
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Breeding known 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 habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		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
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known 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
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	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

Name	Threatened	Type of Presence
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
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		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
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		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

Name	Threatened	Type of Presence
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Pterodroma macroptera Great-winged Petrel [1035]		Foraging, feeding or related behaviour known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus huttoni Hutton's Shearwater [1025]		Foraging, feeding or related behaviour known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to 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	Foraging, feeding or related behaviour may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Endangered	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
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
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 galei Gale's Pipefish [66191]		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

Name	Threatened	Type of Presence
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
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 breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		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

Name	Threatened	Type of Presence
Hippocampus subelongatus West Australian Seahorse [66722]		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
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		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
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		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
Urocampus carinirostris		
Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer		
Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Dugong dugon		
Dugong [28]		Breeding known to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Endangered	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 likely 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 pooleorum		
Shark Bay Seasnake [66061]		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	Foraging, feeding or related behaviour known to occur within area
Disteira kingii		
Spectacled Seasnake [1123]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		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
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

Name	Status	Type of Presence
		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
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Hyperoodon planifrons Southern Bottlenose Whale [71]		Species or species habitat may occur within area
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area
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
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Name	Status	Type of Presence
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
Abrolhos	Habitat Protection Zone (IUCN IV)
Abrolhos	Multiple Use Zone (IUCN VI)
Abrolhos	National Park Zone (IUCN II)
Abrolhos	Special Purpose Zone (IUCN VI)
Carnarvon Canyon	Habitat Protection Zone (IUCN IV)
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Gascoyne	National Park Zone (IUCN II)
Montebello	Multiple Use Zone (IUCN VI)
Ningaloo	National Park Zone (IUCN II)
Ningaloo	Recreational Use Zone (IUCN IV)
Shark Bay	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Bernier And Dorre Islands	WA
Bessieres Island	WA
Bundegi Coastal Park	WA
Cape Range	WA
Dirk Hartog Island	WA
Freycinet, Double Islands etc	WA
Houtman Abrolhos Islands	WA
Jurabi Coastal Park	WA
Koks Island	WA
Muiron Islands	WA
Round Island	WA
Serrurier Island	WA
Unnamed WA26400	WA
Unnamed WA37338	WA
Unnamed WA37383	WA
Unnamed WA37500	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
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		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
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

Name	Status	Type of Presence
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
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		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
Shark Bay East	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
Wallaby Saddle	North-west
Ancient coastline at 90-120m depth	South-west
Commonwealth marine environment surrounding	South-west
Perth Canyon and adjacent shelf break, and other	South-west
Western demersal slope and associated fish	South-west
Western rock lobster	South-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

-17.1591 115.1048,-18.0736 113.2135,-19.2485 112.4326,-19.4115 112.0048,-19.2843 111.3337,-19.5674 110.9244,-20.4962 111.033,-22.6227 110.601,-22.8322 109.6243,-22.9184 109.4507,-23.8285 109.6417,-24.9839 110.102,-25.5596 110.664,-26.5199 110.9953,-26.9356 111.2331,-27.0608 112.082,-27.6215 111.9946,-28.0831 111.2711,-28.262 109.6237,-28.4258 109.6435,-28.5109 110.3643,-28.2682 111.5305,-28.3082 112.0337,-29.9439 112.9124,-30.1012 113.1195,-30.0933 113.3347,-29.5021 113.9686,-28.3661 113.7149,-27.9074 113.4696,-26.3943 113.3136,-26.1195 113.2013,-25.4517 112.9507,-25.3625 113.0667,-24.7488 113.1167,-24.1856 113.4223,-23.7102 113.4962,-23.4745 113.6647,-23.3184 113.7837,-23.1232 113.7446,-23.0809 113.821,-22.8264 113.7984,-22.7193 113.6949,-22.5814 113.6874,-22.0448 113.942,-21.8235 114.1031,-21.7197 114.5247,-21.5814 114.6675,-21.3726 114.8347,-21.0078 115.0505,-20.6112 115.1633,-19.6981 115.3309,-19.541 115.955,-19.3205 115.9001,-19.146 114.5773,-18.5287 114.384,-17.7606 114.8866,-17.2255 115.1997,-17.1591 115.1048

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.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

APPENDIX D OIL SPILL PREPAREDNESS AND RESPONSE STRATEGY SELECTION AND EVALUATION

Oil Spill Preparedness and Response Mitigation Assessment for Enfield Subsea Infrastructure Decommissioning (WA-28-L) Environment Plan

Security and Emergency Management
Hydrocarbon Spill Preparedness

January 2021
Revision 0

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

EXECUTIVE SUMMARY

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for Enfield Subsea Infrastructure Decommissioning, hereafter known as the Petroleum Activities Program (PAP).

This document demonstrates that the risks and impacts from an unplanned hydrocarbon release, and the associated response operations, are controlled to As Low as Reasonably Practicable (ALARP) and Acceptable levels. It achieves this by evaluating response options to address the potential environmental impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the Environment Plan (EP). This document then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness.

A summary of the key facts and references to additional detail within this document are presented below.

Table 0-1: Summary of the key details for assessment

Key details of assessment	Summary	Reference to additional detail
Worst-Case Credible Scenario	**Credible Scenario-01 (CS-01): Instantaneous hydrocarbon release of marine diesel caused by vessel collision.** A short-term (instantaneous) uncontrolled release of 500 m^3 of marine diesel from a vessel, representing a fuel tank rupture after a collision. 5% residual component – 25 m^3	**Section 2.2**
Hydrocarbon Properties	**Marine Diesel (API 37.2)** Marine diesel 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 between 12 hours and 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. The aromatic content of the oil is approximately 3%. If released in the marine environment and in contact with the atmosphere (i.e. surface spill), approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending on the prevailing conditions, with further evaporation slowing over time. The heavier (low volatility) components of marine diesel have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind-waves abate. Therefore, the heavier components of this oil can remain entrained or on the sea surface for an extended period, with associated potential for dissolution of the soluble aromatic fraction. Specifically, the mass balance forecast for constant 5 knot wind conditions shows that approximately 40% of the marine diesel is predicted to evaporate within 36 hours. Under these calm conditions the majority of the remaining oil on the water surface would 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 biodegradation. Under a variable-wind case, where the winds are of greater strength, entrainment into the water column is indicated to be significant. Approximately 2 days after the spill, around 45% of the oil mass is forecast to have entrained and a further 45% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface. The residual compounds will tend to entrain beneath the surface under conditions that generate wind waves (> ~6 m/s).	**Section 6.7.1.1 of the EP** **Appendix A of the First Strike Plan**

<table>
<tr><td rowspan="8">Modelling Results</td><td colspan="2">A quantitative, stochastic assessment has been undertaken for CS-01 to help assess the environmental risk of a hydrocarbon spill.

Stochastic modelling for CS-01 included a total of 200 replicate simulations over an annual period (50 per quarter). Deterministic modelling was not undertaken and the stochastic modelling has, therefore, been used to scale the response.</td><td rowspan="8">Section 2.3</td></tr>
<tr><td colspan="2">Stochastic modelling results</td></tr>
<tr><td></td><td>Credible Scenario-01
Marine diesel surface release</td></tr>
<tr><td>Maximum distance from release location for surface hydrocarbons greater than 50 g/m^2</td><td>105 km</td></tr>
<tr><td>Maximum distance from release location for surface hydrocarbons greater than 10 g/m^2</td><td>165 km</td></tr>
<tr><td>Minimum time to shoreline impact (above 100 g/m^2)</td><td>2.5 days (Ningaloo Coast North – 196 m^3) *</td></tr>
<tr><td>Largest volume ashore at any single Response Priority Area (RPA) (above 100 g/m^2)</td><td>196 m^3 (Ningaloo Coast North, 2.5 days) *</td></tr>
<tr><td>Largest total shoreline accumulation (above 100g/m^2) all shorelines</td><td>237 m^3 (Ningaloo Coast North, Ningaloo Coast Middle, and Muiron Islands) *</td></tr>
<tr><td colspan="4">* Results for CS-01 derived from stochastic modelling results. The minimum timeframes and maximum volumes cited for 'minimum time to shoreline impact' and 'largest volume ashore' for CS-01 are derived from 200 replicate simulations and so the timeframe and volume given may not be associated with the same single release. The 'largest total shoreline accumulation' is also derived from 200 replicate simulations and all three locations may not have been contacted during a single simulation. Therefore, the results presented for CS-01 are likely to be conservative.</td></tr>
<tr><td>Net Environmental Benefit Analysis</td><td colspan="2">Identified as potentially having a net environmental benefit (dependent on the actual spill scenario) and carried forward for further assessment are:
• Monitor and Evaluate
• Source Control via vessel SOPEP (Ship Oil Pollution Emergency Plan)
• Shoreline Protection and Deflection
• Shoreline Clean-up
• Oiled Wildlife Response
• Scientific monitoring programs.</td><td>Section 4</td></tr>
<tr><td>ALARP evaluation of selected response techniques</td><td colspan="2">The evaluation of the selected response techniques shows the proposed controls reduced the risk to an ALARP and Acceptable level for the risk presented in Section 2, without the implementation of considered additional, alternative or improved control measures.</td><td>Section 7</td></tr>
</table>

1 INTRODUCTION

1.1 Overview

Woodside Energy Ltd (Woodside) has developed its oil spill preparedness and response position for Enfield Subsea Infrastructure Decommissioning (WA-28-L), hereafter known as the Petroleum Activities Program (PAP). This document outlines Woodside's decisions and techniques for responding to a hydrocarbon loss of containment event and the process for determining its level of hydrocarbon spill preparedness.

1.2 Purpose

This document, together with the documents listed below, meet the requirements of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS Environment Regulations) relating to hydrocarbon spill response arrangements.

- The Enfield Subsea Infrastructure Decommissioning (WA-28-L) Environment Plan (EP)
- Oil Pollution Emergency Arrangements (OPEA) (Australia)
- The Enfield Subsea Infrastructure Decommissioning (WA-28-L) Oil Pollution Emergency Plan (OPEP) including
  - First Strike Response Plan (FSP)
  - Relevant Operations Plans
  - Relevant Tactical Response Plans (TRPs, also see Annex E)
  - Relevant Supporting Plans
  - Data Directory.

The purpose of this document is to demonstrate that the risks and impacts from an unplanned hydrocarbon release and the associated response operations are controlled to As Low as Reasonably Practicable (ALARP) and Acceptable levels.

1.3 Scope

This document demonstrates that the risks and impacts from an unplanned hydrocarbon release, and 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 risks and impacts resulting from an unplanned loss of hydrocarbon containment associated with the PAP described in the EP. This document then outlines Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness. It should be read in conjunction with the documents listed in **Table 1-1**. The location of the Petroleum Activity Program is shown in Figure 3-2 of the EP.

1.4 Oil spill response document overview

The documents outlined in **Table 1-1** and **Figure 1-1** are collectively used to manage the preparedness and response for a hydrocarbon release.

The Oil Pollution First Strike Response Plan (FSP) contains a pre-operational Net Environmental Benefit Analysis (NEBA) summary, outlining the selected response techniques for this PAP. Relevant Operational Plans to be initiated for associated response techniques are identified in the FSP and relevant forms to initiate a response are appended to the FSP.

The process to develop an Incident Action Plan (IAP) begins once the Oil Pollution FSP is underway. The IAP includes inputs from the Monitor and Evaluate (ME) 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 (**Section 4**).

The response will continue as described in **Section 5** until the response termination criteria have been met.

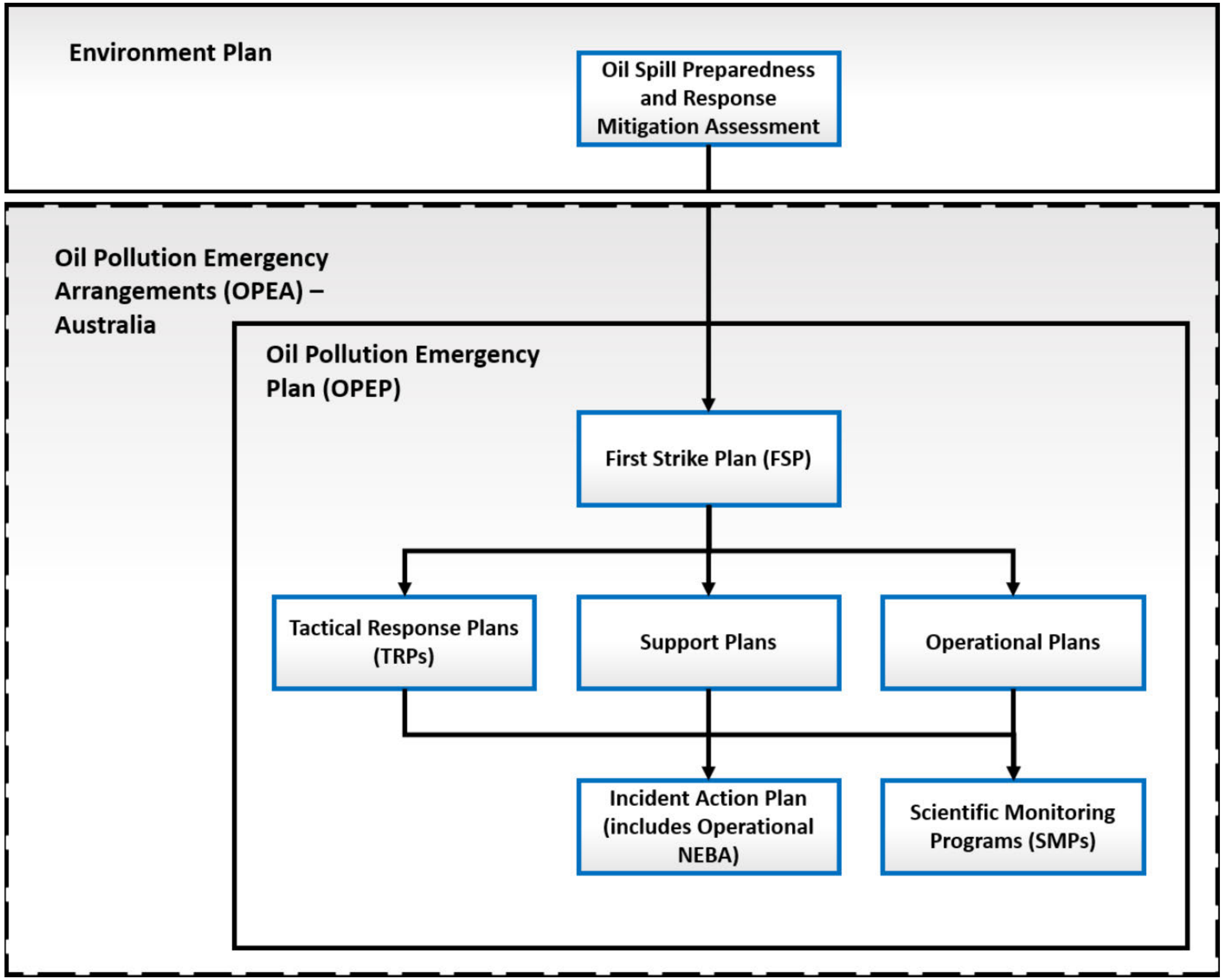


Figure 1-1: Woodside hydrocarbon spill document structure

Table 1-1: Hydrocarbon Spill preparedness and response – document references

Document	Document overview	Stakeholders	Relevant information	Document name/reference
Enfield Subsea Infrastructure Decommissioning (WA-28-L) Environment Plan (EP)	Demonstrates that potential adverse impacts on the environment associated with the Enfield Subsea Infrastructure Decommissioning (during both routine and non-routine operations) are mitigated and managed to As Low As Reasonably Practicable (ALARP) and will be of an acceptable level.	NOPSEMA Woodside internal	EP Section 6 (Identification and evaluation of environmental risks and impacts, including credible spill scenarios) EP Section 7 (Implementation strategy – including EP Section 7.9 - emergency preparedness and response) EP Section 7.8 (Reporting) EP Section 7.9 (Performance outcomes, standards and measurement criteria)	Enfield Subsea Infrastructure Decommissioning (WA-28-L) EP
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	https://docs.nopsema.gov.au/A682414
Oil Spill Preparedness and Response Mitigation Assessment for the Enfield Subsea Infrastructure Decommissioning (WA-28-L) (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.	N/A
Enfield Subsea Infrastructure Decommissioning (WA-28-L) Oil Pollution First Strike Response Plan	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 Incident Action Plan (IAP) specific to the event is developed. Oil Pollution First Strike Response Plans are intended to be the first document used to provide	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 (OSTM), aerial	Enfield Subsea Infrastructure Decommissioning (WA-28-L) Oil Pollution First Strike Plan

Document	Document overview	Stakeholders	Relevant information	Document name/reference
	immediate guidance to the responding Incident Management Team (IMT).		surveillance and oil spill tracking buoy details.	
Operational Plans	Lists the actions required to activate, mobilise and deploy personnel and resources to commence response operations. 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 use resources to undertake a response.	Operational monitoring Protection and deflection Shoreline clean-up Oiled wildlife Scientific monitoring Vessel Shipboard Oil Pollution Emergency Plan (SOPEP)
Tactical Response Plans	Provides options for response techniques in selected 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.	For full list of relevant Tactical Plans for the Enfield Subsea Infrastructure Decommissioning (WA-28-L) oil spill response, refer to **Annex E** (or here).
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.	Technique for mobilising and managing additional resources outside of Woodside's immediate preparedness arrangements.	Marine Logistics People and Global Capability Surge Labour Requirement Plan Health and Safety Aviation IT (First Strike Response) IT (Extended Response)

Document	Document overview	Stakeholders	Relevant information	Document name/reference
				Communications (First Strike Response) Communications (Extended Response) Stakeholder Engagement Accommodation and Catering Waste Management Guidance for Oil Spill Claims Management Not Controlled (Land based) Security Support Plan Hydrocarbon Spill Responder Health Monitoring Guideline

2 RESPONSE PLANNING PROCESS

This document details Woodside's process for identifying potential response options for the hydrocarbon release scenarios, identified in the EP. **Figure 2-1** outlines the interaction between Woodside's response, planning/preparedness and selection process.

This structure has been used because it shows how the planning and preparedness activities inform a response and provides indicative guidance on what activities would be undertaken, in sequential order, if a real event were to occur. The process also evaluates alternative, additional and/or improved control measures specific to the PAP.

The Enfield Subsea Infrastructure Decommissioning (WA-28-L) First Strike Plan then summarises the outcome of the response planning process and provides initial response guidance and a summary of ongoing response activities, if an incident were to occur.

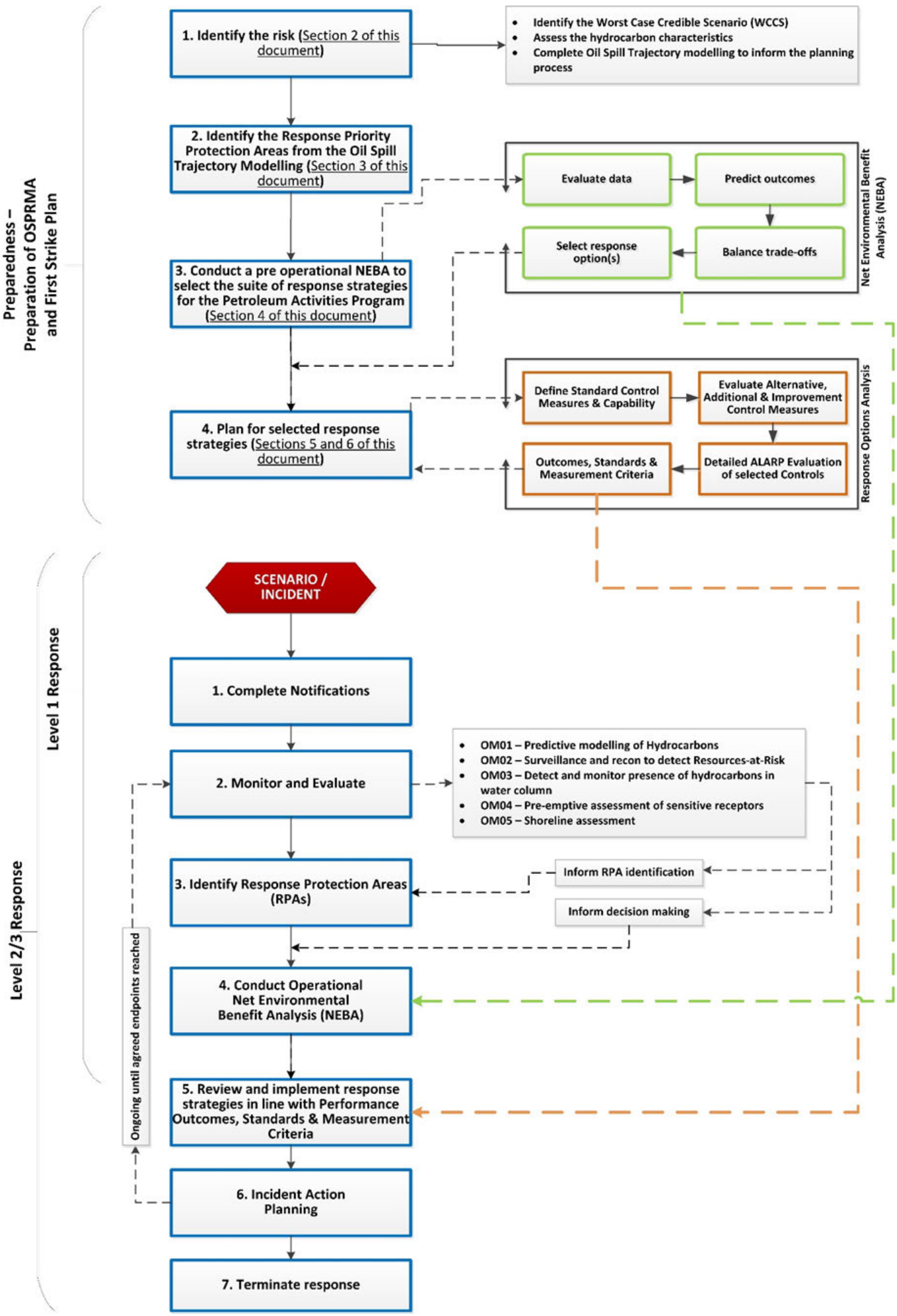


Figure 2-1: Response planning and selection process

2.1 Response planning process outline

This document is expanded below to provide additional context on the key steps in determining capability, evaluating ALARP and hydrocarbon spill response requirements.

Section 1. INTRODUCTION

Section 2. RESPONSE PLANNING PROCESS

- identification of worst-case credible scenario(s) (WCCS)
- spill modelling for WCCS.

Section 3. IDENTIFY RESPONSE PROTECTION AREAS (RPAs)

- areas predicted to be contacted at concentration >100g/m^2 [1]

Section 4. NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

- pre-operational NEBA (during planning/ALARP evaluation): this must be reviewed during the initial response to an incident to ensure its accuracy
- selected response techniques prioritised and carried forward for ALARP assessment.

Section 5. HYDROCARBON SPILL ALARP PROCESS

- determines the response need based on predicted consequence parameters.
- details the environmental performance of the selected response options based on need.
- sets the environmental performance outcomes, environmental performance standards and measurement criteria.

Section 6. ALARP EVALUATION

- evaluates alternative, additional, and improved options for each response technique to demonstrate the risk has been reduced to ALARP.
- provides a detailed ALARP assessment of selected control measure options against:
  - predicted cost associated with implementing the option
  - predicted change to environmental benefit
  - predicted effectiveness / feasibility of the control measure.

Section 7. ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

- evaluation of impacts and risks from implementing selected response options.

Section 8. ALARP CONCLUSION

Section 9. ACCEPTABILITY CONCLUSION

[1] This represents the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat.

2.1.1 Response Planning Assumptions

For the purpose of defining terms related to response planning and timing, the following definitions have been developed;

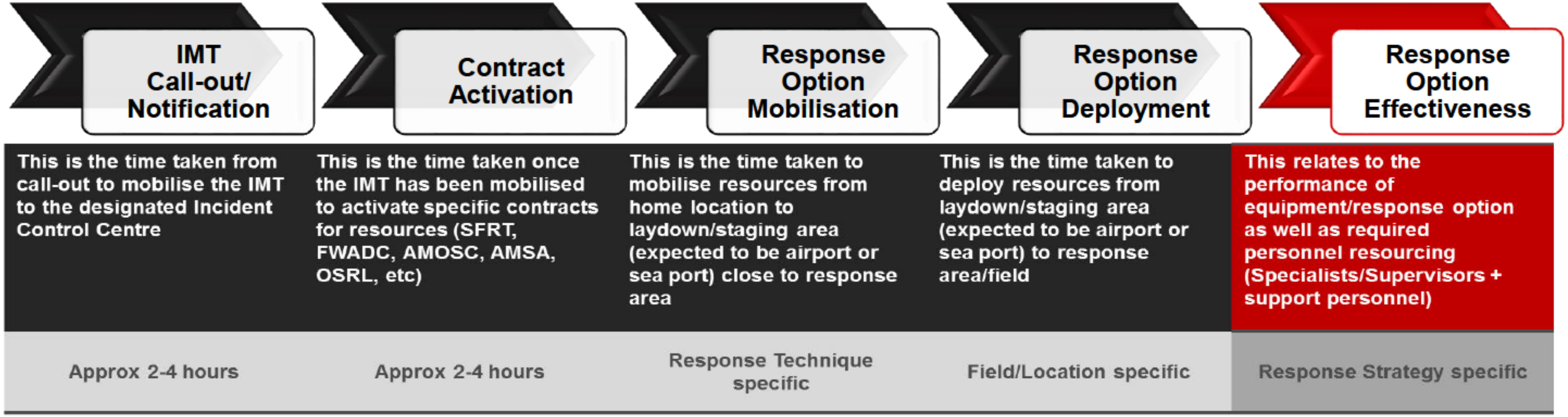


Figure 2-2: Response Planning Assumption - Timing, Resourcing and Effectiveness

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. 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.

The surface release of marine diesel caused by vessel collision (Credible Scenario-01; CS-01) has been modelled for a worst-case spill scenario of an instantaneous surface release of 500 m^3 of marine diesel. This is the volume of the largest single fuel tank and is considered for response planning purposes. Marine fuel loss during bunkering (Credible Scenario-02; CS-02) has a significantly smaller marine diesel release volume of 8 m^3, based on a release of 5 min at a transfer rate of 1.6 m^3/min. CS-02 is considered to be within the risk profile and spill response capability requirements of CS-01 and is therefore selected for response planning purposes.

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)[1]	Incident Level	Hydrocarbon (HC) type	Residual proportion	Residual volume (liquid m^3)
Credible Spill Scenario-01 (CS-01)	Yes	Hydrocarbon release caused by marine vessel collision. Instantaneous release of 500 m^3 of marine diesel within the Operational Area.	500 m^3	Level 2	Marine Diesel	5.0%	25 m^3
Credible Spill Scenario-02 (CS-02)	No	Loss of containment caused by refuelling hose failure, coupling failure or operator error.	8 m^3	Level 1	Marine Diesel	5.0%	0.4 m^3

2.2.1 Hydrocarbon characteristics

Hydrocarbon characteristics, including modelled weathering data and ecotoxicity, are included in Section 6 of the EP.

Marine Diesel

Marine Diesel Oil is typically classed as an International Tanker Owners Federation (ITOPF) Group two oil.

Marine diesel is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the diesel 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 diesel is shown to be persistent. The aromatic content of the diesel is approximately 3%.

If released in the marine environment and in contact with the atmosphere (i.e. surface spill), approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending upon the prevailing conditions, with further evaporation slowing over time. The heavier (low volatility) components of marine diesel have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind-waves abate. Therefore, the heavier components of this oil can remain entrained or on the sea surface for an extended period, with associated potential for dissolution of the soluble aromatic fraction.

Specifically, the mass balance forecast for constant 5 knot wind conditions shows that approximately 40% of the marine diesel is predicted to evaporate within 36 hours. Under these calm conditions the majority of the remaining oil on the water surface would 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 biodegradation.

Under a variable-wind case, where the winds are of greater strength, entrainment into the water column is indicated to be significant. Approximately 2 days after the spill, around 45% of the oil mass is forecast to have entrained and a further 45% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface. The residual compounds will tend to entrain beneath the surface under conditions that generate wind waves (> ~6 m/s).

2.3 Hydrocarbon spill modelling

Oil spill trajectory modelling tools are used for environmental impact assessment and during response planning to understand spatial scale and timeframes for response operations. Woodside recognises that there is a degree of uncertainty related to the use of modelling data and has subsequently utilised conservative approaches to volumes, weathering, spatial areas, timing and response effectiveness to scale capability to need.

The Oil Spill Model and Response System (OILMAP) and Integrated Oil Spill Impact Model System (SIMAP) models are both used for stochastic and deterministic trajectory modelling. They have been developed over three decades of planning, exercises, actual responses, several peer reviews, and validation studies. OILMAP was originally derived from the United States Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Type A model (French et al. 1996), for assessing marine transport, biological impact and economic impact that was also used under the United States Oil Pollution Act 1990 Natural Resource Damage Assessment (NRDA) regulations. Notable spills where the model has been used and validated against actual field observations include Exxon Valdez (French McCay 2004), North Cape Oil Spill (French McCay 2003), along with an assessment of 20 other spills (French McCay and Rowe, 2004). In addition, test spills designed to verify fate, weathering and movement algorithms have been conducted regularly and in a range of climate conditions (French and Rines 1997; French et al. 1997; Payne et al. 2007; French McCay et al. 2007).

Further to this, the algorithms have been updated using the latest findings from the Macondo/Deepwater Horizon well blowout in the Gulf of Mexico and validated according to the Deepwater Horizon (DWH) oil spill in support of the Natural Resource Damage Assessment (NRDA) (Spaulding et al. 2015; French McCay et al. 2015, 2016).

Finally, the OILMAP and SIMAP models have been used extensively in Australia to prosecute pollution offences, predict discharge locations and likely spill volumes based on weathering and surveillance observations, and has been used as expert witness evidence in Australian court proceedings, aiding the prosecution to determine spill quantum estimates.

2.3.1 Stochastic modelling

Stochastic modelling has been completed for the spill scenario CS-01, outlined in **Table 2-1**. A quantitative, stochastic assessment has been undertaken for the credible spill scenarios to help assess the environmental consequences of a hydrocarbon spill.

Multiple replicate simulations were completed for each scenario 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. For CS-01, a total of 200 replicate simulations were run over an annual period (50 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 – EMBA and hydrocarbon exposure

The outputs of the stochastic spill modelling are used to assess the potential environmental impact from the credible scenarios. The stochastic modelling results are used to delineate areas of the marine and shoreline environment that could be exposed to hydrocarbon levels exceeding environmental impact threshold concentrations. The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as Environment that May Be Affected (EMBA) and is discussed further in Section 6 of the EP. As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, a different EMBA is presented for each fate within the EP.

A conservative approach – adopting accepted contact thresholds for impacts on the marine environment – is used to define the EMBA. These hydrocarbon thresholds are presented in **Table 2-2** below and described in **Section 6 of the EP**.

Table 2-2: Summary of thresholds applied to the stochastic hydrocarbon spill modelling to determine the EMBA and environmental impacts

Threshold (marine diesel)	Description
10 g/m^2	Surface hydrocarbon
100 ppb	Entrained hydrocarbon (ppb)
50 ppb	Dissolved aromatic hydrocarbon (ppb)
100 g/m^2	Shoreline accumulation

2.3.2 Deterministic modelling

Deterministic modelling was not undertaken for CS-01. Stochastic modelling has, therefore, been used to scale the response.

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 spill modelling results are then used to assess the nature and scale of a response.

In the event of an actual response, existing spill modelling would be reviewed for suitability and additional modelling would be conducted using real-time data and field information to inform Incident Management Team decisions.

The spill modelling outputs are presented at response planning thresholds for surface hydrocarbons for the WCCS. Surface spill concentrations are expressed as grams per square metre (g/m^2) (**Section 2.2**). The thresholds used are derived from oil spill response planning literature and industry guidance and are summarised below.

2.3.2.2 Surface hydrocarbon concentrations

Table 2-3: Surface hydrocarbon thresholds for response planning

Surface hydrocarbon concentration (g/m^2)	Description	Bonn Agreement Oil Appearance Code (BAOAC)	Mass per area (g/m^2)
>10	Predicted minimum threshold for commencing operational monitoring [2]	Code 3 – Dull metallic colours	5 - 50
50	Predicted minimum floating oil threshold for containment and recovery and surface dispersant application [3]	Code 4 – Discontinuous true oil colour	50 - 200
100	Predicted optimum floating oil threshold for containment and recovery and surface dispersant application	Code 5 – Continuous true oil colour	>200

[2] 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 Western Australia Department of Transport (WA DoT).

[3] 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.

Surface hydrocarbon concentration (g/m^2)	Description	Bonn Agreement Oil Appearance Code (BAOAC)	Mass per area (g/m^2)
100	Predicted minimum shoreline accumulation threshold for shoreline assessment operations	Stain	>100
250	Predicted minimum threshold for commencing shoreline clean-up operations	Level 3 - Thin Coating	200 - 1000

The surface thickness of oil at which dispersants are typically effective is approximately 100 g/m^2. However, substantial variations occur in the thickness of the oil within the slick. Additionally, the recommended rate of application for surface dispersant is typically 1-part dispersant to 20 or 25 parts of spilled oil. These figures assume a 0.1 mm slick thickness, averaged over the thickest part of the spill, to calculate a litres/hectare application rate from vessels and aircraft. In practice, this can be difficult to achieve as it is not possible to accurately assess the thickness of the floating oil.

Some degree of localised over-dosage and under-dosage is inevitable in dispersant response. An average oil layer thickness of 0.1 mm is often assumed, although the actual thickness can vary over a wide range (from less than 0.0001 mm to more than 1 mm) over short distances (International Petroleum Industry Environment Conservation Association [IPIECA] 2015).

Guidance from Australian Maritime Safety Authority (AMSA, 2015) indicates that spreading of spills of Group II or III products will rapidly decrease slick thickness over the first 24 hours of a spill resulting in the potential requirement of up to a ten (10) fold increase in capability on day 2 to achieve the same level of performance.

Further guidance from the European Maritime Safety Authority (EMSA) states that spraying the 'metallic' looking area of an oil slick (Bonn Agreement Oil Appearance Code [BAOAC] 3, approx. 5 – 50 µm) with dispersant from spraying gear designed to treat an oil layer 0.1 mm (100 µm) thick, will inevitably cause dispersant over-treatment by a factor of 2 to 20 times (EMSA 2012).

Therefore, dispersant application should be concentrated on the thickest areas of an oil slick and Woodside intends on applying surface dispersants to only BAOAC 4 and 5. Spraying areas of oil designated as BAOAC Code 4 (Discontinuous true oil colour) with dispersant will, on average, deliver approximately the recommended treatment rate of dispersant.

Spraying areas of oil designated as BAOAC Code 5 with dispersant (Continuous true oil colour and more than 0.2 mm thick) will, on average, deliver approximately half the recommended treatment rate of dispersant. Repeated application of these areas of thicker oil, or increased dosage ratios, will be required to achieve the recommended treatment rate of dispersant (EMSA 2012).

Guidance from the National Oceanic and Atmospheric Administration (NOAA) in the United States is found in the document: *Characteristics of Response Techniques: A Guide for Spill Response Planning in Marine Environments 2013* (NOAA 2013). This guide outlines advice for response planning across all common techniques, including surface dispersant spraying and containment and recovery. It states that oil thickness can vary by orders of magnitude within distinct areas of a slick, thus the actual slick thickness and oil distribution of target areas are crucial for determining response method feasibility. Further to this, ITOPF also states that in terms of oil spill response, sheen can be disregarded as it represents a negligible quantity of oil, cannot be recovered or otherwise dealt with to a significant degree by existing response techniques, and is likely to dissipate readily and naturally (ITOPF, 2014).

25% 50% 75%

Figure 2-3 below from AMSA's Identification of Oil on Water – Aerial Observation and Identification Guide (AMSA, 2014) shows expected percent coverage of surface hydrocarbons as a proportion of total surface area. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

From this information and other relevant sources (Allen and Dale, 1996, EMSA, 2012, Spence, 2018) the surface threshold of 50g/m^2 was chosen as an average / equilibrium thickness (50g/m^2 is an average is 50% coverage of 0.1mm Bonn Agreement Code 4 - discontinuous true oil colour, or 25% coverage of 0.2 mm Bonn Agreement Code 5 – continuous true oil colour which would represent small patches of thick oil or wind-rows).

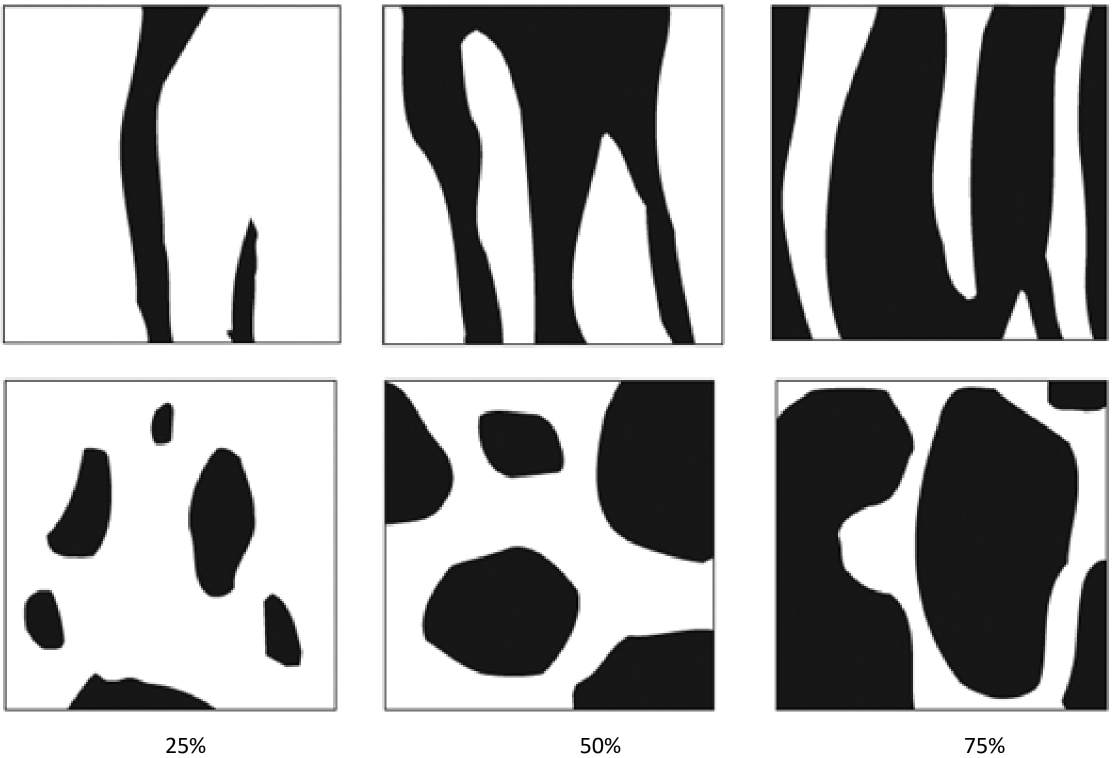


Figure 2-3: Proportion of total area coverage (AMSA, 2014)

Figure 2-4 illustrates the general relationships between on-water response techniques and slick thickness. Wind-rows, heavy oil patches and tar balls, for example, must be considered, as they influence oil encounter rates, chemical dosages and ignition potential. Each method has different thickness thresholds for effective response.

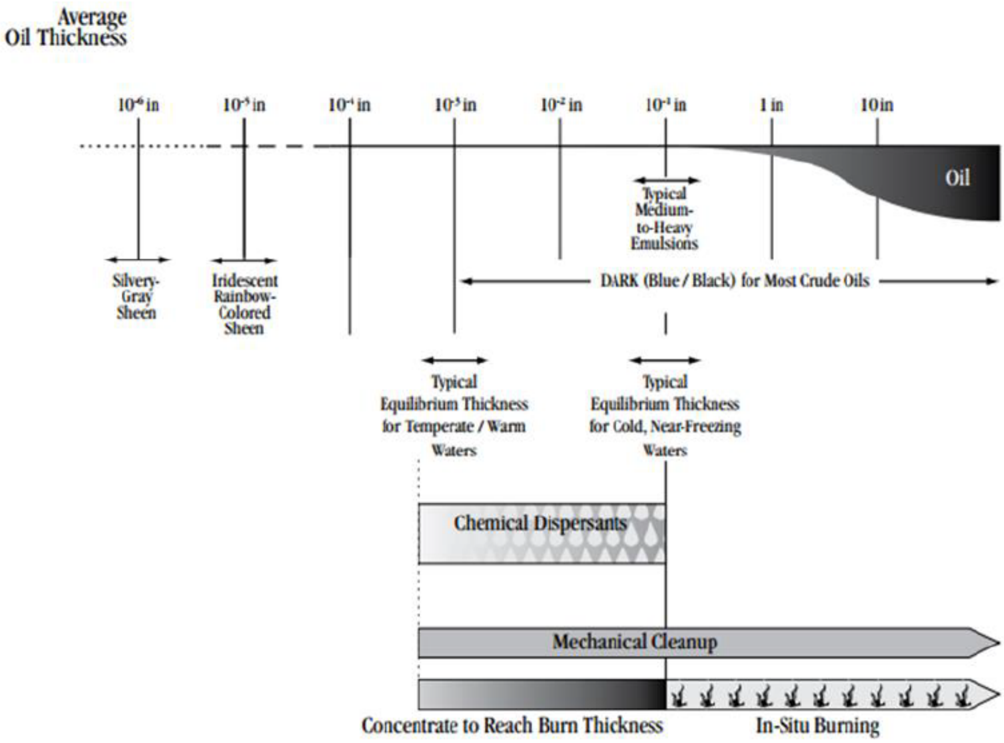


Figure 2-4: Oil thickness versus potential response options (from Allen and Dale 1996)

Wind and waves influence the feasibility of mechanical clean-up operations, dropping the effectiveness significantly because of entrainment and/or splash-over as short period waves develop beyond two to three feet (0.6–0.9m) in height. Waves and wind can also be limiting factors for the safe operation of vessels and aircraft. There is also potential secondary contamination of unimpacted areas and waste issues associated with mechanical dispersion of slicks (**Table 4-3** and **Section 4.2.3.1**).

2.3.2.3 Surface hydrocarbon viscosity

Table 2-4: Surface hydrocarbon viscosity thresholds

Surface viscosity (cSt)	Description	European Maritime Safety Authority (EMSA)	Viscosity at sea temperature (cSt)
5,000	Predicted optimum viscosity for surface dispersant operations	Generally possible to disperse	500-5000
10,000	Predicted maximum viscosity for effective surface dispersant operations	Sometimes possible to disperse	5,000-10,000

Further to the required thickness for surface dispersant application and containment and recovery to be deployed effectively as outlined above, changes to viscosity will also limit the treatment of offshore response techniques. As outlined in the EMSA Manual on the Applicability of Oil Spill Dispersants (EMSA, 2012), guidance around changes to viscosity and likely effectiveness of surface dispersant application is provided.

This includes the following statements: “It has been known for many years that it is more difficult to disperse a high viscosity oil than a low or medium viscosity oil. Laboratory testing had shown that the effectiveness of dispersants is related to oil viscosity, being highest for modern “Concentrate, UK Type 2/3” dispersants at an oil viscosity of about 1,000 or 2,000 mPa.s (1,000 – 2,000 cSt) and then declining to a low level with an oil viscosity of 10,000 mPa.s (10,000 cSt). It was considered that some generally applicable viscosity limit, such as 2,000 or 5,000 mPa.s (2,000 – 5,000 cSt), could be applied to all oils.”

However, modern oil spill dispersants are generally effective up to an oil viscosity of 5,000 mPa.s (5,000 cSt) or more, and their performance gradually decreases with increasing viscosity; oils with a viscosity of more than 10,000 are, in most cases, no longer dispersible. Guidance from EMSA (2012) also indicates that products with a range of 500 – 5,000 cSt at sea temperature are generally possible to disperse, while 5,000 – 10,000 cSt at sea temperature above pour point are sometimes possible to disperse, with products beyond 10,000 cSt at sea temperature below pour point are generally impossible to disperse. The potential use of dispersants is evaluated in **Table 4-3**.

To support decision making and response planning, a threshold of 10,000 cSt at sea temperature was chosen as a conservative estimate of maximum viscosity for surface dispersant spraying operations.

The thresholds described above are compared with the modelling results for CS-01 (**Table 2-5**). Stochastic modelling was undertaken for CS-01 but deterministic modelling was not undertaken. The minimum timeframes and maximum volumes cited for ‘minimum time to shoreline impact’ and ‘largest volume ashore’ for CS-01 are derived from 200 replicate simulations and so the timeframe and volume specified may not be associated with the same single release. The ‘largest total shoreline accumulation’ is also derived from 200 replicate simulations and all three locations may not have been contacted during a single simulation. Therefore, the results presented for CS-01 are likely to be conservative.

Results are presented below in **Table 2-5**, **Section 2.3.3** below.

2.3.3 Spill modelling results

Details of the credible scenarios and modelling inputs are included along with modelling results in **Table 2-5**.

The selected spill modelling results used to represent the WCCS are:

- Minimum time to shoreline contact (above 100g/m^2);
- Largest volume ashore at any single RPA (above 100g/m^2); and
- Largest volume ashore on all shorelines from a single model run (above 100g/m^2).

Stochastic modelling was undertaken for CS-01 but deterministic modelling was not undertaken. The minimum timeframes and maximum volumes cited for 'minimum time to shoreline impact' and 'largest volume ashore' for CS-01 are derived from 200 replicate simulations and so the timeframe and volume specified may not be associated with the same single release. The 'largest total shoreline accumulation' is also derived from 200 replicate simulations and all three locations may not have been contacted during a single simulation. Therefore, the results presented for CS-01 are likely to be conservative.

Results are presented below in **Table 2-5**.

Table 2-5: Worst-case credible scenario modelling results

Scenario description	Modelled results Credible Scenario-01 Marine diesel surface release
Worst-case credible scenario(s) (WCCS) Total volume released	Hydrocarbon release caused by vessel collision. Instantaneous release of 500 m^3
Worst-case credible scenario(s) (WCCS) Residual volume remaining post-weathering	5% residual component – 25 m^3 marine diesel
Modelling results	
Maximum distance from release location for surface hydrocarbons greater than 50 g/m^2	105 km
Maximum distance from release location for surface hydrocarbons greater than 10 g/m^2	165 km
Minimum time to shoreline impact (above 100 g/m^2)	2.5 days (Ningaloo Coast North, 196 m^3) *
Largest volume ashore at any single RPA (above 100 g/m^2)	196 m^3 (Ningaloo Coast North, 2.5 days) *
Largest total shoreline accumulation (above 100 g/m^2) all shorelines	237 m^3 (Ningaloo Coast North, Ningaloo Coast Middle, and Muiron Islands) *
* Results for CS-01 derived from stochastic modelling results. The minimum timeframes and maximum volumes cited for 'minimum time to shoreline impact' and 'largest volume ashore' for CS-01 are derived from 200 replicate simulations and so the timeframe and volume given may not be associated with the same single release. The 'largest total shoreline accumulation' is also derived from 200 replicate simulations and all three locations may not have been contacted during a single simulation. Therefore, the results presented for CS-01 are likely to be conservative.	

From the above modelling results, the volumes and timeframes derived from stochastic modelling results in the case of CS-01 have been considered as the basis for response planning and are included in **Section 4.2**.

Further, stochastic modelling results for CS-01 are summarized in **Section 2.3.3.1**.

2.3.3.1 Credible Scenario-01 (Surface Release, Marine Diesel)

- Surface hydrocarbon concentrations greater than 50 g/m^2 may occur up to 105 km from the release location, at the Gascoyne AMP, Ningaloo Coast North WHA and the Ningaloo AMP.
- Surface hydrocarbons greater than 10 g/m^2 may occur up to 165 km from the release location.
- Weathering of the surface oil occurs rapidly due to the loss of light, volatile components and the spreading. Dispersant application and containment and recovery are not appropriate for use on spills of marine diesel due to these weathering characteristics.
- Shoreline accumulations greater than 100 g/m^2 may occur in 2.5 days at Ningaloo Coast North, and 4-5 days at Ningaloo Coast Middle and the Muiron Islands.
- The Gascoyne Australian Marine Park (AMP) and Ningaloo Coast are predicted to receive the worst-case entrained oil concentrations at the 100 ppb threshold with a probability of 18% after 9 hours and 6.5% after 21 hours, respectively.

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**.

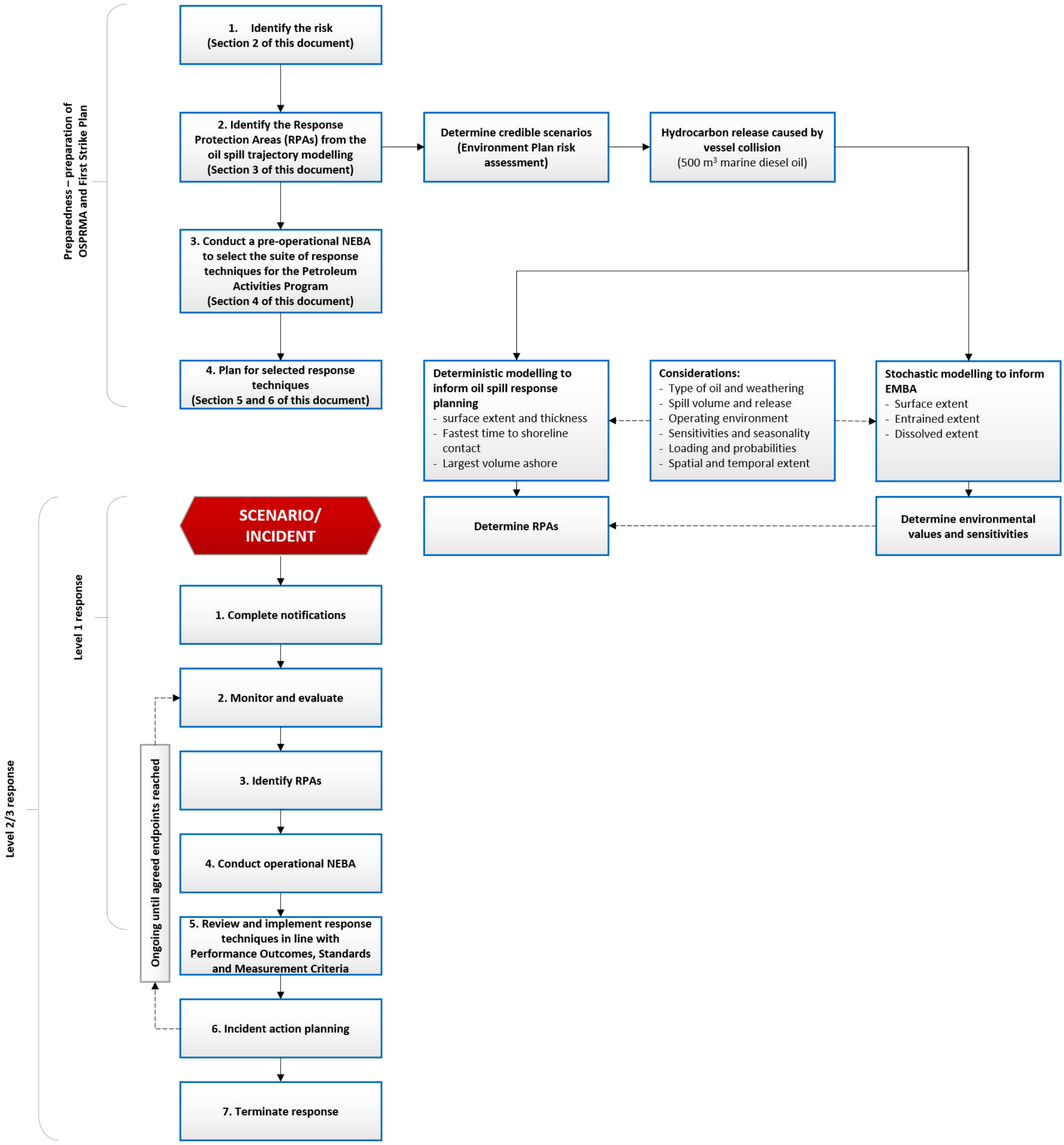


Figure 3-1: Identify Response Protection Areas (RPAs) flowchart

3.1 Identified sensitive receptor locations

Section 6.7.2 of the EP includes the list of sensitive receptor locations that have been identified by stochastic modelling as meeting the requirements outlined below:

- receptors with the potential to incur surface, entrained or shoreline accumulation contact above environmental impact thresholds
- receptors within the EMBA which meet the following:
  - a number of priority protection criteria/categories
  - International Union of Conservation of Nature (IUCN) marine protected area categories
  - high conservation value habitat and species
  - important socio-economic/heritage value.

3.2 Identify Response Protection Areas

From the identified sensitive receptors described in **Section 6.7.2 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) have been selected for response planning purposes.

3.2.1 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**). It is important to note that the figures outlined in **Table 3-1** are the combined results of the individual worst-case runs and do not indicate a single WCCS (where the timings and volumes are all expected from one release).

While not discounting other sensitivities, these RPAs have been 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.

Table 3-1 outlines locations which were identified from the modelling runs for the WCCS but does not constitute the full list of Priority Protection Areas (PPAs) potentially contacted from stochastic modelling (as per EMBA definition) (see **Section 6.7.2 of the EP**). Other PPA outliers were identified from the modelling and have been included in the assessment of capability in **Sections 5 and 6**.

Additional sensitive receptors are presented the existing environment description (**Section 4 of the EP**) and impact assessment section (**Section 6.7 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.

The RPAs identified in **Table 3-1** are used to plan for the nature and scale of a shoreline response.

Table 3-1: Response Protection Areas (RPAs)

Areas of coastline contacted	Conservation status	IUCN protection category	Credible Scenario-01	
			Minimum time to shoreline contact (above 100g/m^2) in days	Maximum shoreline accumulation (above 100g/m^2) in m^3
Ningaloo Coast North (Incl. WHA)	State Marine Park Australian Marine Park World Heritage Area	IUCN IV – Recreational Use Zone (AMP) IUCN II – Marine National Park Zone	2.5 days (196 m^3)	196 m^3 (2.5 days)
Ningaloo Coast Middle (Incl. WHA)	State Marine Park Australian Marine Park World Heritage Area	IUCN IV – Recreational Use Zone (AMP) IUCN II – Marine National Park Zone	4 days (3 m^3)	3 m^3 (4 days)
Muiron Islands (Incl. MMA-WHA)	State Marine Management Area World Heritage Area	IUCN IA – Strict Nature Reserve IUCN VI – Multiple Use Zone	4.8 days (38 m^3)	38 m^3 (4.8 days)

4 NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

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.

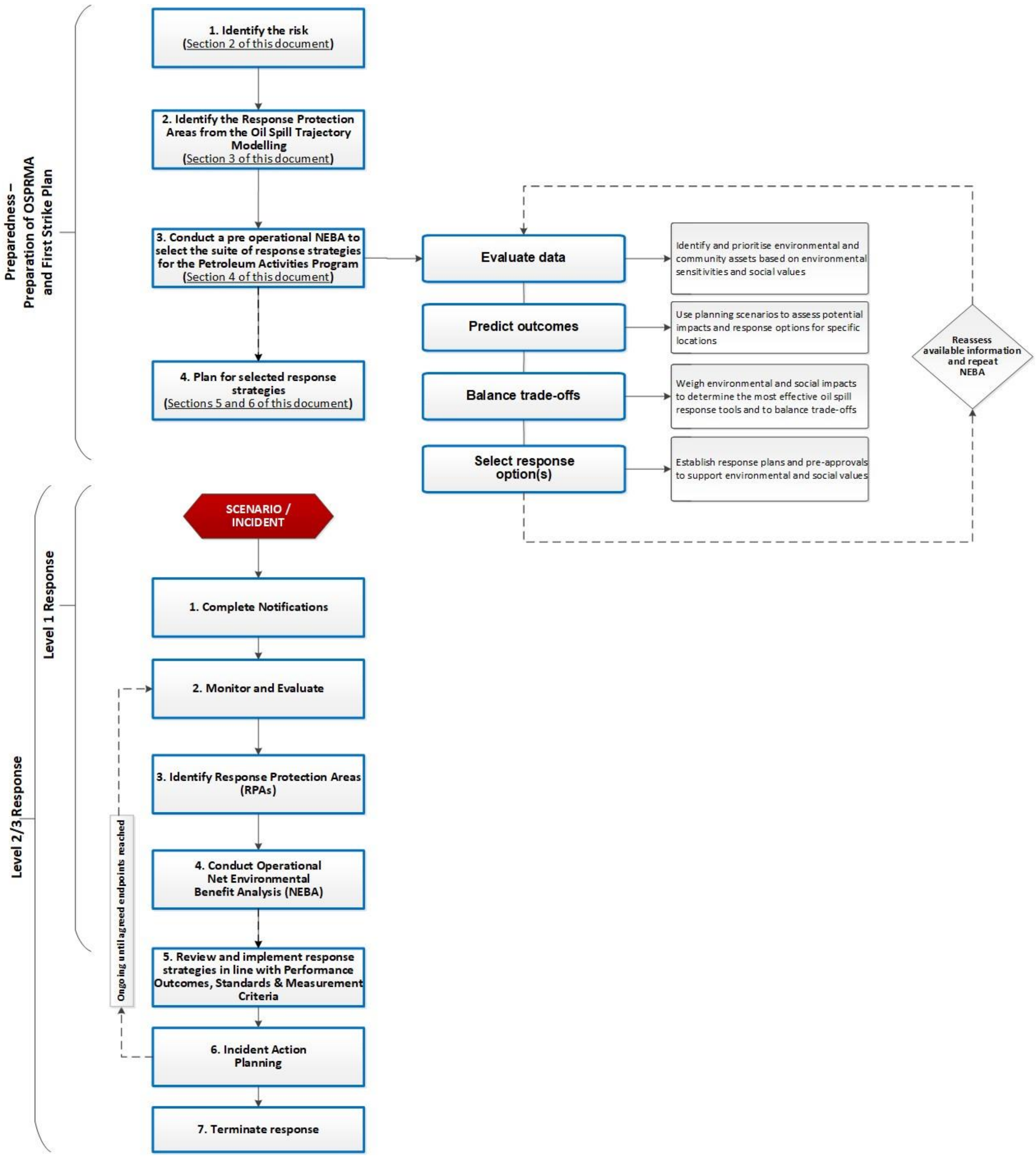


Figure 4-1: Net Environmental Benefit Analysis (NEBA) flowchart

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 2.3.2.2**) from the 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. Modelling of the WCCS is then used for this pre-operational NEBA. Outlier locations with potential environmental impacts, selected from the stochastic modelling may also be included for assessment. Response thresholds and modelling are then used to assess the feasibility/effectiveness and scale of the response.

Table 4-1: Scenario summary information (WCCS, Credible Scenario-01)

Scenario summary information (Credible Scenario-01)	
Scenario	Hydrocarbon release caused by marine vessel collision
Location	Close to ENA-01 well location (Operational Area) Latitude: 21° 29’ 55.012” S Longitude: 114° 0’ 4.816” E
Oil Type	Marine diesel
Volume and duration of release	500 m^3 – instantaneous

4.2.1.1 Hydrocarbon characteristics

Marine Diesel – Credible Scenario-01

Marine Diesel Oil is typically classed as an International Tanker Owners Federation (ITOPF) Group two oil.

Marine diesel is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. In general, about 6% of the diesel 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 diesel is shown to be persistent. The aromatic content of the diesel is approximately 3%.

If released in the marine environment and in contact with the atmosphere (i.e. surface spill), approximately 41% by mass of this oil is predicted to evaporate over the first couple of days depending upon the prevailing conditions, with further evaporation slowing over time. The heavier (low volatility) components of marine diesel have a tendency to entrain into the upper water column due to wind-generated waves but can subsequently resurface if wind-waves abate. Therefore, the heavier components of this oil can remain entrained or on the sea surface for an extended period, with associated potential for dissolution of the soluble aromatic fraction.

Specifically, the mass balance forecast for constant 5 knot wind conditions shows that approximately 40% of the marine diesel is predicted to evaporate within 36 hours. Under these calm conditions the majority of the remaining oil on the water surface would 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 biodegradation.

Under a variable-wind case, where the winds are of greater strength, entrainment into the water column is indicated to be significant. Approximately 2 days after the spill, around 45% of the oil mass is forecast to have entrained and a further 45% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface. The residual compounds will tend to entrain beneath the surface under conditions that generate wind waves (> ~6 m/s).

Table 4-2: Oil fate, behaviour and impacts

Modelling results		
	Credible Scenario-01	
Surface area of hydrocarbons (>50 g/m^2)	Deterministic modelling was not undertaken for CS-01 so spatial area is not available. Surface hydrocarbon concentrations greater than 50 g/m^2 may occur up to 105 km from the release location.	
Surface area of hydrocarbons (>50 g/m^2 and <15,000 cSt)	Deterministic modelling was not undertaken for CS-01 so viscosity data and spatial area are not available.	
Minimum time to shoreline contact (>100 g/m^2)	2.5 days (Ningaloo Coast North – 196 m^3) *	
Largest volume ashore at any single RPA (>100 g/m^2)	196 m^3 (Ningaloo Coast North, 2.5 days) *	
Largest total shoreline accumulation (>100 g/m^2)	237 m^3 (Ningaloo Coast North, Ningaloo Coast Middle, and Muiron Islands) *	
	Credible Scenario-01	
	Minimum time to shoreline contact (>100g/m^2) in days	**Maximum shoreline accumulation (>100g/m^2) in m^3**
Ningaloo Coast North (Incl. WHA)	2.5 days (196 m^3)	196 m^3 (2.5 days)
Ningaloo Coast Middle (Incl. WHA)	4 days (3 m^3)	3 m^3 (4 days)
Muiron Islands (Incl. MMA-WHA)	4.8 days (38 m^3)	38 m^3 (4.8 days)
* Results for CS-01 derived from stochastic modelling results. The minimum timeframes and maximum volumes cited for 'minimum time to shoreline impact' and 'largest volume ashore' for CS-01 are derived from 200 replicate simulations and so the timeframe and volume given may not be associated with the same single release. The 'largest total shoreline accumulation' is also derived from 200 replicate simulations and all three locations may not have been contacted during a single simulation. Therefore, the results presented for CS-01 are likely to be conservative.		

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 via vessel SOPEP
- 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 (including hazing)
- Waste management
- Post spill monitoring/scientific monitoring

An assessment of which response options are feasible for the scenarios is included below in **Table 4-3**. 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 and when and timings throughout the response.

Table 4-3: Response technique evaluation – Marine diesel release caused by marine vessel separation (Credible Scenario-01)

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: Marine Diesel				
Monitor and evaluate	Will be effective in tracking the location of the spill, predicting potential impacts and triggering further monitoring and response techniques as required. Operational Monitoring (OM) techniques include: • OM01 Predictive modelling of hydrocarbons – used throughout release. 'Ground-truthed' using the outputs of all other monitoring techniques. • OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of release. • OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of release. • 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 Marine Diesel release is a feasible response technique and outputs will be used to guide decision making on the use of other monitoring/response techniques and providing information to regulatory agencies including AMSA and Western Australia's Department of Transport (WA DoT).	Yes	Monitoring the release 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 (vessel)	Controlling the spill of diesel at source would be the most effective way to limit the quantity of hydrocarbon entering the marine environment.	A spill of diesel from a vessel collision will be instantaneous and source control will be limited to what the vessel or facility can achieve whilst responding to the incident.	Yes	Ability to stop the spill at source will be dependent upon the specific spill circumstances and whether or not it is safe for response personnel to access/isolate the source of the spill.
Surface dispersant application (SDA)	Dispersants are not considered effective when applied on thin surface films such as marine diesel as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon.	Marine diesel is prone to rapid spreading and evaporation thus the use of dispersant would be deemed an unnecessary response technique.	No	The application of dispersant to marine diesel is unnecessary as the diesel will rapidly evaporate and would thus unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons.
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 is also 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 marine diesel is unfeasible as the minimum slick thickness cannot be attained due to rapid spreading. In addition, there is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which is unlikely to be achieved. Furthermore, entering a volatile environment to undertake this technique would be unsafe for response personnel.	No	Diesel characteristics are not appropriate for the use of in situ burning as the minimum thickness will not be attained due to rapid spreading. Furthermore, it would unnecessarily cause an increase the release of atmospheric pollutants.
Containment and recovery	Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5. Containment and recovery requires a spill to be BAOAC 4 or 5 with a 50-100% coverage of 100 g/m^2 to 200 g/m^2.	Marine diesel is prone to rapid spreading and evaporation thus reducing the feasibility of containment and recovery as a response technique.	No	Containment and recovery would be an inappropriate response technique as it requires the spilled hydrocarbon to be BAOAC 4 or 5 with a 50-100% coverage of 100 g/m^2 to 200 g/m^2 which a spill of marine diesel would not achieve. In addition, most of the spilled diesel would have been subject to rapid evaporation prior to the commencement of containment and recovery operations.

Shoreline protection and deflection	Shoreline protection and deflection can be effective at preventing contamination of at-risk areas.	Given the minimum time to shoreline contact is 2.5 days, use of shoreline protection and deflection for a spill of marine diesel may provide some environmental benefit and could prevent shoreline accumulation occurring. Operational monitoring will be deployed from the outset of a spill to track the spill location and fate in real-time. Due to potentially high levels of volatiles from a spill of marine diesel, shoreline protection and deflection would only be undertaken if safe for response personnel.	**Yes**	Protection and deflection may be deployed to prevent contamination of sensitive resources. RPAs predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event.
Shoreline clean-up	Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines where coverage is at an optimum level of 250 g/m^2.	A marine diesel spill would be prone to rapid spreading and evaporation prior to impacting any sensitive receptors. Operational monitoring will, however, be deployed from the outset of a spill to track the spill location and fate in real-time. The modelling indicates that there is a very low probability of an impact from a marine diesel spill and that in the event of an impact the diesel would continue to evaporate and decay rapidly post-impact. Due to potentially high levels of volatiles from a spill of marine diesel, shoreline clean-up would only be undertaken when safe for response personnel.	**Potentially**	Shoreline clean-up may be undertaken if sensitive receptors are impacted at levels that would permit an effective response and only if volatile levels are safe for responders. RPAs predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event.
Oiled wildlife	Oiled wildlife response is an effective response technique for reducing the overall impact of a release on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination. Air-breathing fauna such as marine mammals are most at risk from surface exposures due to the high volatile components. Marine mammals that have direct physical contact with surface, entrained or dissolved aromatic hydrocarbons may suffer surface fouling, ingest hydrocarbons and inhale toxic vapours.	Due to the likely volatile atmospheric conditions surrounding a diesel spill, response options would be limited to hazing to ensure the safety of response personnel. In addition, any rehabilitation could only be undertaken by trained specialists.	**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 are 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 CS-01 for the PAP are detailed in the subsections below and are excluded from further assessment within this document.

4.2.3.1 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.

4.2.3.2 In situ burning

This technique requires calm sea state conditions as is required for containment and recovery operations, which limits its feasibility in Exmouth 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 Exmouth 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.

4.2.3.3 Surface dispersant application

Marine diesel is prone to rapid spreading and evaporation thus the use of dispersant would be deemed an unnecessary response technique. The application of dispersant to marine diesel is unnecessary as the diesel will rapidly evaporate and would thus unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons.

4.2.3.4 Containment and recovery

Marine diesel is prone to rapid spreading and evaporation thus reducing the feasibility of containment and recovery as a response technique. Furthermore, entering a volatile environment to undertake this technique would be unsafe for response personnel. Although this scenario results in surface oil of BAOAC 4, this only occurs within the first 24 hours during which time volatile levels would be very high and unsafe for response personnel.

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 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. The NEBA can be found in **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 4-4: Selection and prioritisation of response techniques

Response planning scenario	Key characteristics for response planning (minimum times to contact for first receptor and/or shoreline contacted above response threshold)	Feasibility of response techniques														
		Monitor and evaluate	Source control – via IRS, ROV or subsea tree	Debris clearance	Source control – capping stack	Source control on the vessel	Source control – relief well drilling	Subsea dispersant injection	Surface dispersant application	Mechanical dispersion	In situ burning	Containment and recovery	Shoreline protection and deflection	Shoreline cleanup	Oiled wildlife response	Outline response technique
Credible Scenario-01: Hydrocarbon release caused by marine vessel separation. Instantaneous release of 500 m^3 of marine diesel within the Operational Area. Residual component of 25 m^3 (5%)	Minimum time to shoreline accumulation >100 g/m^2: 2.5 days (Ningaloo Coast North) Maximum shoreline accumulation >100 g/m^2: 196 m^3 (Ningaloo Coast North)	Yes	N/A	N/A	N/A	Yes	N/A	N/A	No	No	No	No	Yes	Potentially	Yes	Monitor and evaluate. Initiate vessel source control if feasible. Consider shoreline protection and deflection (in liaison with WA DoT) if safety of responders can be ensured with regard to the potentially high level of volatiles. Consider shoreline clean-up (in liaison with WA DoT) if safety of responders can be ensured with regard to the potentially high level of volatiles. Plan for oiled wildlife response and implement if oiled wildlife is observed.

From the NEBA undertaken on the WCCS identified, the primary response techniques are;

- Monitor and evaluate
- Source control on the vessel
- Shoreline protection and deflection at identified RPAs
- Shoreline clean-up on priority impacted coastlines
- Oiled wildlife response

Support functions include:

- Waste management
- Scientific monitoring programs

5 HYDROCARBON SPILL ALARP PROCESS

Woodside's hydrocarbon spill ALARP process is aligned with guidance provided by NOPSEMA in *Guidance Note GN1488* (2021) and is set out in the 'Woodside Hydrocarbon Spill Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) Development Guidelines' (Link).

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, or
   - no identified reasonably practicable additional, alternative and/or improved control measures would provide further overall increased proportionate environmental benefit, or
   - no reasonably practical additional, alternative, and/or improved control measures have been identified.
3. where an alternative, additional and/or improved control measure is adopted, a measurable level of environmental performance has been assigned
4. higher order impacts/risks have received more comprehensive alternative, additional, and improved control measure evaluations and do not just compare the cost of the adopted control measures to the costs of an extreme or clearly unreasonable control measure
5. cumulative effects have been analysed when considered in combination across the whole activity.

The response technique selection is based on the risk assessment conducted in the EP. The risk assessment identifies the type of oil, volume of release, duration of release, predicted fate, weathering and the EMBA (along with other requirements such as time to impact and predicted volumes ashore). Modelling is then used to inform the NEBA and the prioritisation of suitable response options. The scale of the response techniques selected in the pre-operational NEBA is informed through the assessment of results from the 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.

Table 5-1 provides the operations monitoring plans that support the successful execution of this response technique.

Table 5-1: Description of supporting operational monitoring plans

ID	Title
OM01	Predictive modelling of hydrocarbons to assess resources at risk
OM02	Surveillance and reconnaissance to detect hydrocarbons and resources at risk
OM03	Monitoring of hydrocarbon presence, properties, behaviour and weathering in water
OM04	Pre-emptive assessment of sensitive receptors at risk
OM05	Shoreline assessment

Woodside maintains an *Operational Monitoring Operational Plan*. If shoreline contact is predicted, 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 Exmouth to the spill event location means that monitoring of the spill can be undertaken in a relatively short timeframe. The primary mobilisation base for initial monitoring activities would be Exmouth. However, in the unlikely event of an extended spill with potential to impact receptors further afield, monitoring activities may also be mobilised from Onslow, Dampier or Karratha.

5.1.1 Response need based on predicted consequence parameters

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.

The following statements identify the key parameters upon which a response need can be based.

- Floating oil concentrations greater than 10 g/m^2 and 50 g/m^2 may occur at Ningaloo Coast North after 20 hours and 22 hours respectively. Floating oil concentrations greater than

50 g/m^2 and 10 g/m^2 may occur up to 105 km and 165 km from the release location, respectively.
- The minimum time to contact for oil at concentrations of entrained hydrocarbons greater than 100 ppb at shoreline receptors is 21 hours at Ningaloo Coast North.
- Shoreline accumulations greater than 100 g/m^2 may occur at Ningaloo Coast North after 2.5 days, and at Ningaloo Coast Middle and the Muiron Islands within 4-5 days of the release.
- 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.

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 (COP) 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 5.9)**
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 APASA 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 vessel and ready for deployment 24/7	1, 3A, 3C, 4
		2.2	Deploy tracking buoy from vessel within 2 hours as per the First Strike Plan.	1, 3A, 3B, 4
		2.3	Contract in place with service provider to allow data from tracking buoy to be received 24/7 and processed.	1, 3B, 3C, 4
		2.4	Data received to be uploaded into Woodside Common Operating Picture (COP) daily to improve the accuracy of other monitor and evaluate techniques.	1, 3B, 4
3	Satellite imagery	3.1	Contract in place with 3rd party provider to enable access and analysis of satellite imagery. Imagery source/type requested on activation of service.	1, 3C, 4
		3.2	3rd party provider will confirm availability of an initial acquisition within 2 hours	1, 3B, 3C, 4
		3.3	First image received with 24 hours of Woodside confirming to 3rd party provider its acceptance of the proposed acquisition plan.	1
		3.4	3rd party provider to submit report to Woodside per image. Report is to include a polygon of any possible or identified slick(s) with metadata.	1
		3.5	Data received to be uploaded into Woodside COP daily to improve accuracy of other monitor and evaluate techniques.	1, 3B, 4
		3.6	Satellite Imagery services available and employed during response	1, 3C, 4
4	Aerial surveillance	4.1	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 two sorties per day, available for the duration of the response from day 1	1, 3C, 4
		4.3	Observer to compile report during flight as per first strike plan. Observers report available to the IMT within 2 hours of landing after each sortie.	1, 2, 3B, 4
		4.4	Unmanned Aerial Vehicles/Systems (UAV/UASs) to support 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 2.5 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 operational SIMA confirms conventional methods are unsafe or not possible.	1, 2, 3C, 4

6	Pre-emptive assessment of sensitive receptors	6.1	Within 2 days, 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	Within 2 days, deployment of 2 specialists in SCAT from resource pool for each of the Response Protection Areas (RPAs) with predicted impacts at greater than 100 g/m^2.	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

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 (**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 grossly disproportionate to the environmental benefit gained and/or not reasonably practicable for this PAP.
- The Monitor and Evaluate capability outlined in this section is part of the response developed to manage potential risks and impacts associated with the scenarios to ALARP, and there are no further additional, alternative and improved control measures other than those implemented that would provide further benefit.

5.2 Source Control via Vessel SOPEP

Vessel source control will be conducted, where feasible and in accordance with International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 Annex I[4], 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 International Maritime Organisation (IMO) Resolution MEPC.54 (32) adopted on 6 March 1992, as amended by resolution MEPC.86 (44) adopted on 13 March 2000.

Its purpose is to set the necessary actions in motion to stop or minimise oil discharge and mitigate its effects. Furthermore, it outlines responsibilities, pollution reporting requirements, procedures and resources needed in the event of a hydrocarbon spill from vessel activities.

In the event of the WCCS vessel collision event, the vessel master may engage precautionary marine manoeuvres to avoid collision or commence pumping operations to transfer marine diesel and thus minimise the release.

5.2.1 Environmental performance based on need

Woodside has established control measures, environmental performance outcomes, performance standards and measurement criteria to be used for vessel-source oil spill response during the PAP which are detailed in **Section 6 of the EP**. The vessel master’s roles and responsibilities are described in **Section 7 of the EP**.

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.

[4] Marpol 73/78 Annex I entry into force in Australia, 2 Oct 1983

5.3 Shoreline Protection and Deflection

The placement of containment, protection or deflection booms on and near a shoreline is a response technique to reduce the potential volume of hydrocarbons contacting or spreading along shorelines, which may reduce the scale of shoreline clean-up. Hydrocarbons contained by the booms would be collected where practicable.

Shorelines would be protected where accessible via vessel or shore. Where hydrocarbon contact has already occurred, there may still be value in deploying protection equipment to limit further accumulations and preventing remobilisation of stranded hydrocarbons.

Shoreline protection and deflection equipment would be mobilised to selected locations, where the following conditions were met:

- Sea-states and hydrocarbon characteristics are safe to deploy protection and deflection measures,
- Oil trajectory has been identified as heading towards identified RPAs.

5.3.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which the response need can be based for CS-01:

- Floating oil concentrations greater than 10 g/m^2 and 50 g/m^2 may occur at Ningaloo Coast North after 20 hours and 22 hours respectively.
- The minimum time for shoreline accumulation >100 g/m^2 is 2.5 days at Ningaloo Coast North, and 4-5 days at Ningaloo Coast Middle and the Muiron Islands.
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised prior to shoreline accumulation at 100 g/m^2, which occurs on day 3 at Ningaloo Coast North.
- Following pre-emptive assessments of sensitive receptors at risk, and in agreement of prioritisation with WA DoT (if a Level 2/3 incident and within State Waters), protection and deflection operations would commence until agreed termination criteria are reached.
- Shoreline response operations may extend 1-2 weeks following the release based on the predicted time for shoreline contact and the time to complete shoreline clean-up operations.
- Arrangements for support organisations who provide specialist services (trained personnel, protection and deflection equipment) and/or resources and should be tested regularly.
- Tactical Response Plans (TRPs) for Response Protection Areas (RPAs) along with other relevant plans, procedures and support documents need to be in place for Operational and Support functions. These should be reviewed and updated regularly.

In addition, a number of assumptions are required to estimate the response need for Shoreline Protection and Deflection. These assumptions have been described in the table below.

Table 5-3: Response Planning Assumptions – Shoreline Protection and Deflection

Response Planning Assumptions	
Safety considerations	Shoreline protection and deflection 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. Personnel safety issues may include: • hydrocarbon gas and/or liquid exposure • safe for deployment and conditions within range of vessels • high ambient temperatures.
Shoreline Protection and Deflection	One (1) Shoreline Protection and Deflection operation may include; • Quantity of shoreline sealing boom (as outlined in TRP) • Quantity of fence or curtain boom (as outlined in TRP) • 1-2 x trained supervisors • 8-10 x personnel / labour hire Specific details of each operation would be tailored to the Tactical Response Plan implemented (where available).

5.3.2 Environmental performance based on need

Table 5-4: Environmental Performance – Shoreline Protection and Deflection

Environmental Performance Outcome		To stop hydrocarbons encountering particularly sensitive areas		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.9)**
8	Response teams	8.1	Relevant Tactical Response Plans (TRPs) will be identified in the first strike plan for activation within 12 hours of the release.	1, 3A, 3C, 4
		8.2	Mobilise teams to RPAs within 12 hours of operational monitoring predicting impacts. Teams to contaminated RPAs comprised of: • 1-2 trained specialists per operation • 8-10 personnel/labour hire • Personnel sourced through resource pool	1, 2, 3B, 3C, 4
		8.3	1 operation mobilised within 24 hours to each identified RPA. Expected to be 1 RPA within 2.5 days or 3 RPAs within 5 days (operation as detailed above).	1, 3A, 3B, 4
		8.4	12 trained personnel available within 48 hours sourced through resource pool.	1, 2, 3A, 3B, 3C, 4
		8.5	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s)	1, 3A, 3B
		8.6	The safety of shoreline response operations will be considered and appropriately managed. During shoreline operations: • All personnel in a response will receive an operational/safety briefing before commencing operations • Gas monitoring and site entry protocols will be used to assess safety of an operational area before allowing access to response personnel	1, 3B, 4
9	Response equipment	9.1	Equipment mobilised from closest stockpile within 12 hours.	1, 3A, 3C, 4
		9.2	Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles within 24 hours.	1, 3C, 3D, 4
		9.3	Supplementary equipment mobilised from OSRL within 48 hours.	
		9.4	Woodside maintains integrated fleet of vessels. Additional vessels can be sourced through existing contracts/frame agreements	1, 3A, 3C, 4
10	Management of Environmental Impact of the response risks	10.1	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	1

		10.2	Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines	

The resulting shoreline protection and deflection capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to shoreline protection and deflection at identified RPAs.

Under optimal conditions, during the subsea and surface releases the capability available exceeds the need identified. It indicates that, the shoreline protection and deflection capability have the following expected performance:

- Modelling scenarios indicate that first shoreline impact at Ningaloo Coast North may occur within 2.5 days for CS-01.
- Existing capability allows for mobilisation and deployment of 1 protection and deflection operation (approximately 10-12 responders) within 24 hours (if required). Given shoreline contact at RPAs is not predicted until Day 2.5 at Ningaloo Coast North, the existing capability is considered sufficient to mobilise and deploy protection at RPAs prior to hydrocarbon contact, guided by the ongoing operational monitoring.
- The most significant constraint on expanding the scale of response operations is the availability of accommodation and transport services in the region between Exmouth and Port Hedland, and the management of response generated waste. From previous assessment of accommodation in this region, Woodside estimates that current accommodation can cater for a range of 500-700 personnel per day for an ongoing operation.
- TRPs have been developed for all identified RPAs excepting international locations.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures (**Section 6.3**).
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the timeframe required for deployment of this technique does not justify the excessive costs of identified alternate, improved or additional controls.

5.4 Shoreline Clean-up

Shoreline clean-up may be undertaken using a broad range of techniques when floating hydrocarbons contact shorelines. The timing, location and extent of shoreline clean-up activities can vary from one scenario to another, depending on the hydrocarbon type, sensitivities and values contacted, shoreline type and access, degree of oiling, and area oiled.

Shoreline clean-up is typically undertaken as a three-phase process, phase one (gross contamination removal) involving the collection of bulk oil, either floating against the shoreline or stranded on it, phase two (moderate to heavy contamination removal) involving removal or in situ treatment of shoreline substrates such as sand or pebble beaches, and phase three (final treatment or polishing) involving removal of the remaining residues of oil. As phase one typically involves recovery of floating and pooled oil, and phase three removes minor volumes, they have not been considered in the assessment of response need for the scenarios identified.

The *Shoreline Clean-up Operational Plan* details the mobilisation and resource requirements for a shoreline clean-up operation including the logistics, support and facility arrangements to manage the movement of personnel and resources.

The *Shoreline Clean-up Operational Plan* includes the process for the IMT to mobilise resources depending on the nature and scale of the spill. Woodside would activate and mobilise trained and competent personnel in shoreline assessment before or following shoreline contact at response thresholds.

Shoreline clean-up consists of different manual and mechanical recovery techniques to remove hydrocarbons and contaminated debris from a shoreline; this is to minimise ongoing environmental contamination and impact. The National Plan also provides guidance on shoreline clean-up techniques as outlined in National Plan Guidance *Response, assessment and termination of cleaning for oil contaminated foreshores* (AMSA 2015).

5.4.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which the response need can be based for CS-01:

- The minimum time for shoreline accumulation >100 g/m^2 is 2.5 days at Ningaloo Coast North, and 4-5 days at Ningaloo Coast Middle and the Muiron Islands.
- Shoreline response operations may extend 1-2 weeks following the release based on the predicted time for shoreline contact and the time to complete shoreline clean-up operations.
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised prior to shoreline contact.
- Following Shoreline Assessment and agreement of prioritisation with WA Department of Transport, clean-up operations would commence until agreed termination criteria are reached.
- Arrangements for support organisations who provide specialist services (trained personnel, labour hire, shoreline clean-up, and site management equipment) and/or resources and should be tested regularly.
- Tactical Response Plans (TRPs) for Response Protection Areas (RPAs) along with other relevant plans, procedures and support documents should be in developed and in place for Operational and Support functions. These should be reviewed and updated regularly.

In addition, a number of assumptions are required to estimate the response need for shoreline clean-up. These assumptions have been described in the table below.

Table 5-5: Response Planning Assumptions – Shoreline Clean-up

Response planning assumptions: Shoreline clean-up	
Safety considerations	Shoreline clean-up 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. Personnel safety issues may include: • hydrocarbon gas and/or liquid exposure • waves and/or sea states, tidal cycle and intertidal zone limits • presence of wildlife • high ambient temperatures.
Manual shoreline clean-up operation (Phase 2)	One, manual shoreline clean-up operation (Phase 2) may include: • 1–2 x trained supervisor • 8–10 x personnel/labour hire • Supporting equipment for manual clean-up including rakes, shovels, plastic bags etc.

Physical properties	Surface Threshold
	• Lower – 100 g/m^2 - 100% coverage of 'stain' – cannot be scratched off easily on coarse sediments or bedrock
	  – Expected trigger to undertake detailed shoreline survey
	• Optimum – 250 g/m^2 – 25% coverage of 'coat' – can be scratched off with a fingernail on coarse sediments
	  – Expected trigger to commence clean-up operations

Efficiency (m^3 oil recovered per person per day)	Manual shoreline clean-up (Phase 2) - approx. 0.25–1 m^3 oil recovered per person per 10 hr day is based on moderate to high coverage of oil (100 g/m^2–1000 g/m^2) with manual removal using shovels/rakes, etc. from studies of previous response operations and exercises
Field operation supervisors required (per team)	Manual shoreline clean-up (Phase 2) – 1-2 trained supervisor(s) per operation (assumes one team per operation)
Personnel/ labour hire (per team)	Manual shoreline clean-up (Phase 2) – 8-10 personnel/labour hire per operation (assumes one team per operation)

Table 5-6: Shoreline Clean-up techniques and recommendations

Technique	Description	Shoreline type: Recommended	Shoreline type: Not recommended	Application
Natural recovery	Allowing shoreline to self-clean; no intervention undertaken.	Remote and inaccessible shorelines for personnel, vehicles and machinery. Other clean-up techniques may cause more damage than allowing the shoreline to naturally recover. Natural recovery may be recommended for areas with mangroves and coral reefs due to their sensitivity to disturbance from other shoreline clean-up techniques. High-energy shorelines: where natural removal rates are high, and hydrocarbons will be removed over a short timeframe.	Low-energy shorelines: these areas tend to be where hydrocarbon accumulates and penetrates soil and substrates.	May be employed, if the operational NEBA identifies that other clean-up techniques will have a negligible or negative environmental impact on the shoreline. May also be used for buried or reworked hydrocarbons where other techniques may not recover these.
Manual recovery	Use of manpower to collect hydrocarbons from the shoreline. Use of this form of clean-up is based on type of shoreline.	Remote and inaccessible shorelines for vehicles and machinery. Areas where shorelines may not be accessible by vehicles or machinery and personnel can recover hydrocarbons manually. Where hydrocarbons have formed semi-solid to solid masses that can be picked up manually. Areas where nesting and breeding fauna cannot or should not be disturbed.	Coral reef or other sensitive intertidal habitats, as the presence of a response may cause more environmental damage then allowing them to recover naturally. For some high-energy shorelines such as cliffs and sea walls, manual recovery may not be recommended as it may pose a safety threat to responders.	May be used for sandy shorelines. Buried hydrocarbons may be recovered using shovels into small carry waste bags, but where possible the shoreline should be left to naturally recover to prevent any further burying of hydrocarbons (from general clean-up activities).

Technique	Description	Shoreline type: Recommended	Shoreline type: Not recommended	Application
Sorbents	Sorbent boom or pads used to recover fluid or sticky hydrocarbons. Can also be used after manual clean-up to remove any residues from crevices or from vegetation.	When hydrocarbons are free-floating close to shore or stranded onshore. As a secondary treatment method after hydrocarbon removal and in sensitive areas where access is restricted.	Access for deploying and retrieving sorbents should not be through soft or sensitive habitats or affect wildlife.	Used for rocky shorelines. Sorbent boom will allow for deployment from small shallow draught vessels, which will allow deployment close to shore where water is sheltered and to aid recovery. Sorbents will create more solid waste compared with manual clean-up, so will be limited to clean rocky shorelines.
Vacuum recovery, flushing, washing	The use of high volumes of low-pressure water, pumping and/or vacuuming to remove floating hydrocarbons accumulated at shorelines.	Suited to rocky or pebble shores where flushing can remobilise hydrocarbons (to be broken up) and aid natural recovery. Any accessible shoreline type from land or water. May be mounted on barges for water-based operations, on trucks driven to the recovery area, or hand-carried to remote sites. Flushing and vacuum may be useful for rocky substrate. Medium- to high-energy shorelines where natural removal rates are moderate to high. Where flushed hydrocarbons can be recovered to prevent further oiling of shorelines.	Areas of pooled light, fresh hydrocarbons may not be recoverable via vacuum due to fire and explosion risks. Shorelines with limited access. Flushing and washing not recommended for loose sediments. High-energy shorelines where access is restricted.	High volume low pressure (HVLP) flushing and washing into a sorbent boom could be used for rocky substrate, if protection booming has been unsuccessful in deflecting hydrocarbons from these areas.
Sediment reworking	Movement of sediment to surf to allow hydrocarbons to be removed from the sediment and move sand via heavy machinery.	When hydrocarbons have penetrated below the surface. Recommended for pebble/cobble shoreline types. Medium- to high-energy shorelines where natural removal rates are moderate to high.	Low-energy shorelines as the movement of substrate will not accelerate the natural cleaning process. Areas used by fauna which could potentially be affected by remobilised hydrocarbons.	Use of wave action to clean sediment: appropriate for sandy beaches where light machinery is accessible.

Technique	Description	Shoreline type: Recommended	Shoreline type: Not recommended	Application
Vegetation cutting	Cutting vegetation to prevent oiling and reduce volume of waste and debris.	Vegetation cutting may be recommended to reduce the potential for wildlife being oiled. Where oiling is restricted to fringing vegetation.	Access in bird-nesting areas should be restricted during nesting seasons. Areas of slow-growing vegetation.	May be used on shorelines where vegetation can be safely cleared to reduce oiling.
Cleaning agents (OSCA)	Application of chemicals such as dispersants to remove hydrocarbons.	May be used for manmade structures and where public safety may be a concern.	Natural substrates and in low-energy environments where sufficient mixing energy is not present.	Not recommended for shorelines. Could be used for manmade structures such as boat ramps.

5.4.2 Environmental performance based on need

Table 5-7: Environmental Performance – Shoreline Clean-up

Environmental Performance Outcome		To remove bulk and stranded hydrocarbons from shorelines and facilitate shoreline amenity habitat recovery.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.9)**
11	Shoreline responders	11.1	In liaison with WA DoT (for Level 2/3 incidents), deployment of one shoreline clean-up team to each contaminated RPA comprised of: • 1-2 trained specialists per operation • 8-10 personnel/labour hire Personnel sourced through resource pool within 48 hours of request from the IMT.	1, 2, 3A, 3B, 3C, 4
		11.2	Relevant Tactical Response Plans (TRPs) will be identified in the first strike plan for activation within 24 hours of the release	1, 3A, 3C, 4
		11.3	Relevant Tactical Response Plans (TRPs) available for international locations potentially contacted by accumulation >100 g/m^2 within 14 days.	1, 3A, 3C, 4
		11.4	Clean-up operations for shorelines in line with results and recommendations from SCAT outputs	1, 3A, 3B
		11.5	All shoreline clean-up sites will be zoned and marked before clean-up operations commence.	
		11.6	In liaison with WA DoT (for Level 2/3 incidents), mobilise and deploy 3-5 shoreline clean-up operations by Day 3.	1, 2, 3A, 3C, 4
		11.7	In liaison with WA DoT (for Level 2/3 incidents), mobilise and deploy 8-10 shoreline clean-up operations by Day 5.	
		11.8	The safety of shoreline response operations will be considered and appropriately managed. During shoreline clean-up operations: • All personnel in a response will receive an operational/safety briefing before commencing operations • Gas monitoring and site entry protocols will be used to assess safety of an operational area before allowing access to response personnel	1, 3B, 4
		11.9	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s)	1, 3A, 3B
12	Shoreline clean up equipment	12.1	Contract in place with 3rd party providers to access equipment.	1, 3A, 3C, 4
		12.2	Equipment mobilised from closest stockpile within 12 hours.	
		12.3	Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles within 24 hours.	1, 3C, 3D, 4
		12.4	Supplementary equipment mobilised from OSRL within 48 hours.	
13	Management of Environmental Impact of the response risks	13.1	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	1
		13.2	Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines	
		13.3	Vehicular access will be restricted on dunes, turtle nesting beaches an in mangroves	
		13.4	Removal of vegetation will be limited to moderately or heavily oiled vegetation	
		13.5	Shoreline access routes with the least environmental impact identified will be selected by a specialist in SCAT operations	
		13.6	Oversight by trained personnel who are aware of the risks	

		13.7	Trained unit leader's brief personnel of the risks prior to operations	

The resulting shoreline clean-up capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to shoreline clean-up at identified RPAs. Woodside's capability can cover all required shoreline clean-up operations for the PAP from Day 5.

Whilst modelling predicts shoreline contact from Day 2.5 Ningaloo Coast North, Woodside is satisfied that the current capability is managing risks and impacts to ALARP.

The capability available meets the need identified for this activity. The shoreline clean-up capability has the following expected performance (if required during a response):

- Assessment of response capability indicates that for a worst-case scenario, the existing shoreline clean-up capability would be sufficient by Day 5, but prior to this there is a deficit in the available capability to respond to shoreline hydrocarbons as personnel and equipment are not yet mobilised to site. From Day 5 onwards, the available response capability is predicted to be sufficient as the number of personnel and equipment mobilised to RPAs increases. While additional resources are predicted to be required for shoreline clean-up to remove 100% of oil on the same day that it accumulates between Day 3 and Day 5, it is noted that up-scaling of available resources is still adequate to clean-up residual oil by the end of Week 1. It is also emphasised that the gap in capability is based on a combination of the worst-case volumes and minimum timeframes to shore from CS-01. Under most conditions, the available response capability is expected to be sufficient.
- Woodside has considered deployment of additional personnel to undertake shoreline clean-up operations but is satisfied that the identified level of resource is balanced between cost, time and effectiveness. The most significant constraint on expanding the scale of response operations is the availability of accommodation and transport services in the region between Exmouth and Port Hedland and management of response generated waste. From previous assessment of accommodation in this region, Woodside estimates that current accommodation can cater for a range of 500 - 700 personnel per day for an ongoing operation.
- TRPs have been developed for all identified RPAs.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures (**Section 6.4**).
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the limited scale and timeframe for deployment of this technique does not justify the excessive costs of identified alternate, improved or additional controls.

5.5 Oiled wildlife response (including hazing)

Woodside would implement a response in accordance with the Western Australian *Oiled Wildlife Operational Plan* (WA OWRP). This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill. Oiled wildlife operations would be implemented with advice and assistance from the Oiled Wildlife Advisor from the Western Australia Department of Biodiversity, Conservation and Attractions (DBCA).

Oiled wildlife response is undertaken in accordance with the 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 fauna at slow speeds to ensure animals are not directed towards the oil and deterrence/hazing and pre-emptive capture will only be conducted if Woodside has licensed authority from DBCA and approval from the Incident Controller.

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 or the wider region. Additional personnel would be sourced through Woodside's arrangements to support an oiled wildlife response as required.

5.5.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- modelling predicts the shortest time to shoreline contact at day 2.5 (CS-01) at Ningaloo Coast North.
- the offshore location of the release site and relatively low floating oil concentrations 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 2 and 3, as defined in the WA OWRP (**Table 5-10**).

Table 5-8: Key at-risk species potentially in Priority Protection Areas and open ocean

Species	Open Ocean	Ningaloo Coast	Muiron Islands	Gascoyne AMP
Marine turtles	✓	✓	✓	✓
Sea birds and/or migratory shorebirds	✓	✓	✓	✓
Cetaceans – migratory whales	✓	✓	✓	✓
Cetaceans – dolphins and porpoises	✓	✓	✓	✓
Dugongs		✓	✓	
Whale sharks	✓	✓	✓	✓
Sea snakes	✓	✓	✓	✓

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 5-9** below.

Table 5-9: 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 fauna from entering areas potentially contaminated by spilled hydrocarbons, as well as dispersing, displacing or relocating fauna to minimise/prevent contact and provide time for clean-up.
Stage 5: Wildlife rescue and staging	This includes the different roles of finding oiled wildlife, capturing wildlife, and holding and/or transportation of wildlife to oiled wildlife facilities.
Stage 6: Establishment of an oiled wildlife facility	Treatment facilities would be required for the first-aid, cleaning and rehabilitation of affected animals. 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 Exmouth have been identified in the draft Regional Oiled Wildlife Response Operational Plan (OWROP), should a land-based site be required.
Stage 7: Wildlife rehabilitation	Considerations include a suitable rehabilitation centre and personnel, wildlife housing, record keeping and success tracking.
Stage 8: Oiled wildlife response termination	Once a decision has been made to terminate operations, the Incident Controller will stand down individual participating and supporting agencies.

Reconnaissance and primary response would be done during operational monitoring and surveillance activities. Where marine fauna 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 fauna 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 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 and Global Capability Surge Labour Requirement Plan*.

The WA OWRP provides indicative oiled wildlife response levels (**Table 5-10**) and the resources likely to be needed at each increasing level of response.

Table 5-10: Indicative oiled wildlife response level (adapted from the WA OWRP [AMOSC/DPAW, 2014])

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

5.5.2 Environmental performance based on need

Table 5-11: 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 fauna under the Animal Welfare Act 2002.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.9)**
14	Wildlife response equipment	14.1	Contracted capability to treat 100 individual fauna for immediate mobilisation to Response Priority Areas (RPAs)	1, 3A, 3B, 3C, 4
		14.2	Contracted capability to treat up to an additional 250 individual fauna within a five-day period.	
		14.3	National plan access to additional resources under the guidance of the DoT (up to a Level 5 oiled wildlife response as specified in the OWRP), with the ability to treat about 600 individual fauna by the time hydrocarbons contact the shoreline.	1, 3C, 4
		14.4	Vessels used in hazing/pre-emptive capture will approach fauna at slow speeds to ensure animals are not directed towards the hydrocarbons.	1, 3A, 3B, 4
		14.5	Facilities for the rehabilitation of oiled wildlife are operational 24/7 as per WAOWRP.	1, 3A, 4
15	Wildlife responders	15.1	4 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	Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA.	1
		15.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s)	1, 3A, 3B

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 approximately 4 wildlife collection teams by Day 2 at Ningaloo Coast North.
- Mobilisation and deployment of approximately 1 additional wildlife collection teams by Day 5 at the Muiron Islands.
- Mobilisation and deployment of 2 central wildlife treatment and rehabilitation locations at Exmouth in accordance with WA OWRP.

Additional capability could be deployed but given modelling predicts discreet impacts, the response teams can be redeployed and thus additional personnel are unlikely to increase the net environmental benefit. This capability is considered to be a manageable balance between effective response and minimising environmental impact.

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 Exmouth.

5.6 Waste Management

Waste management is considered a support technique to wildlife response, containment and recovery and shoreline clean-up. 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 shoreline clean-up; and/or
- Solids/semi-solids (oily solids, garbage, contaminated materials) and debris (e.g. seaweed, sand, woods, and plastics) collected during wildlife response, and shoreline clean-up.

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 (Veolia Waste Management) to manage waste volumes generated from response activities.

5.6.1 Response need based on predicted consequence parameters

Table 5-12: Response Planning Assumptions – Waste Management

Response planning assumptions: Waste management	
Waste loading per m^3 oil recovered (multiplier)	Shoreline clean-up (manual) – approx. 5-10x multiplier for oily solid and liquid wastes generated by manual clean-up
	Oiled wildlife response – approx. 1 m^3 of oily liquid waste generated for each wildlife unit cleaned

5.6.2 Environmental performance based on need

Table 5-13: 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 5.9)**
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	Access to at least 2000 m^3 of solid and liquid waste storage available within 3 days upon activation of 3rd party contract.	
		17.3	Access to up to 2000 m^3 of solid and liquid waste storage up to end of Month 1.	
		17.4	Decanting in accordance with National Plan guidelines to occur in daylight hours into the apex of the boom once hydrocarbon/water has settled in storage container.	
		17.5	Recovered hydrocarbons and wastes will be transferred to licensed treatment facility for reprocessing or disposal.	
		17.6	Response teams will segregate liquid and solid wastes at the earliest opportunity.	
		17.7	Waste management provider support staff available year-round to assist in the event of an incident with waste management as detailed in contract.	
		17.8	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
		17.9	Waste management to be conducted in accordance with Australian laws and regulations	1, 3A, 3B, 3C, 4
		17.10	Waste management services available and employed during response	

The resulting waste management capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to waste management at identified RPAs.

Noting that offshore surface dispersant application and containment and recovery operations are unlikely to be a significant part of the response for the WCCS, the greatest waste volumes are associated with shoreline clean-up activities, with a small contribution from potential shoreline protection and deflection and oiled wildlife response.

The greatest volume of hydrocarbons ashore for CS-01 may involve, 196 m^3 of diesel on Day 3, followed by an additional 3 m^3 of diesel on Day 4 and an additional 38 m^3 of diesel on Day 5, generating a maximum of approximately 1,960 m^3 of waste during any single day during Week 1 of the response.

This indicates that the waste management capability has the following expected performance:

- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Woodside currently has access to service providers committed to providing approximately 120,000 m^3 liquid waste over 77 days (approximately 1,600 m^3 per day) from an offshore response or 64,000 m^3 solid waste over 130 days for shoreline clean-up.
- The waste management requirements of all credible spill scenarios are well 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 (**Section 6.6**).
- No further control measures that may result in an increased environmental benefit that involve moderate to significant cost and/or dedication of resources have been adopted as the requirements of this technique does not justify the excessive costs of identified alternate, improved or additional controls.

5.7 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**:

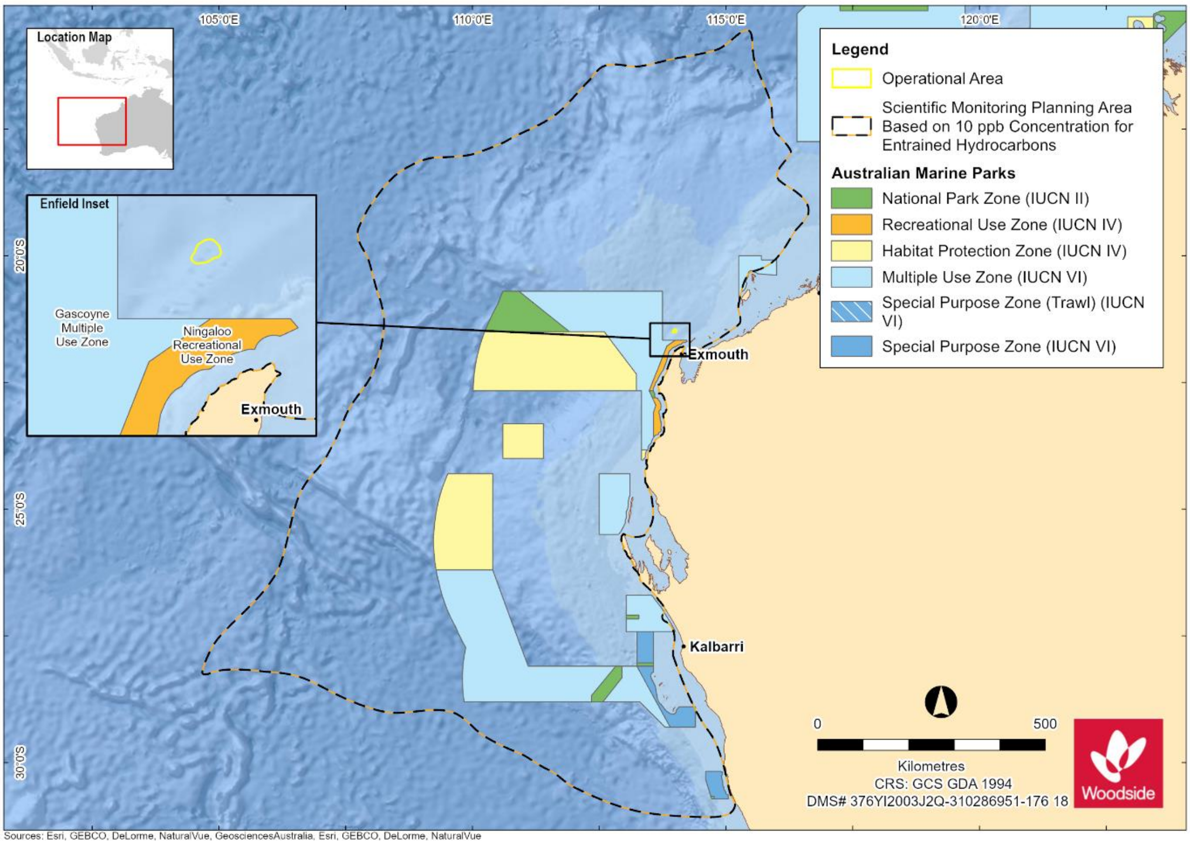


Figure 5-1: The planning area for scientific monitoring based on the area potentially contacted by the low (below ecological impact) entrained hydrocarbon threshold of 10 ppb in the event of the worst-case credible spill scenario CS-01).

Please note that Figure 5-1 represents the overall combined extent of the oil spill model outputs based on a total of 200 replicate simulations over an annual period for CS-01 and therefore represents the largest spatial boundaries of 200 CS-01 hydrocarbon spill combinations, not the spatial extent of a single CS-01 hydrocarbon spill trajectory.

5.7.1 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 5.7.2). In the event of a spill, the SMP activation (as per the Enfield Subsea Infrastructure Decommissioning Oil Pollution First Strike Response 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 5.7.2) 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.

5.7.2 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 Enfield Subsea Infrastructure Decommissioning 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: Enfield Subsea Infrastructure Decommissioning • 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 scenario hydrocarbon release for the activity has identified the following: − Ningaloo Coast [5] − Muiron Islands [6] Refer to ANNEX D, Table D-2 – baseline data available. Australian Marine Parks (AMPs) potentially affected includes: − Gascoyne AMP − Ningaloo AMP − Carnarvon 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 water column.
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 (AMP, WHA and State Marine Park) including the barrier islands of Bernier and Dorre. − Abrolhos AMP 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. 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 Enfield Subsea Infrastructure Decommissioning, 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.

[5] Ningaloo Coast includes the WHA, State Marine Park
[6] Muiron Islands includes the WHA and State Marine Management Area

	• 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 (PAP) worse case credible spill scenario CS-01 is presented in Enfield Subsea Infrastructure Decommissioning EP (Section 7). • 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 worse case credible spill event scenario 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).

5.7.3 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.

5.7.4 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
- Ningaloo AMP
- Gascoyne AMP
- Carnarvon AMP

Documented baseline studies are available for certain sensitive receptor locations including the 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.

[1] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

The option analysis in Section **Error! Reference source not found.** considers ways to reduce t he gap by considering alternate, additional, and/or improved control measures on each selected response strategy.

5.7.5 Environmental performance based on need

Table 5-14: 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**
18	• Woodside has an established and dedicated SMP team comprising the Environmental Science Team and additional Environment Advisers within the HSE Function.	18.1	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
19	• 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 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.	19.1	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 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	• Hydrocarbon Spill Preparedness 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 resourcing report register). • Training materials • Training attendance registers • Competency criteria for SMP roles • SMP annual arrangement testing and reporting

20	• 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 ICC) 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 ICC 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 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.	20.1	• 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

21	• 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'.	21.1	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.	• Hydrocarbon Spill Preparedness 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
22	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.	22.1	• 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 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).			• Accessing baseline knowledge via the SMP annual arrangement testing

Environmental Performance Outcome		**SMP plan to acquire response phase monitoring targeting pre-emptive baseline data achieved**		
Control measure		**Performance Standard**		**Measurement Criteria**
23	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.	23.1	**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 ICC) contribute SMP component of the ICC Planning Function in development of the IAP.	• Response SMP plan • Woodside's online Incident Management System records • SMP component of the Incident Action Plan.
		23.2	**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)**	
Control measure	**Performance Standard**	**Measurement Criteria**

24	• 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.	24.1	**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	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
		24.2	**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.	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
		24.3	**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):	Evidence of Termination Criteria triggered: • Documentation and approval by relevant stakeholders to end SMPs for specific receptor types.

5.8 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.

5.8.1 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 incident action plan (IAP) and assist the IMT with the execution of that plan. The site-based incident controller (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.

5.8.2 Operational NEBA process

In the event of a response Woodside will confirm that the response techniques adopted at the time of Environment Plan/Oil Pollution Emergency Plan (EP/OPEP) acceptance remain appropriate to reduce the consequences of the spill. This process verifies that there is a continuing net environmental benefit associated with continuing the response technique through the operational NEBA process. This process manages the environmental risks and impacts of response techniques during the spill response, an operational NEBA will be undertaken throughout the response, for each operational period.

The operational NEBA will consider the risks and benefits of conducting and response activity. For example, if vessels are required for access to nearshore or onshore areas, anchoring locations will be selected to minimise disturbance to benthic habitats. Vessel cleanliness would be commensurate with the receiving environment. The operational NEBA will consider the risks and benefits of conducting other response techniques.

The operational NEBA process is also used to terminate a response. Using data from operational and scientific monitoring activities the response to a hydrocarbon spill will be terminated in accordance with the termination process outlined in the Oil Pollution Emergency Arrangements (Australia). In effect the operational NEBA will determine whether there is net environmental benefit to continue response operations.

5.8.3 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 First-Strike Response Plan). This includes notification to mariners to communicate navigational hazards introduced through response equipment and personnel.
- In the event of a response, identify and engage with relevant stakeholders and continually assess and review.

5.8.4 Environmental performance based on need

Table 5-15: 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 5.9)</th></tr>
<tr><td rowspan="3">25</td><td rowspan="3">Operational SIMA</td><td>25.1</td><td>Confirm that the response techniques adopted at the time of acceptance remain appropriate to reduce the consequences of the spill within the next 24 hours.</td><td rowspan="6">1, 3A</td></tr>
<tr><td>25.2</td><td>Record the evidence and justification for any deviation from the planned response activities.</td></tr>
<tr><td>25.3</td><td>Record the information and data from operational and scientific monitoring activities used to inform the SIMA.</td></tr>
<tr><td rowspan="3">26</td><td rowspan="3">Stakeholder engagement</td><td>26.1</td><td>Prompt and record all notifications (including government notifications) for stakeholders in the region are made</td></tr>
<tr><td>26.2</td><td>In the event of a response, identification of relevant stakeholders will be re-assessed throughout the response period.</td></tr>
<tr><td>26.3</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="7">27</td><td rowspan="7">Personnel required to support any response</td><td>27.1</td><td>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.</td><td>1, 3B</td></tr>
<tr><td>27.2</td><td>A duty roster (Link) 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>27.3</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 Manager
People Coordinator
Public Information Coordinator
Intelligence Coordinator
Finance Coordinator.</td><td rowspan="4">1, 2, 3B, 3C, 4</td></tr>
<tr><td>27.4</td><td>Collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an Incident Action Plan (IAP) and assist with the execution of that plan.</td></tr>
<tr><td>27.5</td><td>Security and emergency management (S&EM) advisors will be integrated into ICC to monitor performance of all functional roles.</td></tr>
<tr><td>27.6</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>27.7</td><td>Follow the OPEA, Operational Plans, FSPs, support plans and the IAPs developed.</td><td>1, 2, 3A, 4</td></tr>
</table>

		27.8	Contribute to Woodside's response in accordance with the aims and objectives set by the Duty Manager.	1, 2, 3B, 3C, 4

5.9 Measurement criteria for all response techniques

Woodside ensures compliance with environmental performance outcomes and standards through four primary mechanisms. The aforementioned performance tables 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 and 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 and 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 Incident Action Plan (IAP) process formally documents and communicated the:

- Incident objectives
- Status of assets
- Operational period objectives
- Response techniques (defined during response planning)
- The effectiveness of response techniques.

The information captured in the IMS (including information from personal logs and assigned tasks/close outs) confirms the response techniques implemented remain appropriate to reduce the consequences of the spill. The system also records all information and data that can be used to support the site-based IMT, development and the execution of the IAP.

2. The S&EM Competency Dashboard

The S&EM competency dashboard records the number of trained and competent responders that are available across Woodside, and some external providers, to participate in a response.

This number varies dependent on expiry of competency certificates, staff attrition, internal rotations, leave and other absences. As such the Dashboard is designed to identify the minimum manning requirements and to identify sufficient redundancy to cater for the variances listed above.

Figure 5-2 shows the minimum manning numbers for the different hydrocarbon spill response roles and the number of qualified persons against those roles.

Woodside's pool of trained responders is composed of but not limited to personnel from the following organisations:

- Woodside internal
- Australian Marine Oil Spill Centre (AMOSC) core group
- AMOSC
- Oil Spill Response Limited (OSRL)
- Marine Spill Response Corporation (MSRC)
- AMSA
- Woodside contracted workforce

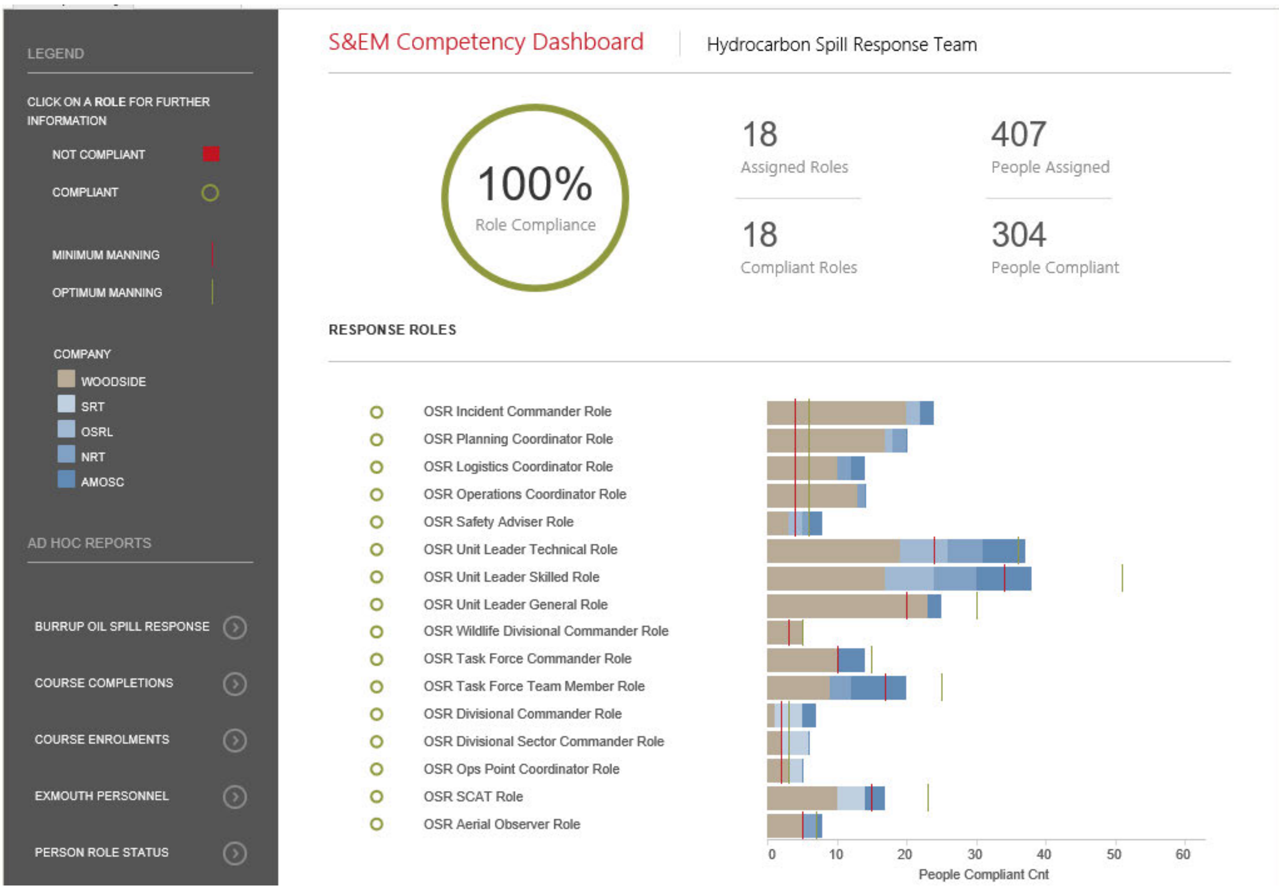


Figure 5-2: Example screen shot of the HSP competency dashboard

The Dashboard is one of Woodside's key means of monitoring its readiness to respond. It also and shows that Woodside can meet the requirements of the environmental performance standard that relate to filling certain response roles.

Figure 5-3 shows deeper dive into the Ops Point Coordinator role and the training modules required to show competence.

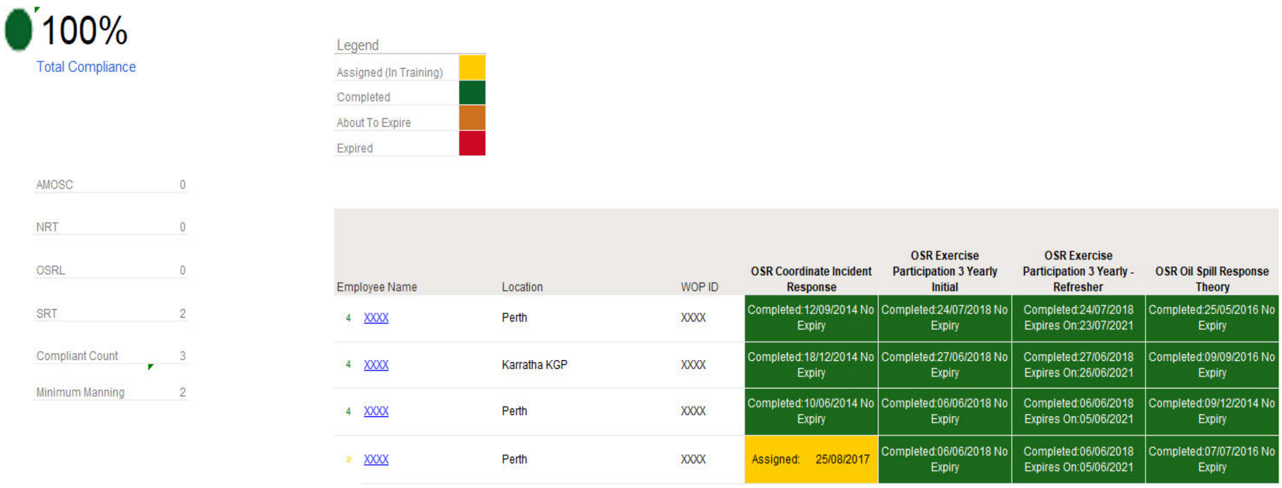


Figure 5-3: Example screen shot for the Ops Point Coordinator role

3. The Hydrocarbon Spill Preparedness ICE Assurance Process

The Hydrocarbon Spill Response Team has developed a Hydrocarbon Spill Preparedness and Response Internal Control Environment (ICE) process to align and feed into the Woodside Management System Assurance process for hydrocarbon spill. The process tracks compliance over four key control areas:

a) **Plans** – Ensures all plans (including: Oil Pollution Emergency Arrangements, first strike response plans, operational plans, support plans and tactical response plans in **Annex E**) 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, Crisis Management Team (CMT) and hydrocarbon spill response roles. The hydrocarbon spill training plan and exercise schedule, including testing of arrangements is also tracked. The Testing of Arrangements (TOA) register tracks the testing of all hydrocarbon spill response arrangements, key contracts and agreements in place with internal and external parties to ensure compliance.

c) **Capability** – Tracks and monitors capability that could be required in a hydrocarbon incident, including but not limited to: integrated fleet[7] vessel schedule, dispersant availability, rig/vessels monitoring, equipment stockpiles, tracking buoy locations and the CICC duty roster.

d) **Compliance and 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 and 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
  - maintaining access to identified equipment and personnel.

[7] 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

- 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:

- assuring 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
- determining priority response receptors
- determining ALARP
- 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 the challenge of collecting essential data/implementing reliable modelling in shorter timeframes.	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*					
Night time aerial surveillance.	The risk of undertaking the aerial observations at night is disproportionate to the limited environmental benefit. The images would be of low quality and as such the variable is not adopted.	Flights will only occur when deemed safe by the pilot. The risk of night operations is disproportionate to the benefit gained, as images from sensors (IR, UV, etc.) will be low quality. Flight time limitations will be adhered to.	No improvement can be made without risk to personnel health and safety and breaching Woodside's Golden Rules.	This option is not adopted as the safety considerations outweigh any environmental benefit gained.	No
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 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.

6.2.1 Source Control via Vessel SOPEP – Control Measure Options Analysis

6.2.1.1 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**	**Cost**	**Implemented**
No reasonably practical alternative control measures identified.				N/A

6.2.1.2 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**	**Cost**	**Implemented**
No reasonably practical alternative control measures identified.				N/A

6.2.1.3 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**	**Cost**	**Implemented**
No reasonably practical alternative control measures identified.				N/A

6.2.2 Selected control measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.3 Shoreline Protection and Deflection - 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.

6.3.1 Existing Capability – Shoreline Protection and Deflection

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.

6.3.2 Response Planning: Enfield Subsea Infrastructure Decommissioning – Shoreline Protection and Deflection

Planning for shoreline protection is based upon identification of Response Protection Areas (RPAs) from spill modelling and the logistics associated with deploying protection at these locations. The response planning scenarios indicate that this would require effective mobilisation to priority shorelines and maintenance of protection until operational monitoring confirms that the locations were no longer at risk. Woodside has identified the RPAs from spill modelling results provided from specific scenarios.

The control measures selected provide capability to mobilise shoreline protection equipment within 24 hours.

Modelling for CS-01 indicates that floating oil concentrations greater than 10 g/m^2 and 50 g/m^2 may occur at Ningaloo Coast North after 20 hours and 22 hours respectively. The minimum time for shoreline accumulation >100 g/m^2 is 2.5 days at Ningaloo Coast North (196 m^3), and 4-5 days at Ningaloo Coast Middle (3 m^3) and the Muiron Islands (38 m^3). The existing capability is considered sufficient to mobilise and deploy protection at all identified RPAs prior to hydrocarbon contact. In the event of a real spill, protection activities will be guided by predictive modelling, direct observation/surveillance and remote sensing methods (OM01, OM02 and OM03) which will be employed from the outset of a spill to track the oil and assess receptors at risk. This will then trigger the undertaking of pre-emptive assessments of sensitive receptors at risk (OM04). OM04 would only be undertaken in liaison with WA DoT. Due to potentially high levels of volatiles from a spill of marine diesel, shoreline protection and deflection operations would only be undertaken if safety of responders could be ensured.

TRPs exist for many of the RPAs identified. The plans identify values and sensitivities that would be protected at each location. Modelling does not predict that all priority protection shorelines will be at risk of contact at the same time. Therefore, to allow for the best use of available shoreline protection and deflection resources, operational monitoring (OM01, OM02 and OM03) will inform the response, targeting RPAs where contact is predicted. **Table 6-1** below outlines the capability required (number of RPAs predicted to be impacted) against the capability available (number of shoreline protection and deflection operations that can be mobilised and deployed). As can be seen from the table below. Woodside's capability exceeds the response planning need identified for shoreline protection and deflection operations at identified RPAs.

Table 6-1: Response planning – shoreline protection and deflection

	Shoreline Protection & Deflection (SPD)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7		Week 2	Week 3	Week 4		Month 2	Month 3	Month 4
A	Capability Required															
A1	Number of RPAs contacted (> 100g/m^2) – Marine diesel release (Credible Scenario-01)	0	0	1	1	1	0	0		0	0	0		0	0	0
B	Capability Available (operations per day)															
B1	SPD operations available – per day (lower)	0	1	1	2	2	4	6		70	70	70		330	330	330
B2	SPD operations available – per day (upper)	1	2	3	4	6	8	10		84	84	84		336	336	336
C	Capability Gap (operations per day)															
C1	SPD operations gap – per day (lower)	0	0	0	0	0	0	0		0	0	0		0	0	0
C2	SPD operations gap – per day (upper)	0	0	0	0	0	0	0		0	0	0		0	0	0

A1 – the number of Response Protection Areas contacted by surface hydrocarbons above 100 g/m^2
*B1 and B2 – the upper and lower number of shoreline protection and deflection operations available (based on response planning assumptions in **Section 5.3**),*
C1 and C2 – the gap between the upper and lower number of shoreline protection and deflection operations required in A1 compared to the operations available in B1 and B2

Table 6-2: RPAs for Enfield Subsea Infrastructure Decommissioning

Areas of coastline contacted	Conservation status	IUCN protection category	Credible Scenario-01	
			Minimum time to shoreline contact (above 100 g/m^2) in days [(8)]	Maximum shoreline accumulation (above 100 g/m^2) in m^3 [(5)]
Ningaloo Coast North (Incl. WHA)	State Marine Park Australian Marine Park World Heritage Area	IUCN IV – Recreational Use Zone (AMP) IUCN II – Marine National Park Zone	2.5 days	196 m^3
Ningaloo Coast Middle (Incl. WHA)	State Marine Park Australian Marine Park World Heritage Area	IUCN IV – Recreational Use Zone (AMP) IUCN II – Marine National Park Zone	4 days	3 m^3
Muiron Islands (Incl. MMA-WHA)	State Marine Management Area World Heritage Area	IUCN IA – Strict Nature Reserve IUCN VI – Multiple Use Zone	4.8 days	38 m^3

[8] Results for Scenario-01 inferred from stochastic modelling results as deterministic modelling is not available for this scenario.

Table 6-3: Indicative Tactical response plan, objectives and methods for RPAs with predicted contact

Tactical Response Plan	Response aims and methods
Ningaloo coast – Mangrove Bay	**First Response Objective: Protection of Mangrove Bay Lagoon.** Methods: Prevent oil ingress to lagoons through use of shore sealing booms. Complete northern lagoon first, then southern if required – depending on beach topography and tidal cycle. **Second Response Objective: Pre-clean of the beach area.** Methods: Using rakes and shovels move any debris on the beach to above the high tide area, above the reach of any floating oil. **Third Response Objective: Recovery of oil at lagoon entrance.** Methods: Use skimmer to recover floating oil. **Fourth Response Objective: Clean-up of oiled shoreline.** Methods: Manual clean up techniques, predominantly rakes and shovels, with flushing and vacuum skimming if appropriate and required
Ningaloo coast – Turquoise Bay	**First Response Objective: Pre-clean of the beach area.** Method: Using rakes and shovels move any debris on the beach to above the high tide area, above the reach of any floating oil. **Second Response Objective: Clean-up of oiled shoreline.** Method: Manual clean up techniques, predominantly rakes and shovels, with flushing and vacuum skimming if appropriate and required.
Ningaloo coast – Yardie Creek	**First Response Objective: Protection of Yardie Creek entrance.** Methods: Prevent oil ingress to lagoon through use of shore sealing boom. **Second Response Objective: Pre-clean of the beach area.** Methods: Using rakes and shovels move any debris on the beach to above the high tide area, above the reach of any floating oil. **Third Response Objective: Recovery of oil at Yardie Creek entrance.** Methods: Use skimmer to recover floating oil into temporary storage. **Fourth Response Objective: Clean up of oiled shoreline.** Methods: Manual clean up techniques, predominantly rakes and shovels, with flushing and vacuum skimming if appropriate and required.
Ningaloo coast – Jurabi-Lighthouse Beaches	**First Response Objective: Pre-clean of the beach area.** Method: Using rakes and shovels move any debris on the beach to above the high tide area, above the reach of any floating oil. **Second Response Objective: Clean-up of oiled shoreline.** Method: Manual clean up techniques, predominantly rakes and shovels, with flushing and vacuum skimming if appropriate and required.
Muiron Islands	**First Response Objective:** Ongoing operational monitoring and evaluation of the hydrocarbon spill to adapt aims and response tactics to the evolving nature of the incident.

Tactical Response Plan	Response aims and methods
	Second Response Objective: Pre-clean of potential impact areas (if time allows) using rakes and shovels to move any debris above the high tide line and then segregate appropriately. **Third Response Objective**: Clean-up of the shoreline. Manual clean up techniques, use of mechanical recovery methods and techniques where appropriate. **Fourth Response Objective**: Collection and specialist cleaning/rehabilitation of oiled wildlife.

Pre-emptive mobilisation of equipment and personnel would commence as soon as practicable prior to oil contact. Additional resources would be mobilised depending on the scale of the event to increase the length or number of shorelines being protected.

A shoreline protection and deflection response would be launched and any additional TRPs drafted only when operational monitoring (OM02 and OM03) and modelling (OM01) indicate that contact could occur at RPA(s). The outputs from the monitoring will inform the need for and/or direct any additional response techniques and, additionally, if/when the spill enters State Waters and control of the incident passes to WA DoT.

6.3.3 Shoreline Protection and Deflection – Control Measure Options Analysis

6.3.3.1 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**
Pre-position equipment at Response Protection Areas (RPAs)	Additional environmental benefit of having equipment prepositioned is considered minor. Equipment is currently available to RPAs and additional shorelines, within estimated minimum times until shoreline contact at RPAs, enabling mobilisation of the selected delivery options.	The incremental environmental benefit associated with these delivery options is considered minor and unlikely to reduce the environmental consequence of a significant hydrocarbon release beyond the adopted delivery options. Considering the highly unlikely nature of a significant hydrocarbon release and the costs and organisational complexity associated with prepositioning and maintenance of equipment, the sacrifice is considered disproportionate to the limited environmental benefit that might be realised. Furthermore, these options would conflict with the mutual aid philosophy being adopted under the selected delivery options. The selected delivery options for shoreline protection and deflection meet the relevant objectives of this control measure and do not require prepositioned or additional equipment in Exmouth.	Total cost to preposition protection/ deflection packages at each site of potential impact would be approx. A$6100 per package per day.	This option is not adopted as the existing capability meets the need.	No

6.3.3.2 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**
Supplemented stockpiles of equipment in Exmouth to protect additional shorelines	Additional equipment would increase the number of receptor areas that could be protected from hydrocarbon contact. However, current availability of personnel and equipment is capable of protecting up to 30 km of shoreline, commensurate with the scale and progressive nature of shoreline impact. Additional stocks would be made available from international sources if long term up scaling were necessary. A reduction in environmental consequence from a 'B' rating (serious long-term impacts) is unlikely to be realised as a result of having more equipment available locally.	The incremental environmental benefit associated with these delivery options is considered minor and unlikely to reduce the environmental consequence of a significant hydrocarbon release beyond the adopted delivery options. Considering the highly unlikely nature of a significant hydrocarbon release and the costs and organisational complexity associated with prepositioning and maintenance of equipment, the sacrifice is considered disproportionate to the limited environmental benefit that might be realised. Furthermore, these options would conflict with the mutual aid philosophy being adopted under the selected delivery options. The selected delivery options for shoreline protection and deflection meet the relevant objectives of this control measure and do not require prepositioned or additional equipment in Exmouth.	Total cost for purchase supplemental protection and deflection equipment would be approx. A$455,000 per package.	This option is not adopted as the existing capability meets the need.	No
Additional trained personnel	The level of training and competency of the response personnel ensures the shoreline protection and deflection operation is delivered with minimum secondary impact to the environment. Training additional personnel does not provide an increased environmental benefit.	Additional personnel required to sustain an extended response can be sourced through the Woodside *People & Global Capability Surge Labour Requirement Plan*. Additional personnel sourced from contracted OSRO's (OSRL/AMOSC) to manage other responders. Response personnel are trained and exercised regularly in shoreline response techniques and methods. All personnel involved in a response will receive a full operational/safety brief prior to commencing operations.	Additional Specialist Personnel would cost A$2000 per person per day.	This option is not adopted as the existing capability meets the need.	No

6.3.3.3 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/ mobilisation time	Hydrocarbons are predicted to strand after a period of approximately 2.5 days therefore allowing enough time to re-locate existing equipment, personnel and other resources to the most appropriate areas.	Response teams, trained personnel, contracted oil spill response service providers, government agencies and the associated mitigation equipment required to enact an initial protection and deflection response will be available for mobilisation within 24-48hrs of activation. Additional equipment from existing stockpiles and oil spill response service providers can be on scene within days. Given modelling does not predict shoreline accumulation until approx. 2.5 days, Woodside considers that there is sufficient time for deployment of protection and deflection operations prior to impact.	The cost of establishing a local stockpile of new mitigation equipment (including protection and deflection boom) closer to the expected hydrocarbon stranding areas is not commensurate with the need.	This option is not adopted as the existing capability meets the need.	No

6.3.4 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - None selected
- Improved
  - None selected

6.4 Shoreline Clean-up – 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 – Shoreline Clean-up

Woodside's exiting level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

6.4.2 Response planning: Enfield Subsea Infrastructure Decommissioning – Shoreline Clean-up

Woodside has assessed existing capability against the WCCS and has identified that the range of techniques provide an ongoing approach to shoreline clean-up at identified RPAs.

Modelling for CS-01 indicates that the minimum time for shoreline accumulation >100 g/m^2 is 2.5 days at Ningaloo Coast North (196 m^3), and 4-5 days at Ningaloo Coast Middle (3 m^3) and the Muiron Islands (38 m^3). These volumes assume no treatment of floating surface oil by containment and recovery or surface dispersant application prior to contact so are considered very conservative.

The maximum shoreline accumulation volumes from CS-01 has been presented for any given day / week / month of the response to provide a single response planning scenario so that it provides a worst-case scenario for planning purposes, as outlined below in **Table 6-4**. The existing shoreline clean-up capability would be sufficient by Day 5, but prior to this there is a deficit in the available capability to respond the shoreline hydrocarbons as personnel and equipment are not yet mobilised to site. From Day 5 onwards, the available response capability is predicted to be sufficient as the number of personnel and equipment mobilised to RPAs increases. While additional resources are predicted to be required for shoreline clean-up to remove 100% of oil on the same day that it accumulates between Day 3 and Day 5, it is noted that up-scaling of available resources is still adequate to clean-up residual oil by the end of Week 1. It is also emphasised that the gap in capability is based on a combination of the worst-case volumes and minimum timeframes to shore from CS-01. Under most conditions, the available response capability is expected to be sufficient. The volumes of accumulated oil and the required scale of the response will also depend on the success of other offshore techniques preventing shoreline oiling occurring; other offshore response techniques and their associated reduction in oil volumes have not been taken into account when determining the shoreline clean-up requirements in **Table 6-4** and the approach is therefore conservative.

Due to the time of contact predicted shoreline clean-up and spill modelling predicting ongoing stranding after this peak, this response may not be as time critical compared to other response techniques and the scale will depend on the success of other techniques preventing oiling occurring. Further, the potential scale and remoteness of a response coupled with the uncertainty of which locations will be affected precludes the stockpiling or prepositioning of equipment specific to shorelines. The most significant constraint is accommodation and transport of personnel in the Exmouth region to undertake clean-up operations and to manage wastes generated during the response effort. From previous assessment of facilities in the Exmouth region, Woodside estimates that current accommodation can cater for a range of 500-700 personnel per day.

Woodside has identified several options which could be mobilised to achieve defined response objectives. Evaluation considers the benefit in terms of the time to respond and the scale of response made possible by each option. The evaluation of possible alternative, additional and improved control measures is summarised in **Section 6.4.3**.

Table 6-4: Response Planning – Shoreline Clean-up

	Shoreline clean-up (Phase 2)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Week 2	Week 3	Week 4	Month 2	Month 3	Month 4	Month 5
	Oil on shoreline (from spill modelling) m^3														
	Shoreline accumulation (above 100 g/m^2) – m^3	0	0	196	3	38	0	0	0	0	0	0	0	0	0
	Oil remaining following response operations – m^3	0	0	0	78	33	28	11	0	0	0	0	0	0	0
A	Capability Required (number of operations)														
A1	Shoreline clean-up operations required (lower)	0	0	20	8	7	3	1	0	0	0	0	0	0	0
A2	Shoreline clean-up operations required (upper)	0	0	28	12	10	4	2	0	0	0	0	0	0	0
B	Capability Available (number of operations)														
B1	Shoreline clean-up operations available - Stage 2 - Manual (lower)	0	1	3	5	8	12	15	105	105	105	560	560	560	560
B2	Shoreline clean-up operations available - Stage 2 - Manual (upper)	0	2	5	8	10	15	20	140	140	140	560	560	560	560
C	Capability Gap														
C1	Shoreline clean-up operations gap (lower)	0	0	17	3	0	0	0	0	0	0	0	0	0	0
C2	Shoreline clean-up operations gap (upper)	0	0	23	4	0	0	0	0	0	0	0	0	0	0

A1 and A2 – the number of Shoreline Clean-up operations required based on the hydrocarbon volumes ashore above 100 g/m^2
B1 and B2 – the upper and lower number of shoreline clean-up operations available (based on response planning assumptions in ***Section 5.4****),*
C1 and C2 – the gap between the upper and lower number of shoreline clean-up operations required in A1 and A2 compared to the operations available in B1 and B2

Table 6-5: RPAs for Enfield Subsea Infrastructure Decommissioning

Areas of coastline contacted	Conservation status	IUCN protection category	Credible Scenario-01	
			Minimum time to shoreline contact (above 100 g/m^2) in days [9]	Maximum shoreline accumulation (above 100 g/m^2) in m^3 [5]
Ningaloo Coast North (Incl. WHA)	State Marine Park Australian Marine Park World Heritage Area	IUCN IV – Recreational Use Zone (AMP) IUCN II – Marine National Park Zone	2.5 days	196 m^3
Ningaloo Coast Middle (Incl. WHA)	State Marine Park Australian Marine Park World Heritage Area	IUCN IV – Recreational Use Zone (AMP) IUCN II – Marine National Park Zone	4 days	3 m^3
Muiron Islands (Incl. MMA-WHA)	State Marine Management Area World Heritage Area	IUCN IA – Strict Nature Reserve IUCN VI – Multiple Use Zone	4.8 days	38 m^3

[9] Results for Scenario-01 inferred from stochastic modelling results as deterministic modelling is not available for this scenario.

6.4.3 Shoreline Clean-up – Control measure options analysis

6.4.3.1 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.					

6.4.3.2 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 trained personnel available	The level of training and competency of the response personnel ensures the shoreline clean-up operation is delivered with minimum secondary impact to the environment.	Additional personnel required to sustain an extended response can be sourced through the Woodside *People & Global Capability Surge Labour Requirement Plan*. Additional personnel could be sourced from contracted OSROs (OSRL/AMOSC) to manage other responders. Response personnel are trained and exercised regularly in shoreline response techniques and methods. All personnel involved in a response will receive a full operational/safety brief prior to commencing operations.	Additional Specialist Personnel would cost A$2000 per person per day.	This option would be adopted if real time operational monitoring determines that an impact is likely above the existing response capability.	Yes
Additional trained personnel deployed	Maintaining a span of control of 200 competent personnel is deemed manageable and appropriate for this activity. Additional personnel conducting clean-up activities may be able to complete the clean-up in a shorter timeframe, but modelling predicts ongoing stranding of hydrocarbons over a period of weeks. Managing a smaller, targeted response is expected to achieve an environmental benefit through ensuring the shoreline clean-up response is suitable and scalable for the shoreline substrate and sensitivity type. This will ensure there is no increased impact from the shoreline clean-up through the presence of unnecessary personnel and equipment.	The figure of 200 personnel is broken down to include on 1-2 x Trained Supervisors managing 8-10 personnel/labour hire responders. This allows for multiple operational teams to operate along the extended shoreline at different locations. Typically, an additional 30-50% of the tactical workforce is required to support ongoing operations including On-Scene control, logistics, safety/medical/welfare and transport. Personnel on site will include members with the appropriate specialties to ensure an efficient shoreline clean-up. Additional personnel are available through existing contracts with oil spill response organisations, labour hire organisations and environmental panel contractors	Additional Specialist Personnel would cost $2,000 per person per day.	This option is not adopted as the existing capability meets the need.	No

6.4.3.3 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/ mobilisation time	Hydrocarbons are predicted to strand after a period of approximately 2.5 days therefore allowing enough time to re-locate existing equipment, personnel and other resources to the most appropriate areas.	Response teams, trained personnel, contracted oil spill response service providers, government agencies and the associated mitigation equipment required to enact an initial protection and deflection response will be available for mobilisation within 48 hours of activation. Additional equipment from existing stockpiles and oil spill response service providers can be on scene within the first week.	The cost of establishing a local stockpile of new shoreline clean-up equipment closer to the expected hydrocarbon stranding areas is not commensurate with the need.	This option is not adopted as the existing capability meets the need.	No

		RPAs predicted to be contacted are based on modelling and may differ in a real spill event thus pre-positioning equipment and personnel may provide no additional benefit.			

6.4.4 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- Alternative
  - None selected
- Additional
  - Additional trained personnel available (if need is determined by real-time operational monitoring during a spill event).
- Improved
  - None selected

6.5 Wildlife Response – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in **Section 5.5** 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 – wildlife response

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

6.5.2 Oiled wildlife response – 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**
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

6.5.2.2 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**
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

6.5.2.3 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 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, RPAs predicted to be contacted are based on modelling data and may differ in a real spill event thus pre-positioning equipment and personnel may provide no additional 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 2-3 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 spill modelling cost A$700 per package per day. The cost of having dedicated equipment and personnel available to respond faster is, however, considered disproportionate to the environmental benefit.	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 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.

6.6.1 Existing capability – waste management

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, refuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

6.6.2 Waste management – control measure options analysis

6.6.2.1 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.					

6.6.2.2 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*					
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 Veolia's storage options provides the resources required to store and transport sufficient waste to meet the need. Access to waste contractors existing facilities enables waste to be stockpiled and gradually processed within the regional waste handling facilities. Additional temporary storage equipment is available through existing contract and arrangements with OSRL. Existing arrangements meet identified need for the PAP.	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. $40 per unit per day.	This option is not adopted as the existing capability meets the need.	No

6.6.2.3 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 Veolia waste storage options provides the resources to store and transport waste, permitting the wastes to be stockpiled and gradually processed within the regional waste handling facilities. Bulk transport to Veolia's licensed waste management facilities would be undertaken via controlled-waste-licensed vehicles and in accordance with Environmental Protection (Controlled Waste) Regulations 2004. 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	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

	time of the event is considered low and existing arrangements provide adequate storage to support the response.				

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
  - None selected
- Improved
  - None selected

6.7 Scientific Monitoring – ALARP Assessment

Alternative, Additional and Improved options have been identified and assessed against the base capability described in **Section 5.7** 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.

6.7.1 Existing Capability – Scientific Monitoring

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/vessel/aircraft/vehicle location and duties, survey or classification society inspection requirements, overflight/port/quarantine permits and inspections, crew/pilot duty and fatigue hours, re-fuelling/re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

6.7.2 Scientific Monitoring – Control Measure Options Analysis

6.7.2.1 Alternative Control Measures

Evaluate 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

Ref	Control Measure Category	Option considered	Implemented	Environmental Consideration	Feasibility / Cost
SM01	System	Analytical laboratory facilities closer to the likely spill affected area	No	SM01 water quality monitoring requires water samples to be transported to National Association of Testing Authorities (NATA) rated laboratories in Perth or interstate. Consider the benefit of laboratory access and transportation times to deliver water samples and complete lab analysis. There is a time lag from collection of water samples to being in receipt of results and confirming hydrocarbon contact to sensitive receptors). The environmental consideration of having access to suitable laboratory facilities in Exmouth or Karratha to carry out the hydrocarbon analysis would provide faster turnaround in reporting of results only by a matter of days (as per the time to transport samples to laboratories).	Laboratory facilities and staff available at locations closer to the spill affected area can reduce reporting times only to a moderate degree (days) with associated high costs of maintaining capability do not improve the environmental benefit.
SM01	System	Dedicated contracted SMP vessel (exclusive to Woodside)	No	Would provide faster mobilisation time of scientific monitoring resources, environmental benefit associated with faster mobilisation time would be minor compared to selected options.	Chartering and equipping additional vessels on standby for scientific monitoring has been considered. The option is reasonably practicable but the sacrifice (charter costs and organisational complexity) is significant, particularly when compared with the anticipated availability of vessels and resources within in the required timeframes. The selected delivery provides capability to meet the scientific monitoring objectives, including collection of pre-emptive data where baseline knowledge gaps are identified for receptor locations where spill predictions of time to contact are >10 days. The effectiveness of this alternative control (weather dependency, availability and survivability) is rated as very low The cost and organisational complexity of employing a dedicated response vessel is considered disproportionate to the potential environmental benefit by adopting these delivery options.

6.7.2.2 Additional Control Measures

Additional Control Measures considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Ref	Control Measure Category	Option considered	Implemented	Environmental Consideration	Feasibility / Cost
SM01	System	Determine baseline data needs and provide implementation plan in the event of an unplanned hydrocarbon release	Yes	Address resourcing needs to collect post spill (pre-contact) baseline data as spill expands in the event of a loss of 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 relies on existing environmental baseline for receptors which have predicted hydrocarbon contact (above environment threshold) <10 days and acquiring pre-emptive data in the event of 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 loss of marine diesel due to vessel collision from the PAP activities.

6.7.2.3 Improved Control Measures

No reasonably practicable improved Control Measures identified

6.7.3 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

6.7.4 Operational Plan

Key actions from the Scientific Monitoring Program Operational Plan for implementing the response are outlined in **Table 6-6**.

Table 6-6: Scientific monitoring program operational plan actions

Responsibility	Action
Activation	
Perth ICC Planning (ICC Planning – Environment Unit)	Mobilise SMP Lead/Manager and SMP Coordinator to the ICC Planning function.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	Constantly assess all outputs from OM01, OM02 and OM03 (Section **Error! Reference source not found.** and **Error! Reference source not found.**) 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.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	SMP co-ordinator stands up the SMP contractor. Stands up subject matter experts, if required.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager SMP Coordinator, SMP standby contractor SMP manager)	Establish if, and where, pre-contact baseline data acquisition is required. Determine practicable baseline acquisition program based on predicted timescales to contact and anticipated SMP mobilisation times. Determine scope for preliminary post-contact surveys during the Response Phase. Determine which SMP activities are required at each location based on the identified receptor sensitivities.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP standby contractor SMP manager)	If response phase data acquisition is required, stand up the contractor SMP teams for data acquisition and instruct them to standby awaiting further details for mobilisation from the ICC.

Responsibility	Action
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP standby contactor SMP manager)	SMP 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.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP standby contactor SMP manager)	Liaise with ICC 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 contactor SMP Manager and ICC 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.
Perth ICC Planning (ICC Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP standby contactor (SMP manager)	Confirm communications procedures between Woodside SMP team, SMP contractor SMP Duty Manager, SMP Team Leads and Operations Coordinator (ICC).
Mobilisation	
Perth ICC Logistics	Engage vessels and vehicles and arrange fitting out as specified by the mobilisation Plan Confirm vessel departure windows and communicate with the SMP contractor SMP Duty Manager. Agree SMP mobilisation timeline and induction procedures with the Operations Coordinator (ICC).
Perth ICC Logistics	Coordinate with SMP contactor SMP Duty Manager to mobilise teams and equipment according to the logistics plan and Sector induction procedures.
SMP Survey Team Leads	SMP Survey Team Leader(s) coordinate on-ground/on-vessel mobilisations and support services with the Operations Coordinator (ICC).

6.7.5 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>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 worse case credible spill scenario (CS-01). The range of SMP 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.</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
- Disturbance to Seabed

Additional impacts and risks associated with the control measures not included within the scope of the EP include:

- Vessel operations and anchoring
- Presence of personnel on the shoreline
- Human presence (manual cleaning)
- Vegetation cutting
- Additional stress or injury caused to wildlife
- Secondary contamination from the management of waste

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		✓	✓		✓	✓	
Shoreline Protection & Deflection	✓	✓	✓		✓	✓	✓
Shoreline Clean-up	✓	✓	✓		✓	✓	✓
Oiled Wildlife					✓	✓	
Scientific Monitoring	✓	✓	✓	✓	✓	✓	✓
Waste Management	✓			✓	✓	✓	✓

7.3 Evaluation of impacts and risks from implementing response techniques

Vessel operations and anchoring

Typical booms used in containment and recovery operations are designed to float, meaning that fauna capable of diving, such as cetaceans, marine turtles and sea snakes can readily avoid contact with the boom. Impacts to species that inhabit the water column such as sharks, rays and fish are not expected. Additionally, some fauna, such as cetaceans, are likely to detect and avoid the spill area, and are not expected to be present in the proximity of containment and recovery operations.

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 may include:

- Damage to vegetation/habitat 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); and
- Excessive removal of substrate causing erosion and instability of localised areas of the shoreline.

Human presence

Human presence for manual clean-up operations may lead to the compaction of sediments and damage to the existing environment especially in sensitive locations such as mangroves and turtle nesting beaches. However, any impacts are expected to be localised with full recovery expected.

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), recovered from containment and recovery and shoreline clean-up operations
- Semi-solids/solids (oily solids), collected during containment and recovery and shoreline clean-up operations
- Debris (e.g. seaweed, sand, woods, plastics), collected during containment and recovery and shoreline clean-up operations and oiled wildlife response.

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.

Cutting back vegetation could allow additional oil to penetrate the substrate and may also lead to localised habitat loss. However, any loss is expected to be localised in nature and lead to an overall net environmental benefit associated with the response by reducing exposure of wildlife to oiling.

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.

7.4 Treatment of impacts and risks from implementing response techniques

In respect of the impacts and risks assessed the following treatment measures have been adopted. It must be recognised that this environmental assessment is seeking to identify how to maintain the level of impact and risks at levels that are ALARP and of an acceptable level rather than exploring further impact and risk reduction. It is for this reason that the treatment measures identified in this assessment will be captured in Operational Plans, Tactical Response Plans, and/or First Strike Response Plans.

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 (Performance Standard (PS) 10.1, 13.1).
- Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines (PS 10.2, 13.2).

Presence of personnel on the shoreline

- Oversight by trained personnel who are aware of the risks (PS 13.6).
- Trained unit leader’s brief personnel of the risks prior to operations (PS 13.7).

Human Presence

- Shoreline access routes with the least environmental impact identified will be selected by a specialist in shoreline contamination assessment techniques (SCAT) operations (PS 13.5).
- Vehicular access will be restricted on dunes, turtle nesting beaches and in mangroves (PS 13.3).

Waste generation

- All shoreline clean-up sites will be zoned and marked before clean-up operations commence (PS 11.5).
- Limiting vegetation removal to only that vegetation that has been moderately or heavily oiled (PS 13.4).

Additional stress or injury caused to wildlife

- Operations conducted with advice from the DBCA Oiled Wildlife Advisor and in accordance with the processes and methodologies described in the WA OWRP and the relevant regional plan (PS 15.3).

8 ALARP CONCLUSION

An analysis of alternative, additional and improved control measures has been undertaken to determine their reasonableness and practicability. The tables in **Section 6** document the considerations made in this evaluation. Where the costs of an alternative, additional, or improved control measure have been determined to be clearly disproportionate to the environmental benefit gained from its adoption it has been rejected. Where this is not considered to be the case the control measure has been adopted.

The risks from a hydrocarbon spill have been reduced to ALARP because:

- Woodside has a significant hydrocarbon spill response capability to respond to the WCCS through the control measures identified.
- New and modified impacts and risks associated with implementing response techniques have been considered and will not increase the risks associated with the activity.
- A consideration of alternative, additional, and improved control measures identified any other control measures that delivered proportionate environmental benefit compared to the cost of adoption for this activity ensuring that:
    - All known, reasonably practicable control measures have been adopted.
    - No additional, reasonably practicable alternative and/or improved control measures would provide further environmental benefit.
    - No reasonably practical additional, alternative, and/or improved control measure exists.
- A structured process for considering alternative, additional, and improved control measures was completed for each control measure.
- The evaluation was undertaken based on the outputs of the WCCS so that the capability in place is sufficient for all other scenario from this activity.
- The likelihood of the WCCS spill has been ignored in evaluating what was reasonably practicable.

9 ACCEPTABILITY CONCLUSION

Following the ALARP evaluation process, Woodside deems the hydrocarbon spill risks and impacts 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).

10 REFERENCES

Astron Environmental Service (2014). Exmouth Islands Turtle Monitoring Program January 2014 Field Survey. Report prepared on behalf of Apache Energy (now Quadrant Energy).

AAM (2012), Exmouth-Carnarvon Satellite Orphophoto from RapidEye, Vol 2, Deliverable to Woodside Energy Ltd, Perth, WA.

AAM (2014), RapidEye satellite images were captured along the coastline of Central/ Northern, Western Australia in between September 2011 to April 2014.

AIMS (2010) Reefs: Ningaloo Reef Biodiversity Expeditions (2008-2010). http://www.aims.gov.au/creefs

AIMS (2014). AIMS 2013 Biodiversity Survey of Glomar Shoal and Rankin Bank. Report

AIMS (2014). AIMS 2013 Biodiversity Survey of Glomar Shoal and Rankin Bank. Report prepared by the Australian Institute of Marine Science for Woodside Energy Ltd. Australian Institute of Marine Science, Townsville. October 2014 Rev 1,153pp.

AIMS (2014). AIMS 2014 Extended Benthic Models and Habitat Maps of Rankin Bank. Report prepared by the Australian Institute of Marine Science for Woodside Energy Ltd. Australian Institute of Marine Science, Townsville. December 2014 Rev 0 (43pp.).

AIMS (2014). Ningaloo and Outer Shark Bay Baseline Survey 2014. AIMS Field Report for Woodside. 21 pp. Co-funded Baseline Surveys (November-December 2014).

AIMS (2017a) Greater Western Flank-2 Environmental Monitoring Field Report: Pre-Drilling Baseline Survey. Report prepared by the Australian Institute of Marine Science for Woodside Energy Ltd. Australian Institute of Marine Science, Townsville. February 2017, 43pp.

AIMS (2017b) Juvenile fish recruitment surveys, Ningaloo Reef, Western Australia (WAMSI Node 3 Project 3.1.2). https://data.gov.au/dataset/juvenile-fish-recruitment-surveys-ningaloo-reef-western-australia-wamsi-node-3-project-3-1-2

Allen, A. and D. Dale. 1996. Computerized Mission Planners: Useful tools for the planning and implementation of oil spill response operations. Proceedings, “Prevention is the Key: A Symposium on Oil Spill Prevention and Readiness,” Valdez, AK, Oct. 8–11, 1996, 24 pp.

ANZECC / ARMCANZ 2000. Australian and New Zealand guidelines for fresh and marine water quality. Volume 1, The guidelines / Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.

APASA 2013. Xena Vessel Collision – Spill Modelling Results. Memorandum to Woodside Energy Ltd.

Australian Maritime Safety Authority. The National Plan Oil Spill Control Agents List. Available from: https://www.amsa.gov.au/environment/maritime-environmental-emergencies/national-plan/General-Information/control-agents/list/index.asp [Accessed 23 June 2014]

Australian Maritime Safety Authority (AMSA). 2015a. Automated Identification System Point Density Data. Australian Government, Canberra, Australian Capital Territory. Available at: https://www.operations.amsa.gov.au/Spatial/DataServices/MapProduct (accessed 08/10/2015).

Australasian Fire and Emergency Service Authorities Council, 2011, Fundamentals of Doctrine: A best practice guide, East Melbourne, VIC, AFAC Limited.

AMOSC/DPAW (2014). Inter-Company Oil Spill Wildlife Response Plan – Pilbara region. pp. 272 http://www.dpaw.wa.gov.au/images/documents/conservation-management/marine/wildlife/PROWRP_20141103.pdf

Bancroft, K.P. (2009). Establishing long-term coral community monitoring sites in the Montebello/
Barrow Islands marine protected areas: data collected in December 2006. Marine Sci ence Program Data Report Series MSPDR4. January 2009. Marine Science Program, Science Division, Department of Environment and Conservation, Perth, Western Australia. 68p.

Bamford M.J. (2004). Gorgon Development on Barrow Island. Technical Report: Avifauna

Bamford and Moro (2011). Barrow Island as an important bird area for migratory waders in the East Asian – Australasian Flyway. Stilt 60: 46–55

Brandvik, PJ, Johansen, Ø, Farooq, O, Angell, G. and Leirvik, F. (2014). Subsurface oil releases – Experimental study of droplet distributions and different dispersant injection techniques. A scaled experimental approach using the SINTEF Tower basin. SINTEF report no. A26122. Norway.

Brown M, 2012, Implementing an Operational Capability System within Fire & Rescue NSW, Australasian Fire and Emergency Service Authorities Council Conference Paper, September 2012.

BirdLife Australia (2017) Shorebirds 2020 programme – Data Extraction (1993-2017). http://www.birdlife.org.au/projects/shorebirds-2020

BSEE. 2016. https://www.bsee.gov/site-page/worst-case-discharge-scenarios-for-oil-and-gas-offshore-facilities-and-oil-spill-response

BSEE. 2016. https://www.bsee.gov/what-we-do/oil-spill-preparedness/response-system-planning-calculators

Cassata, L. and L.B. Collins (2008). Coral reef communities, habitats and substrates in and near Sanctuary Zones of Ningaloo Marine Park. Journal of Coastal Research Vol. 24 (1): 139-51.

Chevron Australia (2010). Gorgon Gas Development and Jansz Feed Gas Pipeline: Coastal and Marine Baseline State and Environmental Impact Report: Domestic Gas Pipeline. Document Number: G1-NT-REPX0002750 http://www.chevronaustralia.com/Libraries/Chevron_Documents/Gorgon_Project_Coastal_and_Marine_Baseline_State_and_Environmental_Impact_Report_Domestic_Gas_Pipeline.pdf.sflb.ashx

Chevron Australia (2011). Gorgon Gas Development and Jansz Feed Gas Pipeline: Dredging and spoil disposal Management and Monitoring Plan, Document number: G1-NT-PLNX0000373. Pp. 255. https://www.chevronaustralia.com/docs/default-source/default-document-library/gorgon-emp-dredging-and-spoil-disposal-plan.pdf?sfvrsn=2

Chevron Australia (2014). Gorgon Gas Development and Jansz Feed Gas Pipeline: Post-Development Coastal and Marine State and Environment Impact Survey Report, Year 2:2012-2013. Document number G1-NT-REPX0005152. Pp. 362 https://www.chevronaustralia.com/docs/default-source/default-document-library/gorgon-emp-post-development-coastal-and-marine-state-and-environmental-impact-survey.pdf?sfvrsn=4

Colquhoun J and Heyward A. (eds) (2008). WAMSI Node 3 Project 1 Subproject 3.1.1 Deepwater Communities at Ningaloo Marine Park: Ningaloo Reef Marine Park Deepwater Benthic Biodiversity Survey Annual Report 2007. 209 pp. http://www.wamsi.org.au/sites/default/files/Node%203.1.1%20Ningaloo%20Reef%20Marine%20Park.pdf

CSIRO (2017) Environmental drivers shaping the Ningaloo shallow water fish communities. Presentation from Ningaloo Outlook Symposium 2017. https://research.csiro.au/ningaloo/research-outputs/

CSIRO (2017) Shallow Reefs. Presentation from Ningaloo Outlook Symposium 2017. https://research.csiro.au/ningaloo/research-outputs/

CSIRO (2017) Deep Reefs. Presentation from Ningaloo Outlook Symposium 2017. https://research.csiro.au/ningaloo/research-outputs/Depczynski M, Heyward A, Wilson S, Holmes T, Case M, Colquhoun J, O'Leary RA, Radford B (2011). Methods of monitoring the health of benthic communities at Ningaloo – Coral & Fish recruitment. WAMSI Node 3 Project 3.1.2. Final Report to the Western Australian Marine Science Institution, Perth. 101 pp. http://www.wamsi.org.au/research-ningaloo/node-3-reports

Edwards v National Coal Board, 1949. 1 All ER 743 CA

European Maritime Safety Agency (EMSA), 2012. Manual on the Applicability of Oil Spill Dispersants, Version 2, p.57.

Fingas, M. 2001. The Basics of Oil Spill Clean-up. Second Edition. Lewis Publishers, CRC Press LLC, Boca Raton, Florida. 233 p.

Fingas, M. 2011a. Physical Spill Countermeasures. Oil Spill Science and Technology: Prevention, Response, and Clean-up, edited by M. Fingas. Elsevier, Inc.

Fingas, M. 2011b. Weather Effects on Oil Spill Countermeasures. Oil Spill Science and Technology: Prevention, Response, and Clean-up, edited by M. Fingas. Elsevier, Inc.

Fitzpatrick B.M., Harvey E.S., Heyward A.J., Twiggs E.J. and Colquhoun J. (2012). Habitat Specialization in Tropical Continental Shelf Demersal Fish Assemblages. PLoS ONE 7(6): e39634. doi:10.1371/journal.pone.0039634 http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0039634

French-McCay, D.P. 2003. Development and application of damage assessment modeling: Example assessment for the North Cape oil spill. Mar. Pollut. Bull. 47(9-12), 341-359.

French-McCay, D.P. 2004. Oil spill impact modeling: development and validation. Environ. Toxicol. Chem. 23(10), 2441-2456.

French, D., Reed, M., Jayko, K., Feng, S., Rines, H., Pavignano, S.1996. The CERCLA Type A Natural Resource Damage Assessment Model for Coastal and Marine Environments (NRDAM/CME), Technical Documentation, Vol. I - Model Description, Final Report. Office of Environmental Policy and Compliance, U.S. Department of the Interior. Washington, D.C.: Contract No. 14-0001-91-C-11

French, D.P., H. Rines and P. Masciangioli. 1997. Validation of an Orimulsion spill fates model using observations from field test spills. In: Proceedings of the 20th AMOP Technical Seminar, Environment and Climate Change Canada, Ottawa, ON, Canada, 20, 933-961.

French, D.P. and H. Rines. 1997. Validation and use of spill impact modeling for impact assessment. International Oil Spill Conference Proceedings, Vol. 1997, No. 1, pp. 829-834. [https://doi.org/10.7901/2169-3358-1997-1-829]

French-McCay, D.P. and J.J. Rowe. 2004. Evaluation of bird impacts in historical oil spill cases using the SIMAP oil spill model. In Proceedings of the 27th AMOP Technical Seminar, Environment and Climate Change Canada, Ottawa, ON, Canada, 27, 421-452.

French-McCay, D.P, C. Mueller, K. Jayko, B. Longval, M. Schroeder, J.R. Payne, E. Terrill, M. Carter, M. Otero, S. Y. Kim, W. Nordhausen, M. Lampinen, and C. Ohlmann, 2007. Evaluation of Field-Collected Data Measuring Fluorescein Dye Movements and Dispersion for Dispersed Oil Transport Modeling. In: Proceedings of the 30th Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, Emergencies Science Division, Environment Canada, Ottawa, ON, Canada, pp.713-754.

French McCay, D.P, K. Jayko, Z. Li, M. Horn, Y. Kim, T. Isaji, D. Crowley, M. Spaulding, L. Decker, C. Turner, S. Zamorski, J. Fontenault, R. Shmookler, and J.J. Rowe. 2015. Technical Reports for Deepwater Horizon Water Column Injury Assessment – WC_TR14: Modeling Oil Fate and Exposure Concentrations in the Deepwater Plume and Cone of Rising Oil Resulting from the Deepwater Horizon Oil Spill. DWH NRDA Water Column Technical Working Group Report. Prepared for National Oceanic and Atmospheric Administration by RPS ASA, South Kingstown, RI, USA. September 29, 2015. Administrative Record no. DWH-AR0285776.pdf [https://www.doi.gov/deepwaterhorizon/adminrecord]

French-McCay, D.P, Z. Li, M. Horn, D. Crowley, M. Spaulding, D. Mendelsohn, and C. Turner. 2016. Modeling oil fate and subsurface exposure concentrations from the Deepwater Horizon oil spill. In: Proceedings of the 39th AMOP Technical Seminar, Environment and Climate Change Canada, Ottawa, ON, Canada, 39, 115-150.

Hutchins, J.B. (2004). Fishes of the Dampier Archipelago, Western Australia. Records of the Western Australian Museum Supplement No. 66: 343-398.

IOGP International Association of Oil and Gas Producers, 2016. Environmental fates and effects of ocean discharge of drill cuttings and associated drilling fluids from offshore oil and gas operations (Report No. 543). International Association of Oil and Gas Producers, London.

IPIECA, 2015, Dispersants: surface application, IOGP Report 532, p.43.

ITOPF, 2011. Fate of Marine Oil Spills, Technical Information Paper #2.

ITOPF, 2014, Use of Dispersants to Treat Oil Spills, Technical Information Paper #4, p. 7.

ITOPF, 2014, Aerial Observation of marine oil spills, Technical Information Paper #1, p. 5

ITOPF, 2014, Use of skimmers in oil pollution response, Technical Information Paper #5, p. 9

Johnstone R.E, Burbidge A. H, Darnell J.C. (2013). Birds of the Pilbara Region, including seas and offshore islands, Western Australia: distribution, status and historical changes. Records of the Western Australian Museum, Supplement 78: 343-441. http://museum.wa.gov.au/sites/default/files/WAM_Supp78(B)_JOHNSTONEetal%20pp343-441_0.pdf

Joint Carnarvon Basin Operators (2012), 'Draft Joint Carnarvon Basin Operators North West Cape Sensitivity Mapping, Part A', Apache Energy Ltd, Woodside Energy Ltd, BHP Billiton and the Australian Marine Oil Spill Centre Pty Ltd (AMOSC).388 pp.Kobryn, H.T., Wouters, K.,

Keulen, M. Vand Langdon, M.W. (2011) Ningaloo Collaboration Cluster: Biodiversity and ecology of the Ningaloo Reef lagoon. Final Report No. 1c.

http://www.ningaloo.org.au/www/en/NingalooResearchProgram/Publications/Cluster-finalreports.html

Kobryn, H.T., Wouters, K., Beckley, L.E. and T. Heege (2013). Ningaloo Reef: Shallow marine habitats mapped using a Hyperspectral sensor. PLoS ONE 8(7): e70105. doi:10.1371/journal.pone.0070105. http://dx.plos.org/10.1371/journal.pone.0070105

Markovina, K. (2015), 'Ningaloo Turtle Program Annual Report 2014-2015'. Department of Parks and Wildlife and the Ningaloo Turtle Program, Exmouth, Western Australia.

Markovina, K. (2016), 'Ningaloo Turtle Program Annual Report 2015-2016'. Department of Parks and Wildlife and the Ningaloo Turtle Program, Exmouth, Western Australia.

McLean, D. and Langlois, T. (2017) Fish and shark communities of the Pilbara: informing conservation and fisheries management. Proceedings from the Pilbara Marine Conservation Partnership Symposium 2016

National Oceanic and Atmospheric Administration (NOAA) Characteristics of Response Strategies: A Guide for Spill Response Planning in Marine Environments, 2013, p.19 and p24.

National Offshore Petroleum Safety and Environmental Management Authority. 2012. Environment Plan Assessment Policy, N-04700-PL0930, Perth, WA.

National Offshore Petroleum Safety and Environmental Management Authority. 2012. Environment Plan Preparation Guidance Note, N-04700-GL0931, Perth, WA

National Offshore Petroleum Safety and Environmental Management Authority. 2012. Control Measures and Performance Standards, Guidance Note N04300-N0271, Perth, WA.

National Offshore Petroleum Safety and Environmental Management Authority. 2012. Oil Spill Contingency Planning, Guidance Note N-04700-GN0940, Perth, WA.

National Offshore Petroleum Safety and Environmental Management Authority. 2012. ALARP, Guidance Note N-04300-GN0166, Perth, WA.

National Offshore Petroleum Safety and Environmental Management Authority. 2016. ALARP, Guidance Note N-04750-GL1687 (DRAFT), Perth, WA.

Payne, J.R., E. Terrill, M. Carter, M. Otero, W. Middleton, A. Chen, D. French-McCay, C. Mueller, K. Jayko, W. Nordhausen, R. Lewis, M. Lampinen, T. Evans, C. Ohlmann, G.L. Via, H. Ruiz-Santana, M. Maly, B. Willoughby, C. Varela, P. Lynch and P. Sanchez, 2007a. Evaluation of Field-Collected Drifter and Subsurface Fluorescein Dye Concentration Data and Comparisons to High Frequency Radar Surface Current Mapping Data for Dispersed Oil Transport Modeling. In: Proceedings of the Thirtieth Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, Emergencies Science Division, Environment Canada, Ottawa, ON, pp. 681-711.

Payne, J.R., D. French-McCay, C. Mueller, K. Jayko, B. Longval, M. Schroeder, E. Terrill, M. Carter, M. Otero, S.Y. Kim, W. Middleton, A. Chen, W. Nordhausen, R. Lewis, M. Lampinen, T. Evans, and C. Ohlmann, 2007b. Evaluation of Field-Collected Drifter and In Situ Fluorescence Data Measuring Subsurface Dye Plume Advection/Dispersion and Comparisons to High Frequency Radar-Observation System Data for Dispersed Oil Transport Modeling, Draft Final Report 06-084, Coastal Response Research Center, NOAA/University of New Hampshire, Durham, NH, 98 p. plus 8 appendices. Available at http://www.crrc.unh.edu/

Pendoley Environment (2005). Proposed Gorgon Development: Sea turtle Monitoring program results November 2004 to February 2005. Report for Chevron Australia.

Pendoley Environmental (2006). Pluto LNG Development Holden Beach Sea Turtle Habitat Use Survey(Conducted 3 January 2006). Report Prepared for Woodside Energy Limited.

Pendoley, K. (2009). Marine Turtle beach Survey. Onslow Mainland Area and Nearby Islands. Report to URS for the Chevron Wheatstone Project Team, 91 pp. https://www.chevronaustralia.com/Files/PDF/Wheatstone%20Draft%20EIS_ERMP%20Technical%20Appendices%20O8%20to%20O12%20and.pdf

Pitcher, C.R., Miller, M., Morello, E., Fry, G., Strzelecki, J., McLeod, I., Slawinski, D., Ellis, N., Thomson, D., Bearham, D., Keesing, J., Donovan, A., Mortimer, N. Babcock, R., Fromont, J, Gomez, O., Hosie, A., Hara, A., Moore, G., Morrison, S., Kirkendale, L., Whisson, C., Richards, Z., Bryce, M., Marsh, L., Naughton, K., O'Loughlin, M., O'Hara, T., Boddington, D., Huisman, J. (2016) Environmental Pressures: Regional Biodiversity — Pilbara Seabed Biodiversity Mapping and Characterisation. Final report, CSIRO Oceans and Atmosphere, Published Brisbane, March 2016, 62 pages

Quadrant Energy - Seabird Monitoring - Lowendal, Airlie, Serrurier islands - 1994 to present. Industry-Government Environmental Meta-database (IGEM). UUID: bdd428fe-cf24-4596-a822-cd578695ee16. Accessed June 2017

RPS 2019. WEL Seismic Survey Quantitative Spill Risk Assessment Report. Report prepared for Woodside Energy Ltd.

RPS-Bowman Bishaw Gorham (2005). Gorgon Development on Barrow Island, Technical Report, Marine Benthic Habitats. Prepared for Chevron Australia. https://www.chevronaustralia.com/docs/default-source/default-document-library/c8_marine_benthic_habitats.pdf?sfvrsn=0

Spaulding, M.S., D. Mendelsohn, D. Crowley, Z. Li, and A. Bird, 2015. Draft Technical Reports for Deepwater Horizon Water Column Injury Assessment: WC_TR.13: Application of OILMAP DEEP to the Deepwater Horizon Blowout. DWH NRDA Water Column Technical Working Group Report. Prepared for National Oceanic and Atmospheric Administration by RPS ASA, South Kingstown, RI 02879. Administrative Record no. DWH-AR0285366.pdf [https://www.doi.gov/deepwaterhorizon/adminrecord]

Spence, A, McTaggart, A (2018) Defining response capability: effectiveness, limitations and determining ALARP. Interspill Conference, London 2018.

Stevens, J.D., Last, P.R., White, W.T., McAuley, R.B., Meekan, M.G. (2009) Diversity, abundance and habitat utilisation of sharks and rays. CSIRO Marine and Atmospheric Research. Final report to Western Australian Marine Science Institute

Surman CA and Nicholson LW (2015). Exmouth Sub basin Marine Avifauna Monitoring Program: Final Report. Unpublished report prepared for Apache Energy Ltd. by Halfmoon Biosciences. 188 pp.

Surman CA and Nicholson LW (2012) Monitoring of annual variation in seabird breeding colonies throughout the Lowendal Group of islands: 2012 Annual Report. Unpublished report prepared for Apache Energy Ltd. by Halfmoon Biosciences.

Watson, D.L., Harvey, E.S., Fitzpatrick, B.M. et al. Mar Biology (2010) Assessing reef fish assemblage structure: how do different stereo-video techniques compare? Vol 157 (6): pp 1237-1250. https://doi.org/10.1007/s00227-010-1404-x

Wadsworth, T, 1995, *Containment and Recovery of Oil Spills at Sea. Methods and limitations*, ITOPF, London, United Kingdom.

11 GLOSSARY AND 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.
Major Environment Event	The events with potential environment, reputation, social or cultural consequences of category C or higher (as per Woodside's operational risk matrix) which are evaluated against credible worst-case scenarios which may occur when all controls are absent or have failed.
Performance outcome	A statement of the overall goal or outcome to be achieved by a control measure
Performance standard	The parameters against which [risk] controls are assessed to ensure they reduce risk to ALARP. 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 (World Heritage Area, WHA, Commonwealth or State marine reserve or park) containing one or more receptor type.

Term	Description / Definition
Receptor Sensitivities	This is a classification scheme to categorise receptor sensitivity to an oil spill. The Environmental Sensitivity Index (ESI) is a numerical classification of the relative sensitivity of a particular environment (particularly different shoreline types) to an oil spill. Refer to the Woodside Oil Pollution Emergency Arrangements (Australia) for more details.
Regulator	NOPSEMA are the Environment Regulator under the Environment Regulations.
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. These are defined as: surface hydrocarbon concentration – ≥10 g/m^2, dissolved – ≥50 ppb and entrained hydrocarbon concentrations – ≥100 ppb.
Zone of Application (ZoA)	The zone in which Woodside may elect to apply dispersant. The zone is determined based on a range of considerations, such as hydrocarbon characteristics, weathering and metocean conditions. The zone is a key consideration in the Net Environmental Benefit Analysis for dispersant use.

11.2 Abbreviations

Abbreviation	Meaning
AHV	Anchor Handler Vessel
AIIMS	Australasian Inter-Service Incident Management System
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
API	American Petroleum Institute
APPEA	Australian Petroleum Production & Exploration Association
AUV	Autonomous Underwater Vehicle
BAOAC	Bonn Agreement Oil Appearance Code
BOP	Blowout Preventer
BOPE	Blowout Preventer Equipment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	Condition Factor
CFD	Computational Fluid Dynamic
CICC	Corporate Incident Coordination Centre
CMT	Crisis Management Team
COP	Common Operating Picture
CS	Credible Scenario
DBCA	Department of Biodiversity, Conservation and Attractions (former Department of Parks and Wildlife)
DM	Duty Manager
DNA	Deoxyribonucleic Acid
DoT	Department of Transport
DP	Dynamically Positioned
EMBA	Environment that May Be Affected
EMSA	European Maritime Safety Agency
EP	Environment Plan
EPBC	Environment Protection and Biodiversity Conservation
EROD	ethoxyresorufin-O-deethylase
ESI	Environmental Sensitivity Index
ESD	Environmentally Sustainable Development
ESP	Environmental Services Panel
FSP	First Strike Plan
FST	Functional Support Team
GIS	Geographic Information System
GSI	Gonadosomatic Index
HSE	Health Safety and Environment

Abbreviation	Meaning
HSEQ	Health Safety Environment and Quality
HSP	Hydrocarbon Spill Preparedness
IAP	Incident Action Plan
IC	Incident Controller
ICC	Incident Coordination Centre
ICE	Internal Control Environment
ID	Identification
IGEM	Industry-Government Environmental Meta-database
IMIS	Incident Management Information System
IMS	Incident Management System
IMO	International Maritime Organisation
IMT	Incident Management Team
IPIECA	International Petroleum Industry Environment Conservation Association
IR	Infrared
ISV	Infield Support Vessels
ITOPF	International Tanker Owners Pollution Federation
IUCN	International Union for Conservation of Nature
KBSB	King Bay Support Base
KGP	Karratha Gas Plant
LEL	Lower Explosive Limit
LSI	Liver Somatic Index
MARPOL	International Convention for the Prevention of Pollution from Ships
MoU	Memorandum of Understanding
MSRC	Marine Spill Response Corporation
NATA	National Association of Testing Authorities
NEBA	Net Environmental Benefit Analysis
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NRDA	Natural Resource Damage Assessment
NWBM	Non-Water Based Muds
OIE	Offset Installation Equipment
OILMAP	Oil Spill Model and Response System
OM	Operational Monitoring
OMP	Operational Monitoring Program
OPEA	Oil Pollution Emergency Arrangements
OPEP	Oil Pollution Emergency Plan
OPGGS	Offshore Petroleum and Greenhouse Gas Storage
OSPRMA	Oil Spill Preparedness and Response Mitigation Assessment

Abbreviation	Meaning
OSRL	Oil Spill Response Limited
OSRO	Oil Spill Response Organisation
OSTM	Oil Spill Trajectory Modelling
OWR	Oiled Wildlife Response
OWRP	Oiled Wildlife Response Plan
OWROP	Oiled Wildlife Response Operational Plan
QA/QC	Quality Assurance/Quality Control
PAH	Polyaromatic Hydrocarbon
PAP	Petroleum Activities Program
PBA	Pre-emptive Baseline Areas
PPB	Parts per billion
PS	Performance Standard
ROV	Remotely Operated Vehicle(s)
RPA	Response Protection Area
S&EM	Security and Emergency Management
SCAT	Shoreline Contamination Assessment Techniques
SCERP	Source Control Emergency Response Plan
SDA	Surface Dispersant Application
SDH	Sorbitol Dehydrogenase
SFRT	Subsea First Response Toolkit
SIMAP	Spill Impact Mapping and Analysis Program
SIMOPS	Simultaneous Operations
SM	Scientific Monitoring
SME	Subject Matter Expert
SMP	Scientific Monitoring Program
SOPEP	Ship Oil Pollution Emergency Plan
SQGV	Sediment Quality Guideline Values
SSDI	Subsea Dispersant Injection
TOA	Testing of Arrangements
TRP	Tactical Response Plan
TRSV	Tubing Retrievable Safety Valve
TSS	Total Suspended Solids
UV	Ultraviolet
WA DoT	Western Australia Department of Transport
WBM	Water Based Muds
WCCS	Worst-case Credible Scenario
WHA	World Heritage Area
WMS	Woodside Management System

Abbreviation	Meaning
WiRCs	Woodside Integrated Risk & Compliance System
Woodside	Woodside Energy Limited
WWCI	Wild Well Control Inc
ZoA	Zone of Application

ANNEX A: NET ENVIRONMENTAL BENEFIT ANALYSIS DETAILED OUTCOMES

A NEBA has 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 surface hydrocarbon release due to a support vessel tank rupture of marine diesel (CS-01). 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 include RPAs of the PAP identified from stochastic modelling (see **Section 3** for outline of selection).

These include receptors which have potential for the following impact thresholds and are shown in the tables below:

- Surface contact (>50 g/m^2)
- Shoreline accumulation (>100g/m^2) at any time
- Entrained contact prior to day 14 (>100 ppb)

The full NEBA assessment outcomes are available via this Link

Table A-1: NEBA assessment technique recommendations for surface hydrocarbon release due to a support vessel tank rupture of marine diesel (Credible Scenario-01)

Receptor	Monitor and Evaluate	Containment and Recovery	Dispersant application: sub-sea	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled Wildlife Response	In situ burning	Mechanical dispersion	Source Control
Open Ocean - Commonwealth Waters (Operational Area)	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes
Gascoyne AMP	Yes	No	No	No	No	No	No	No	Yes	No	No	No
Ningaloo Coast North	Yes	No	No	No	Yes	Potentially	No	No	Yes	No	No	No
Ningaloo Coast North WHA	Yes	No	No	No	Yes	Potentially	No	No	Yes	No	No	No
Ningaloo Coast Middle (Incl. WHA)	Yes	No	No	No	Yes	Potentially	No	No	Yes	No	No	No
Ningaloo AMP (RUZ)	Yes	No	No	No	No	No	No	No	Yes	No	No	No
Muiron Islands (Incl. MMA-WHA)	Yes	No	No	No	Yes	Potentially	No	No	Yes	No	No	No
Carnarvon Canyon AMP	Yes	No	No	No	No	No	No	No	Potentially	No	No	No

Overall assessment

Receptor	Monitor and Evaluate	Containment and Recovery	Dispersant application: sub-sea	Dispersant application: > 20 m water depth and > 10 km from shore/reefs	Shoreline protection	Shoreline clean-up (manual)	Shoreline clean-up (mechanical)	Shoreline clean-up (chemical)	Oiled Wildlife Response	In situ burning	Mechanical dispersion	Source Control
Is this response Practicable?	Yes	No	No	No	Yes	Potentially	No	No	Yes	No	No	Yes
NEBA identifies Response potentially of Net Environmental Benefit?	Yes	No	No	No	Yes	Potentially	No	No	Yes	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[10]	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.	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))

[10] 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 • 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 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	Objectives	Activation triggers	Termination criteria
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 (2000) trigger values for 99% species protection.
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.	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 fauna and habitats contacted by hydrocarbons at sensitive habitat and shoreline locations. The primary objectives of OM05 are: • Record evidence of oiled fauna (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 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 fauna 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 Incident Control Centre (ICC) 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 standby SMP 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 standby SMP 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 (Perth)	• Approves activated the SMPs based on operational monitoring data provided by the Planning Function • Provides advice to the ICC 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 (Perth)	• Activates the SMPs based on operational monitoring data provided by the Planning Function • Sits in the Planning function of the ICC. • Liaises with other ICC 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 Chief Environmental Scientist 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.

Role	Location	Responsibility
Environmental Service Provider Roles		
SMP Standby Contractor – SMP Duty Manager/Project Manager (SMP Liaison Officer)	Onshore (Perth)	• 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).

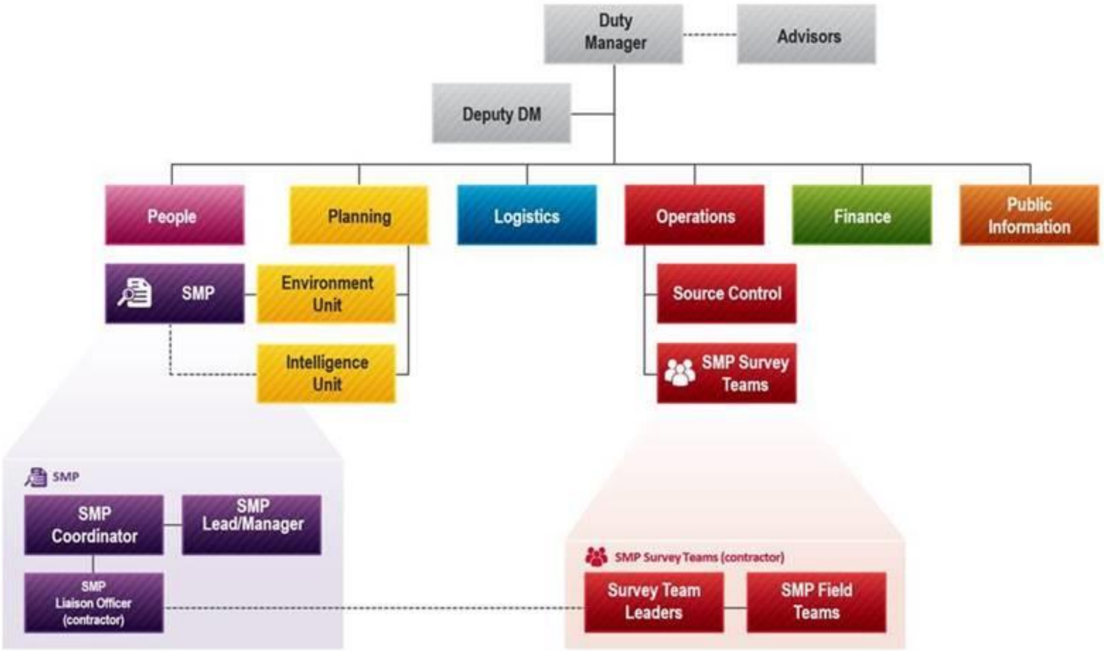


Figure C-1: Woodside Oil Spill Scientific Monitoring Program Delivery Team and Linkage to Incident Control Centre (ICC) organisational structure

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[11]) 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[12]) 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. • 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.

[11] NOPSEMA (2019) Bulletin #1 – Oil spill modelling – April 2019, https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf
[12] 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/m^2 surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m^2 for shoreline accumulation) for mangrove/saltmarsh habitat.	
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/m^2 surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m^2 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/m^2 surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m^2 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/m^2 surface, ≥5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m^2 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. The desk-based assessment will include population analysis to infer potential impacts to marine megafauna species populations.	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 9 (SM09)	The objectives of SM09 are: • Characterise the status of resident fish populations associated with habitats monitored in SM03 exposed/contacted by spilled hydrocarbons;	SM09 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the	SM09 will be undertaken and terminated concurrent with monitoring undertaken for SM03, as per the SMP termination criteria process

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
Assessment of Impacts and Recovery of Marine Fish associated with SM03 habitats	• 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).	potential to contact sensitive environmental receptors and implemented with SMO3.	• 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 ($\geq$0.5 g/m² surface and $\geq$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 First Strike Plan (FSP) for the petroleum activity programme. 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), AMPs, 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) 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 which SMPs are activated, and the 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, AMPs 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 guidelines. 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), AMPs, 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).

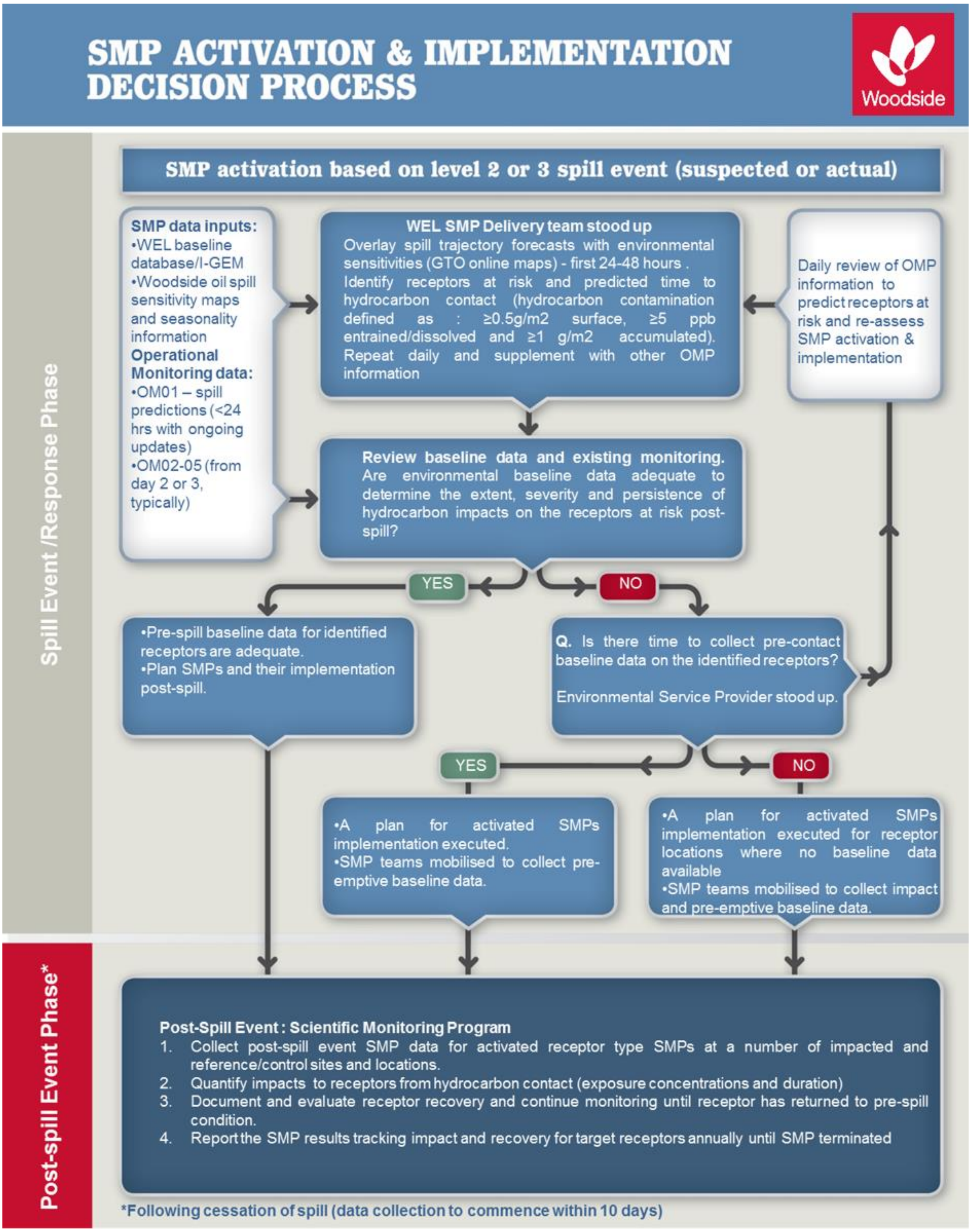


Figure C-2: Activation and Implementation Decision-tree for Oil Spill Environmental Monitoring

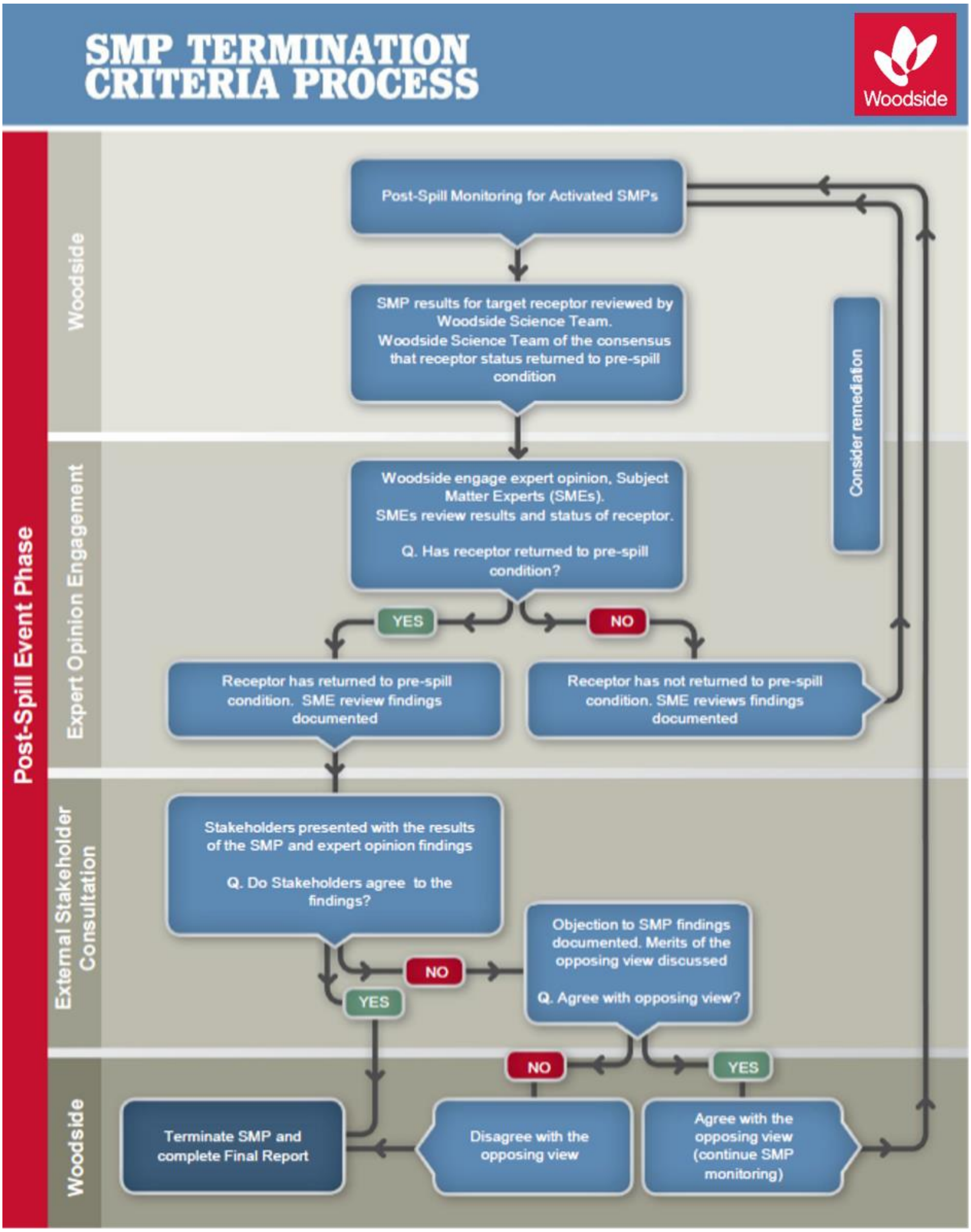


Figure C-3: Termination Criteria Decision-tree for Oil Spill Environmental Monitoring

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 the contracted SMP standby, 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)[13] in 2020. The Index of Marine Surveys for Assessments (IMSA) is an online portal to information about marine-based environmental surveys in Western Australia. IMSA is a project of the Department of Water and Environmental Regulation 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, 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.

[13] 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 the worse case credible spill scenario (CS-01) EMBA for Enfield Subsea Infrastructure Decommissioning (WA-28-L)

Receptors to be Monitored	Applicable SMP	Kimberley AMP	Agro-Rowley Terrace AMP	Montebello AMP	Dampier AMP	Carnarvon 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
		Receptor Areas - Potential Impact and Reference Scientific Monitoring Sites (marked X)																																							
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

	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)
	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)
	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 (<10 days to predicted hydrocarbon contact) for the Petroleum Activities Program: Enfield Subsea Infrastructure Decommissioning (WA-28-L)

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands
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. **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. LTM transects, diver based (video) photo quadrat. **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 - Kobryn et al 2011 and Keulen & Langdon 2011.
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). **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. **References and Data:** 1. Cassata and Collins 2008. DATAHOLDER: Curtin University – Applied Geology. 2. CSIRO – Ningaloo Outlook Program 3. Murdoch University - Kobryn et al 2011 and Keulen and Langdon 2011. 4. AIMS (2010) - http://www.aims.gov.au/creefs
Benthic Habitat (Deeper Water Filter Feeders)	**SM03**	**Studies:** 1. WAMSI 2007 deep-water Ningaloo benthic communities' study, Colquhoun and Heyward (2008). 2. CSIRO/BHP Ningaloo Outlook Program - Deep reef themes 2020

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands
	Quantitative assessment using image capture using towed video. Post analysis into broad groups based on taxonomy and morphology.	**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. **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 **Methods:** 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:**

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands
		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
		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** Baited Remote Underwater Video Stations (BRUVS), Visual Underwater Counts (VUC), Diver Operated Video (DOV).	**Studies:**
		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
		Methods:

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Ningaloo Coast and the Muiron Islands
		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
		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.

REFERENCES

Astron Environmental Service (2014). Exmouth Islands Turtle Monitoring Program January 2014 Field Survey. Report prepared on behalf of Apache Energy/Quadrant Energy (now Santos).

AAM (2014), RapidEye satellite images were captured along the coastline of Central/ Northern, Western Australia in between September 2011 to April 2014.

AIMS (2010) Reefs: Ningaloo Reef Biodiversity Expeditions (2008-2010). http://www.aims.gov.au/creefs

AIMS (2015). Ningaloo and Outer Shark Bay Baseline Survey 2014. AIMS Field Report for Woodside. 21 pp. Co-funded Baseline Surveys (November-December 2014).

AIMS (2017) Juvenile fish recruitment surveys, Ningaloo Reef, Western Australia (WAMSI Node 3 Project 3.1.2). https://data.gov.au/dataset/juvenile-fish-recruitment-surveys-ningaloo-reef-western-australia-wamsi-node-3-project-3-1-2

AMOSC/DPAW (2014). Inter-Company Oil Spill Wildlife Response Plan – Pilbara region. pp. 272 http://www.dpaw.wa.gov.au/images/documents/conservation-management/marine/wildlife/PROWRP_20141103.pdf

Babcock R, Donovan A, Collin S and Ochieng-Erftemeijer C (2017). Pilbara Marine Conservation Partnership – Final Report – Volume 2 (Part III: Coral Reef Health). CSIRO Oceans & Atmosphere, Published Brisbane. https://research.csiro.au/pmcp/pmcp-publications/

BirdLife Australia (2018) Seabird and Shorebird Baseline Studies, Ningaloo Region – Report on January 2018 bird surveys. Interim Report for Woodside Energy Ltd.

BirdLife Australia (2017) Shorebirds 2020 programme – Data Extraction (1993-2017). http://www.birdlife.org.au/projects/shorebirds-2020

Cannell B, Hamilton S and Driessen (2019). Wedge-tailed Shearwater foraging behaviour in the Exmouth Region. Final Report. Report prepared for Woodside Energy Limited. The University of Western Australia and BirdLife, pp.36.

Cassata, L. and L.B. Collins (2008). Coral reef communities, habitats and substrates in and near Sanctuary Zones of Ningaloo Marine Park. Journal of Coastal Research Vol. 24 (1): 139-51.

Colquhoun J and Heyward A. (eds) (2008). WAMSI Node 3 Project 1 Subproject 3.1.1 Deepwater Communities at Ningaloo Marine Park: Ningaloo Reef Marine Park Deepwater Benthic Biodiversity Survey Annual Report 2007. 209 pp. http://www.wamsi.org.au/sites/default/files/Node%203.1.1%20Ningaloo%20Reef%20Marine%20Park.pdf

CSIRO (2020). Highlights Report – Ningaloo Outlook Program. https://research.csiro.au/ningaloo/outlook/shallow-reefs/shallow-reefs-research-2015-2020/

Depczynski M, Heyward A, Wilson S, Holmes T, Case M, Colquhoun J, O'Leary RA, Radford B (2011). Methods of monitoring the health of benthic communities at Ningaloo – Coral & Fish recruitment. WAMSI Node 3 Project 3.1.2. Final Report to the Western Australian Marine Science Institution, Perth. 101 pp. http://www.wamsi.org.au/research-ningaloo/node-3-reports

EOMAP. (2017). Atmospheric correction and land cover classification, NW Cape. Report prepared for Woodside Energy Ltd.

Fitzpatrick B.M., Harvey E.S., Heyward A.J., Twiggs E.J. and Colquhoun J. (2012). Habitat Specialization in Tropical Continental Shelf Demersal Fish Assemblages. PLoS ONE 7(6): e39634. doi:10.1371/journal.pone.0039634 http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0039634

Johnstone R.E, Burbidge A. H, Darnell J.C. (2013). Birds of the Pilbara Region, including seas and offshore islands, Western Australia: distribution, status and historical changes. Records of the Western Australian Museum, Supplement 78: 343-441. http://museum.wa.gov.au/sites/default/files/WAM_Supp78(B)_JOHNSTONEetal%20pp343-441_0.pdf

Joint Carnarvon Basin Operators (2012). Draft Joint Carnarvon Basin Operators North West Cape Sensitivity Mapping. Part A. (Apache Energy Ltd, Woodside Energy Ltd, BHP Billiton and the Australian Marine Oil Spill Centre Pty Ltd (AMOSC).

Keulen, M. Vand Langdon, M.W. (2011) Ningaloo Collaboration Cluster: Biodiversity and ecology of the Ningaloo Reef lagoon. Final Report No. 1c. http://www.ningaloo.org.au/www/en/NingalooResearchProgram/Publications/Cluster-finalreports.html

Kobryn, H.T., Wouters, K., Beckley, L.E. and T. Heege (2013). Ningaloo Reef: Shallow marine habitats mapped using a Hyperspectral sensor. PLoS ONE 8(7): e70105. doi:10.1371/journal.pone.0070105. http://dx.plos.org/10.1371/journal.pone.0070105

Rob D, Barnes P, Whiting S, Fossette S, Tucker T and Mongan T (2019) Turtle activity and nesting on the Muiron Islands and Ningaloo Coast: Final Report 2018, Ningaloo Turtle Program. Report prepared for Woodside Energy Limited. Department of Biodiversity, Conservation and Attractions, Exmouth, pp.51.

Stevens, J.D., Last, P.R., White, W.T., McAuley, R.B., Meekan, M.G. (2009) Diversity, abundance and habitat utilisation of sharks and rays. CSIRO Marine and Atmospheric Research. Final report to Western Australian Marine Science Institute

Surman CA and Nicholson LW (2015). Exmouth Sub basin Marine Avifauna Monitoring Program: Final Report. Unpublished report prepared for Apache Energy Ltd. by Halfmoon Biosciences. 188 pp.

Tucker T, Fossette S, Whiting S, Rob, D and Barnes P (2019) Spatial and temporal use of inter-nesting habitat by sea turtles along the Muiron Islands and Ningaloo Coast. Final Report. Report prepared for Woodside Energy Limited. Department of Biodiversity, Conservation and Attractions, Kensington, pp.77.

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
Montebello Island Champagne Bay & Chippendale channel
Montebello Island - Claret Bay
Montebello Island - Hermite/Delta Is Channel
Montebello Island - Hock Bay
Montebello Island - North & Kelvin Channel
Montebello Island - Sherry Lagoon Entrance
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

APPENDIX F STAKEHOLDER CONSULTATION

Enfield Subsea Infrastructure Decommissioning (WA-28-L) Environment Plan

Date: January 2022

Revision: 0

TABLE OF CONTENTS

Consultation

1.1 Email sent to Australian Border Force, Department of Industry, Science, Energy and Resources, Department of Biodiversity, Conservation and Attractions, Department of Mines, Industry Regulation and Safety and Australian Petroleum Production and Exploration Association (17 September 2021) and Marine Tourism WA, Recfishwest and WA Game Fishing Association (24 September 2021)

Dear Stakeholder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints

Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.2 Email sent to Australian Fisheries Management Authority (17 September 2021)

Dear AFMA

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. Maps are also attached showing Commonwealth fisheries in relation to the proposed activities.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Line Fishery Commonwealth: Nil
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.

Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

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 five overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- North-West Slope Trawl Fishery
- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Deepwater Trawl Fishery
- Western Skipjack Fishery

Woodside has provided advice to relevant fishing representative organisations in the unlikely event of on-water interaction during planned activities, as well as to inform these organisations of Woodside's plans to remove all equipment from the sea floor above the mudline.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.2.1 Email sent to Australian Fisheries Management Authority (14 November 2021)

Dear AFMA

Please be advised that following review of the Fishery Status Report 2021, released by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) on 13 October 2021, Woodside has identified that there has been active fishing in the Operational Area by the Western Deepwater Trawl Fishery.

Woodside will provide consultation information to Western Deepwater Trawl Fishery licence holders, as well as an update to relevant representative organisations for this fishery.

Please don't hesitate to get in contact should you have any feedback or require any further information.

King regards,

Corporate Affairs Adviser | Corporate Affairs

1.3 Email sent to Australian Maritime Safety Authority (Marine Safety) and Australian Hydrographic Office (17 September 2021)

Dear AMSA / AHO

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. A shipping lane map is also attached.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m

Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.4 Email sent to Australian Maritime Safety Authority (Marine Pollution) (17 September 2021)

Dear [redacted]

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

We are currently developing our First Strike Response Plan for the planned activity and will provide a final copy of this Plan to you if relevant to the proposed activity.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500

	m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.5 Email to Department of Agriculture, Water and the Environment (17 September 2021)

Dear DAWE

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. Maps showing relevant fisheries are also attached.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Line Fishery Commonwealth: Nil
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Implications for DAWE’s interests

We have identified and assessed potential risks and impacts to active Commonwealth commercial fishers, biosecurity matters and the marine environment that overlap the proposed Operational Areas in the development of the proposed Environment Plan for this activity. Woodside has endeavoured to reduce these risks and impacts to as low as reasonably practicable (ALARP) and acceptable levels.

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 five overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- North-West Slope Trawl Fishery
- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Deepwater Trawl Fishery
- Western Skipjack Fishery

Woodside has provided advice to relevant fishing representative organisations in the unlikely event of on-water interaction during planned activities, as well as to inform these organisations of Woodside's plans to remove all equipment from the sea floor above the mudline.

Biosecurity implications:
With respect to the biosecurity matters, please note the following information below.

Environment description:	
The Operational Area is located in water depths of 400-600 m on the middle continental shelf and the seabed is relatively flat and featureless, comprised of soft sediments. However, the western portion of the Operational Area overlaps the Enfield Escarpment which is approximately 50 m in height, with a relatively steep slope in comparison to the surrounding seabed. The Enfield canyon lies in the southern portion of the Operational Area and comprises the North and South Enfield Canyons.	
Potential IMS risk	***IMS mitigation management***
Introduction and establishment of IMS.	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.

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.5.1 Email to Department of Agriculture, Water and the Environment (14 November 2021)

Dear DAWE

Please be advised that following review of the Fishery Status Report 2021, released by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) on 13 October 2021, Woodside has identified that there has been active fishing in the Operational Area by the Western Deepwater Trawl Fishery.

Woodside will provide consultation information to Western Deepwater Trawl Fishery licence holders, as well as an update to relevant representative organisations for this fishery.

Please don't hesitate to get in contact should you have any feedback or require any further information.

King regards,

Corporate Affairs Adviser | Corporate Affairs

1.6 Email sent to Department of Defence (24 September 2021)

Dear Stakeholder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. A defence map is also attached.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500

	m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.7 Email to Director of National Parks (17 September 2021)

Dear Director of National Parks

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Implications for Parks Australia interests

We note Australian Government Guidance on consultation activities with respect to the proposed activities and confirm that:

- The proposed activities are outside the boundaries of a proclaimed Australian Marine Parks, with activities taking place approximately 17 km north of the Commonwealth boundary of the Ningaloo Marine Park and approximately 21 km east of the Gascoyne Commonwealth Marine Reserve.
- We have assessed potential impacts to Australian Marine Parks (AMPs) in the development of the proposed Environment Plan for this activity and consider that

there are no credible impacts as part of planned activities that have potential to impact the values of the Marine Parks.
- The worst-case credible spill scenario assessed in this EP is the remote likelihood event of a vessel collision resulting a spill of marine diesel to the marine environment.
- Through review of hydrocarbon spill modelling, and with consideration of a 10 ppb dissolved and entrained hydrocarbon threshold, the following AMPs may be contacted in the event of a spill:
  - Ningaloo
  - Gascoyne
  - Montebello
  - Carnarvon Canyon
  - Shark Bay
  - Abrolhos
  - Jurien
- 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 about the planned activity is attached, which provides background on the activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.8 Email to Department of Primary Industries and Regional Development (17 September 2021)

Dear [redacted]

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. A map showing relevant fisheries is also attached.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Line Fishery Commonwealth: Nil
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500

	m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

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 nine overlapping State managed fisheries, one of which has been active in the vicinity of the Operational Area in recent years – the Pilbara Line Fishery.

We have identified potential impacts and risks to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these impacts and risks to as low as reasonably practicable and acceptable levels.

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
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 and Woodside's Environmental Performance Standards where applicable
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 dates and any exclusion zones prior to commencement of the activity. A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel 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	Appropriate spill response plans, equipment and materials will be in place and maintained

	vessel collision resulting in a tank rupture.	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
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	If complete removal of the manifold foundation is not feasible due to access restrictions or other factors, the manifold foundation is planned to be cut as close to the mudline as technically feasible (<1 m) and marked on navigational charts if remaining portion presents a possible risk to present and future marine users.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.9 Email to Department of Transport (17 September 2021)

Dear DoT

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

We are currently developing our First Strike Response Plan for the planned activity and will provide a final copy of this Plan to you if relevant to the proposed activity.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure.

General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.10 Email to licence holders in Pilbara Line Fishery (17 September 2021)

Dear Licence Holder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The

Information Sheet is also available on our website. A map showing relevant fisheries is also attached.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Line Fishery Commonwealth: Nil
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Commercial fishing implications:

We have identified potential impacts and risks to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these impacts and risks to as low as reasonably practicable and acceptable levels.

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
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	All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable

	reduction in water quality however they will be rapidly diluted and dispersed in the water column	
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 dates and any exclusion zones prior to commencement of the activity A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel 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 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
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	If complete removal of the manifold foundation is not feasible due to access restrictions or other factors, the manifold foundation is planned to be cut as close to the mudline as technically feasible (<1 m) and marked on navigational charts if remaining portion presents a possible risk to present and future marine users.

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.11 Email to BHP and Santos (17 September 2021)

Dear Titleholder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals where this equipment protrudes above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and has the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

A Consultation Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures The Information Sheet is also available on our website Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. An adjacent titleholder map is also attached.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.12 Email to Australian Southern Bluefin Tuna Industry Association and Tuna Australia (17 September 2021)

Dear Stakeholder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. A map is also attached showing Commonwealth fisheries in relation to the proposed activities.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Demersal Scalefish Fisheries – Pilbara Line Commonwealth: Nil
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Commercial fishing implications:

Woodside has assessed potential impacts for commercial fisheries based on ABARES/AFMA data, fishing methods and water depth. We note there are five overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- North-West Slope Trawl Fishery
- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Deepwater Trawl Fishery
- Western Skipjack Fishery

Woodside has provided advice to relevant fishing representative organisations in the unlikely event of on-water interaction during planned activities, as well as to inform these organisations of Woodside’s plans to remove all equipment from the sea floor above the mudline.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.13 Email to Commonwealth Fisheries Association (17 September 2021)

Dear Stakeholder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. Maps are also attached showing Commonwealth fisheries in relation to the proposed activities.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Demersal Scalefish Fisheries – Pilbara Line Commonwealth: Nil
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

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 five overlapping Commonwealth managed fisheries, listed below, none of which have been active in the Operational Area in recent years.

- North-West Slope Trawl Fishery
- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Deepwater Trawl Fishery
- Western Skipjack Fishery

Woodside has provided advice to relevant fishing representative organisations in the unlikely event of on-water interaction during planned activities, as well as to inform these organisations of Woodside’s plans to remove all equipment from the sea floor above the mudline.

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.13.1 Email to Commonwealth Fisheries Association (14 November 2021)

Dear Stakeholder

Please be advised that following review of the Fishery Status Report 2021, released by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) on 13 October 2021, Woodside has identified that there has been active fishing in the Operational Area by the Western Deepwater Trawl Fishery.

Woodside will provide consultation information to Western Deepwater Trawl Fishery licence holders, as well as an update to relevant government and representative organisations for this fishery.

Please don’t hesitate to get in contact should you have any feedback or require any further information.

King regards,

Corporate Affairs Adviser | Corporate Affairs

1.14 Email to Pearl Producers Association (17 September 2021)

Dear [redacted]

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.14.1 Email to Pearl Producers Association (15 November 2021)

Hi [redacted]

Please be advised that following review of the Fishery Status Report 2021, released by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) on 13 October 2021, Woodside has identified that there has been active fishing in the Operational Area by the Western Deepwater Trawl Fishery.

Woodside will provide consultation information to Western Deepwater Trawl Fishery licence holders, as well as an update to relevant government and representative organisations for this fishery.

Please don't hesitate to get in contact should you have any feedback or require any further information.

King regards,

Corporate Affairs Adviser | Corporate Affairs

1.15 Email to Western Australian Fishing industry Council (17 September 2021)

Dear [redacted]

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. A map showing relevant fisheries is also attached.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Line Commonwealth: Nil
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.

Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

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 nine overlapping State managed fisheries, one of which has been active in the Operational Area in recent years.

We have identified potential impacts and risks to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these impacts and risks to as low as reasonably practicable and acceptable levels.

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
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 and Woodside's Environmental Performance Standards where applicable
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 dates and any exclusion zones prior to commencement of the activity A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel 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 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
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	If complete removal of the manifold foundation is not feasible due to access restrictions or other factors, the manifold foundation is planned to be cut as close to the mudline as technically feasible (<1 m) and marked on navigational charts if remaining portion presents a possible risk to present and future marine users.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.15.1 Email to Western Australian Fishing industry Council (14 November 2021)

Hi [redacted]

Please be advised that following review of the Fishery Status Report 2021, released by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) on 13 October 2021, Woodside has identified that there has been active fishing in the Operational Area by the Western Deepwater Trawl Fishery.

Woodside will provide consultation information to Western Deepwater Trawl Fishery licence holders, as well as an update to relevant government and representative organisations for this fishery.

Please don't hesitate to get in contact should you have any feedback or require any further information.

King regards,

Corporate Affairs Adviser | Corporate Affairs

1.16 Email to other stakeholders (17 September 2021) - Exmouth-based charter boat, tourism and dive operators, Cape Conservation Group, Protect Ningaloo, Exmouth Community Reference Group, Exmouth Game Fishing Club, Exmouth Chamber of Commerce and Industry (ECCI), Shire of Exmouth, Ningaloo Coast World Heritage Advisory Committee.

Dear Stakeholder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 16-18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be

	undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.17 Email to Nganhurra Thanardi Garrbu Aboriginal Corporation (17 September 2021)

Dear [redacted]

I hope this email finds you well. I am reaching out to you as the listed representative for Nganhurra Thanardi Garrbu Aboriginal Corporation.

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake

	decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **18 October 2021**.

Kind Regards

Senior Corporate Affairs Advisor - Indigenous Affairs | Corporate Affairs

1.18 Woodside Consultation Information Sheet (sent to all relevant stakeholders).

Woodside

STAKEHOLDER CONSULTATION

INFORMATION SHEET

September 2021

ENFIELD SUBSEA INFRASTRUCTURE DECOMMISSIONING (WA-28-L) ENVIRONMENT PLAN

EXMOUTH PLATEAU SUB-BASIN, NORTH-WEST AUSTRALIA

Woodside has commenced planning on the final stage of its decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

Closure activities have to date included shutting-in and depressurising the former production wells following the end of production in Q4 2018. Woodside plans to permanently plug and abandon these wells by 30 June 2024, with Xmas trees and wellheads removed by the end of 2024. This activity will be managed under the Enfield Plug & Abandonment (P&A) Environment Plan (EP). The Enfield Riser Turret Mooring is subject to a separate environmental approval.

Removal of remaining equipment will be managed under the Enfield Subsea Decommissioning EP and will involve the removal of all remaining infrastructure above the mudline associated with the Enfield Project, including manifolds, manifold foundations, flowlines and umbilicals.

The drag anchors and a section of the mooring line are proposed to be left *in situ*, subject to safety and environment assessment. Drag anchors are currently buried below the mudline and the intention is for the attached mooring lines to be cut as close as practicable to the anchors as part of the infrastructure removal activity.

The manifold foundations are large structures that sit above and below the mudline and are planned to be completely removed. If complete removal is not feasible due to access restrictions or other factors, they will be cut above the mudline and marked on navigational charts.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024. The activity has the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well P&As.

Seabed survey work is planned to be undertaken during 2022-2025, including but not limited to sediment sampling and visual inspection.

Production licence WA-28-L is held by Woodside Energy Ltd (Operator and 60% joint venture participant), and Mitsui E&P Australia Pty Ltd (40% joint venture participant).

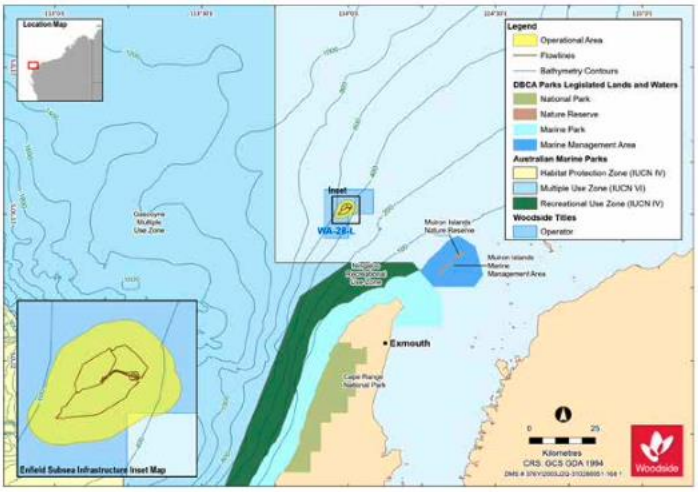


Figure 1. Petroleum Activity Program Operational Area

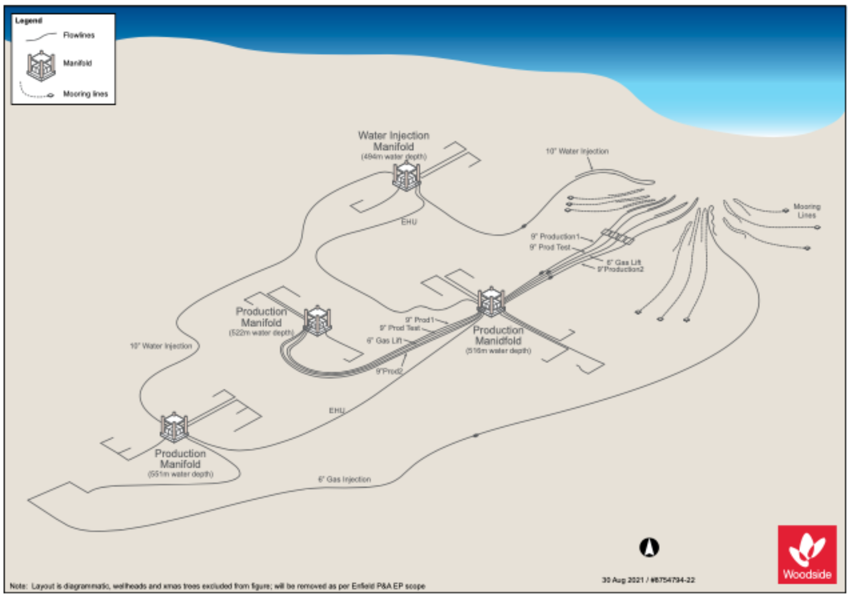


Figure 2. Diagram of Enfield subsea infrastructure

Table 1. Activity summary

Enfield Subsea Infrastructure Decommissioning Activities	
Commencement date	• Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints • Planned seabed surveys, including sediment sampling are scheduled during 2022-2025
Estimated duration	• Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 • Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently • When in progress, activities are anticipated to be 24 hours per day, seven days per week
Water depth	• ~400 m to 600 m
Infrastructure	• 4 x manifolds • 4 x manifold foundation suction piles • 15 x rigid well tie-in spools • 26 km flexibles flowlines and risers • 4 x riser holdback anchors • 9 km umbilicals • 6 km disused umbilicals • 15 x control jumpers • 9 x mooring lines • 9 x drag anchors for mooring lines • Flowline stabilisation • Crossing materials
Rigs / vessels	• Offshore support vessels are planned to be used to decommission and remove subsea infrastructure • General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support
Distance to nearest town	• ~38 km north of the North West Cape
Distance to nearest marine park	• ~16 km north of the Gascoyne Marine Park - Multiple Use Zone (Cwlth)

Table 2. Approximate Subsea Infrastructure Locations

Subsea Infrastructure	Latitude	Longitude	Approximate Water Depth (mLAT)
Manifolds	21° 28' 54.19" S	113° 59' 21.19" E	-516
	21° 27' 55.88" S	113° 59' 34.84" E	-494
	21° 29' 15.35" S	113° 58' 30.82" E	-550
	21° 28' 53.42" S	113° 59' 17.78" E	-522
Flexible flowlines and risers • ***production x 2*** • ***production test x 1*** • ***water injection x 2*** • ***gas injection/lift x 2***	Start: 21° 29' 15.920" S End: 21° 28' 53.268" S	Start: 113° 58' 31.392" E End: 114° 00' 29.249" E	Start: -550 End: -396
	Start: 21° 29' 15.920" S End: 21° 28' 53.268" S	Start: 113° 58' 31.392" E End: 114° 00' 29.249" E	Start: -550 End: -396
	Start: 21° 29' 15.920" S End: 21° 28' 53.268" S	Start: 113° 58' 31.392" E End: 114° 00' 29.249" E	Start: -550 End: -396
	Start: 21° 27' 55.88" S End: 21° 28' 53.268" S	Start: 113° 59' 34.84" E End: 114° 00' 29.249" E	Start: -494 End: -396
	Start: 21° 29' 15.35" S End: 21° 27' 55.88" S	Start: 113° 58' 30.82" E End: 113° 59' 34.84" E	Start: -550 End: -494
	Start: 21° 30' 3.582" S End: 21° 28' 53.268" S	Start: 113° 57' 51.152" E End: 114° 00' 29.249" E	Start: -550 End: -396
	Start: 21° 29' 15.920" S End: 21° 28' 53.268" S	Start: 113° 58' 31.392" E End: 114° 00' 29.249" E	Start: -550 End: -396
Umbilicals	Start: 21° 28' 54.19"S End: 21° 28' 53.268" S	Start:113° 59'21.19"E End: 114° 00' 29.249" E	Start: -516 End: -396
	Start: 21° 27' 55.88" S End: 21° 28' 54.19"S	Start: 113° 59' 34.84" E End: 113° 59' 21.19"E	Start: -494 End: -516
	Start: 21° 28' 53.42" S End: 21° 28' 54.19"S	Start: 113° 59' 17.78" E End: 113° 59' 21.19"E	Start: -522 End: -516
	Start: 21° 29' 15.35" S End: 21° 28' 54.19"S	Start: 113° 58' 30.82" E End:113° 59' 21.19"E	Start: -550 End: -516
	Start: 21° 30' 3.58" S End: 21° 29' 15.35" S	Start: 113° 57' 51.15" E End: 113° 58' 30.82" E	Start: -550 End: -550
Drag anchors for mooring lines	21° 28' 25.28" S	114° 00' 29.85" E	-405
	21° 28' 26.93" S	114° 00' 32.33" E	-402
	21° 28' 26.43" S	114° 00' 34.18" E	-399
	21° 29' 07.62" S	114° 00' 54.73" E	-364
	21° 29' 09.48" S	114° 00' 53.18" E	-364
	21° 29' 11.50" S	114° 00' 51.56" E	-365
	21° 29' 07.18" S	114° 00' 02.58" E	-424
	21° 29' 04.96" S	114° 00' 01.19" E	-426
	21° 29' 02.73" S	114° 00' 00.11" E	-429

Proposed activity

The activities are anticipated to involve the removal of infrastructure above the mudline including manifolds, manifold foundations, flowlines and umbilicals and *in situ*-decommissioning of the drag anchors and a section of mooring line below the mudline, subject to safety and environment assessment. If complete removal of the manifold foundations is not feasible due to access restrictions or other factors, they will be cut above the mudline and marked on navigational charts.

This infrastructure can be removed by a variety of methods, with timing planned to take approximately three months to complete, scheduled in 2022-2024.

Seabed survey work is anticipated to be undertaken during 2022-2025, including but not limited to sediment sampling and visual inspection.

When in progress, activities are anticipated to be 24 hours per day, seven days per week. Timing and duration of these activities is subject to change due to project schedule requirements, vessel availability, unforeseen circumstances and weather. Decommissioning activities will be risk assessed throughout the year (all seasons) in the EP to provide operational flexibility.

Project vessels

Several offshore support and general support vessels will be required to complete the activities. Offshore support vessels will be used to decommission and remove subsea infrastructure, and general support vessels for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

Communications with mariners

A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.

Marine notices will be issued prior to activity commencement to alert vessels which may be operating in waters nearby.

Implications for Stakeholders

Woodside will consult relevant stakeholders whose interests, functions and activities may be affected by the proposed activities. We will also keep other stakeholders who have identified an interest in the activities informed about our planned activities.

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant stakeholders considering timing, duration, location and potential impacts arising from the removal of subsea infrastructure.

A number of mitigation and management measures during the removal of subsea infrastructure will be implemented and are summarised in Table 3. Further details will be provided in the Environment Plan.

Table 3. Summary of key risks and/or impacts and management measures during subsea infrastructure decommissioning

Potential Risk and/or Impact	Mitigation and/or Management Measure
Planned	
Physical presence of infrastructure on seafloor causing interference or displacement	• Subsea infrastructure location marked on marine charts until removed. • Subsea infrastructure above the mudline planned to be removed. If complete removal of the manifold foundation is not feasible due to access restrictions or other factors, the manifold foundation is planned to be cut above the mudline and marked on navigational charts.
Chemical use	• Chemical use will be managed in accordance with Woodside and contractor chemical selection and approval procedures.
Interests of relevant stakeholders including: • Defence activities • Petroleum activities • Commercial and recreational fishing activities • Shipping activities	• Consultation with relevant petroleum titleholders, commercial fishers and their representative organisations, and Government departments and agencies to inform decision making for the proposed activity and development of the Environment Plan. • Advice to relevant stakeholders prior to the commencement of activities.
Marine fauna interactions	• Vessel masters will implement interaction management actions in accordance with the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth).
Light emissions	• Implement relevant controls in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (2020).
Marine discharges	• All routine marine discharges will be managed according to legislative and regulatory requirements and Woodside's Environmental Performance Standards where applicable.
Seabed disturbance	• Attempted retrieval of dropped objects.

Potential Risk and/or Impact	Mitigation and/or Management Measure
Vessel interaction	• Navigation aids and practices will be used as required by Maritime Regulations to minimise potential impact on other marine users. • Notification to relevant fishery and other stakeholders identified through consultation and Government maritime safety agencies of specific start and end dates, specific vessel-on-location dates and any exclusion zones prior to commencement of the activity. • A temporary 500 m radius exclusion zone around the offshore support vessel for the duration of activities. • A 1500 m radius Operational Area around the subsea infrastructure. • Commercial fishers and other marine users are permitted to use but should take care when entering the Operational Area.
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 refuelling procedures and equipment will be used to prevent spills to the marine environment.
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.
Cumulative planned impacts and unplanned risks associated with activities within WA 28L	• EP will consider potential cumulative impacts from concurrent operations within the title and adopt additional mitigation and/or management measures where required.

Providing Feedback

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.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before **18 October 2021.**

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 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).*

www.woodside.com.au

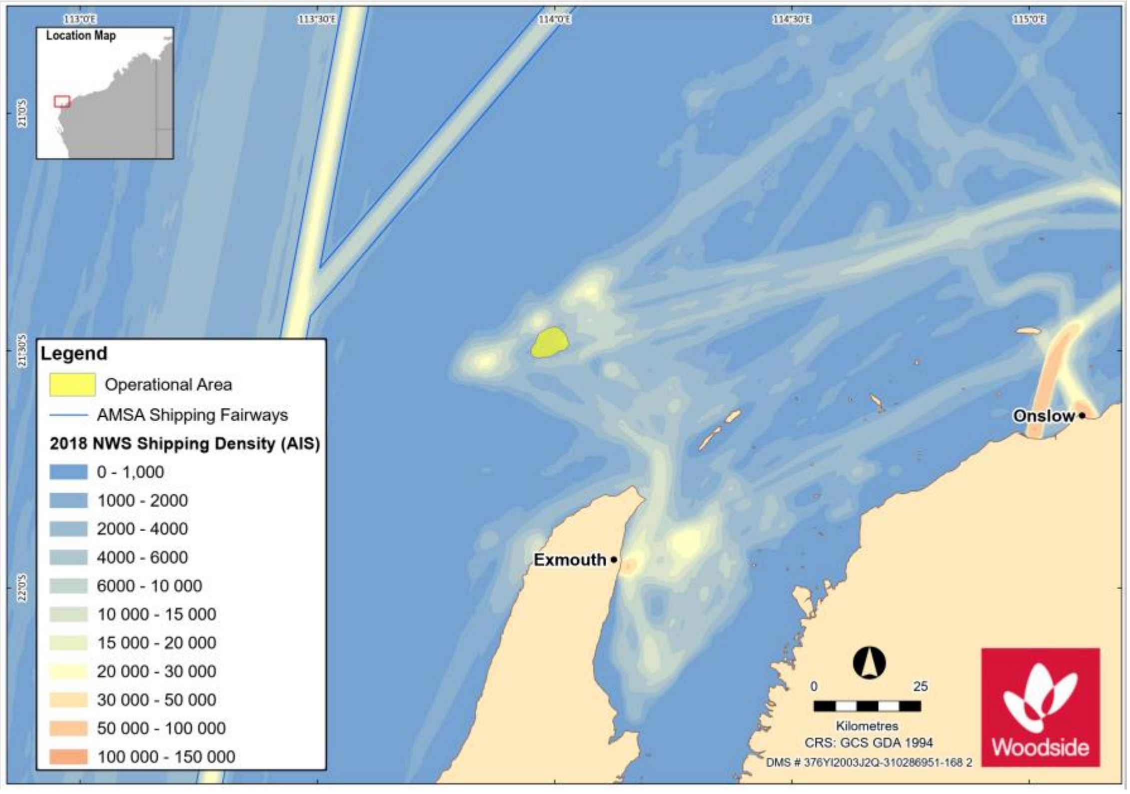
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Shannen Wilkinson, Senior Corporate Affairs Adviser
Woodside Energy Ltd
E: Feedback@woodside.com.au | Toll free: 1800 442 977

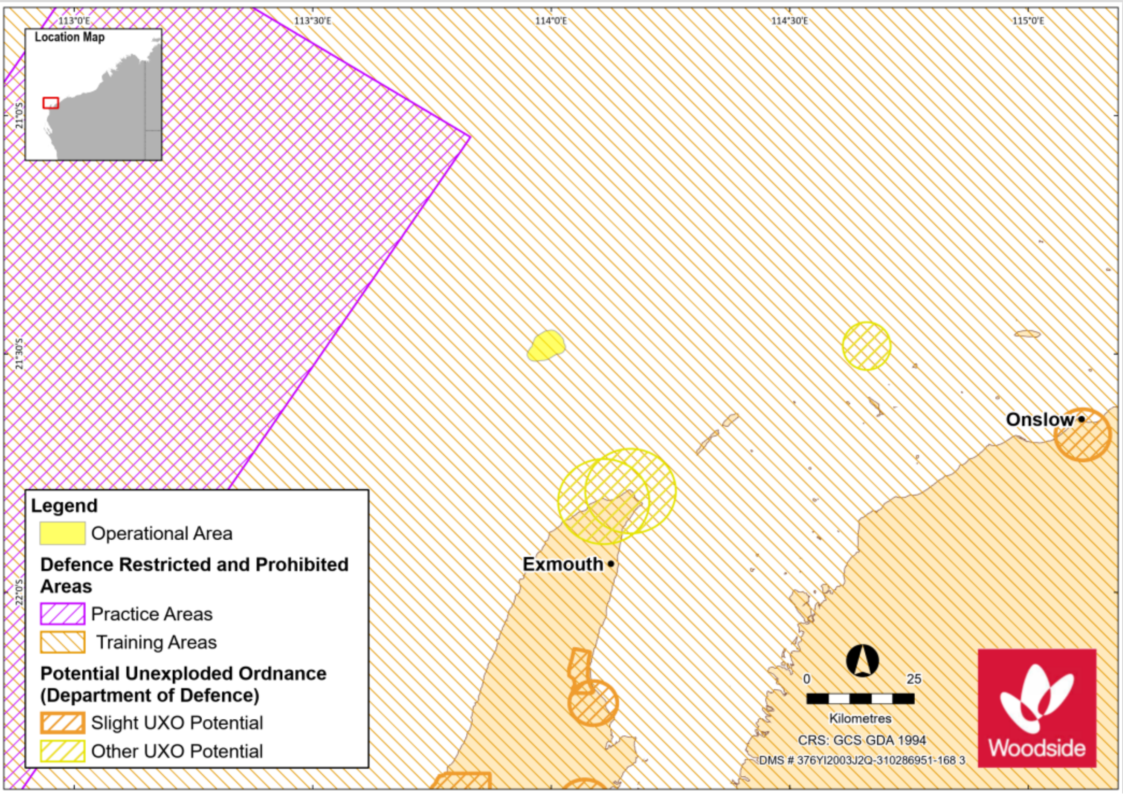
Please note that stakeholder feedback will be communicated to NOPSEMA as required under legislation. Woodside will communicate any material changes to the proposed activity to affected stakeholders as they arise.

Woodside

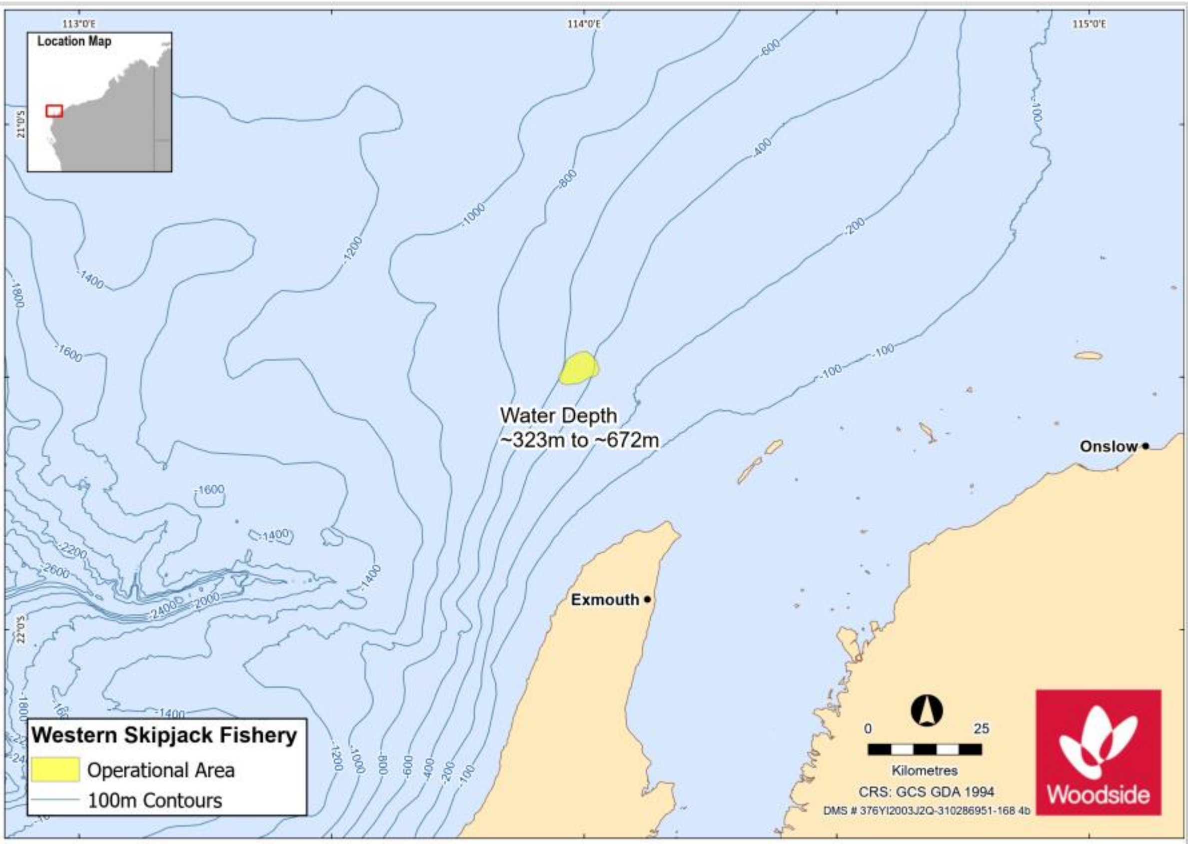
1.19 Shipping lane map sent to AMSA and AHO (17 September 2021)

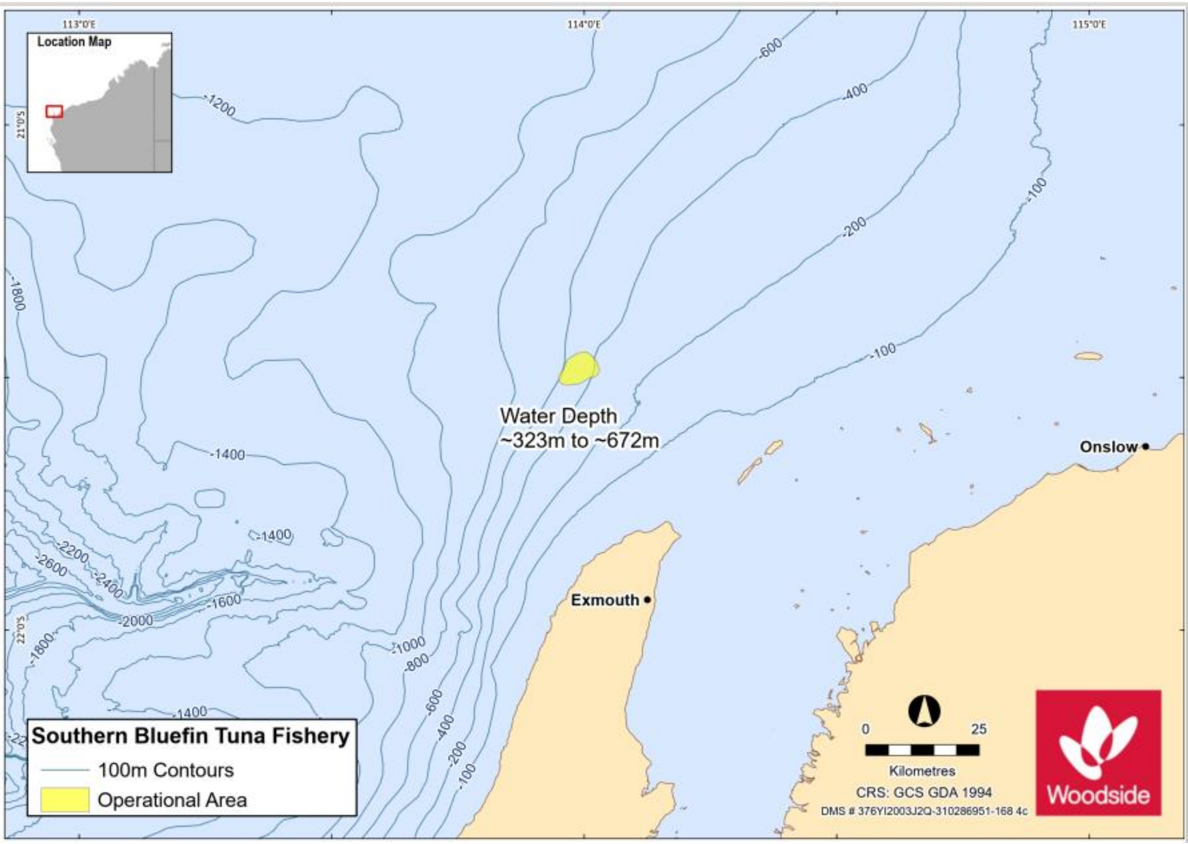


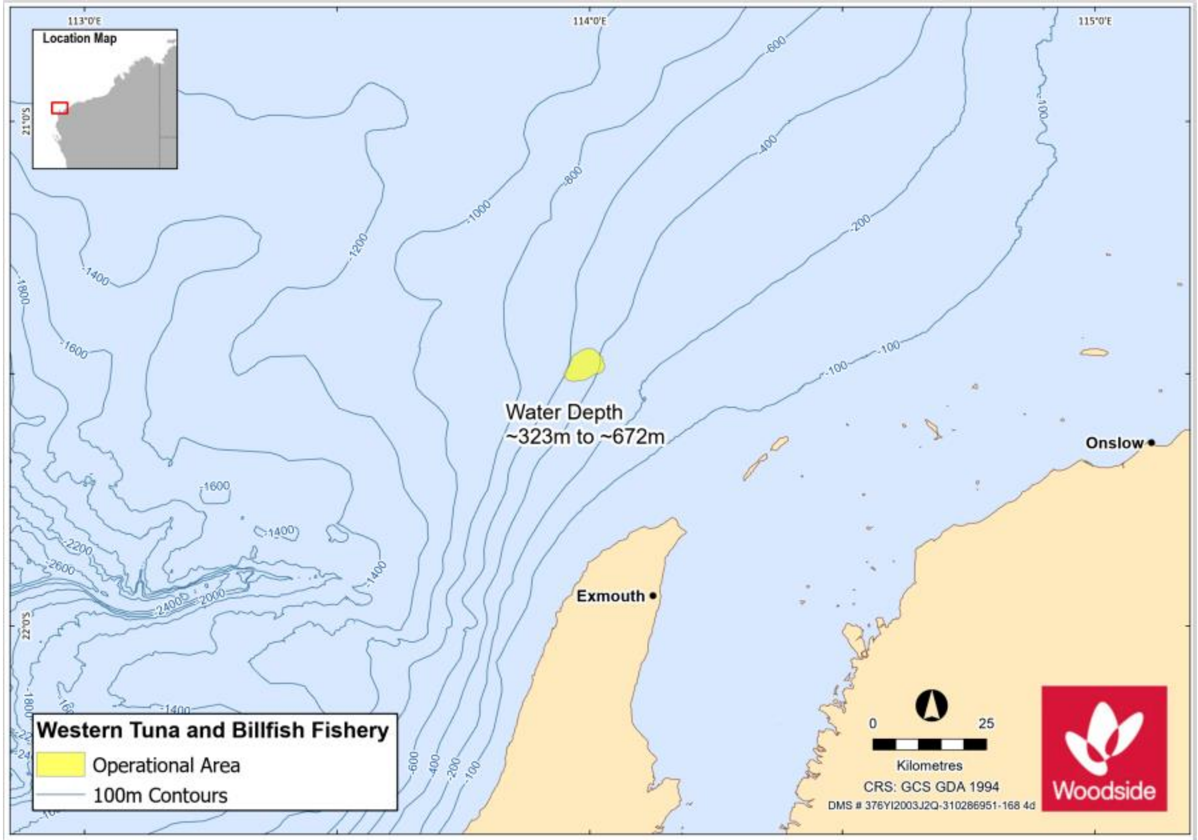
1.20 Defence interests map sent DoD (17 September 2021)

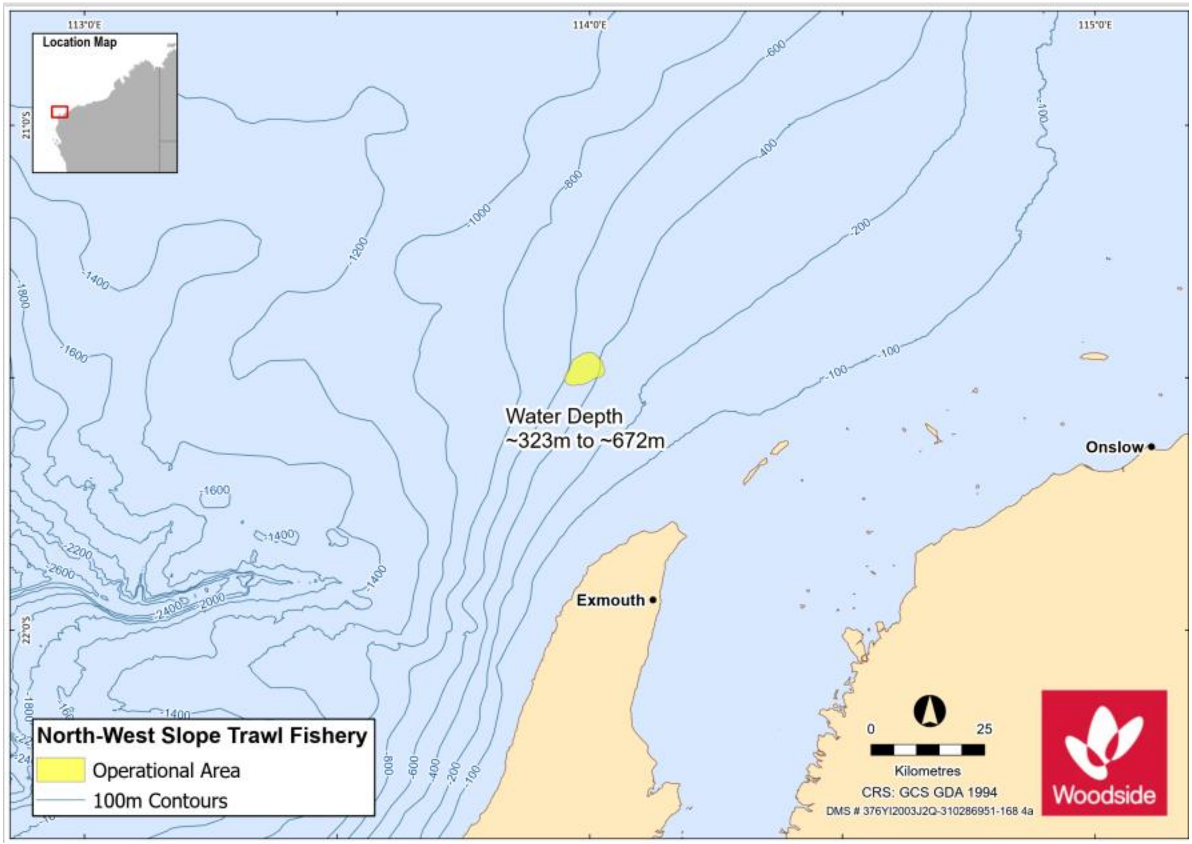


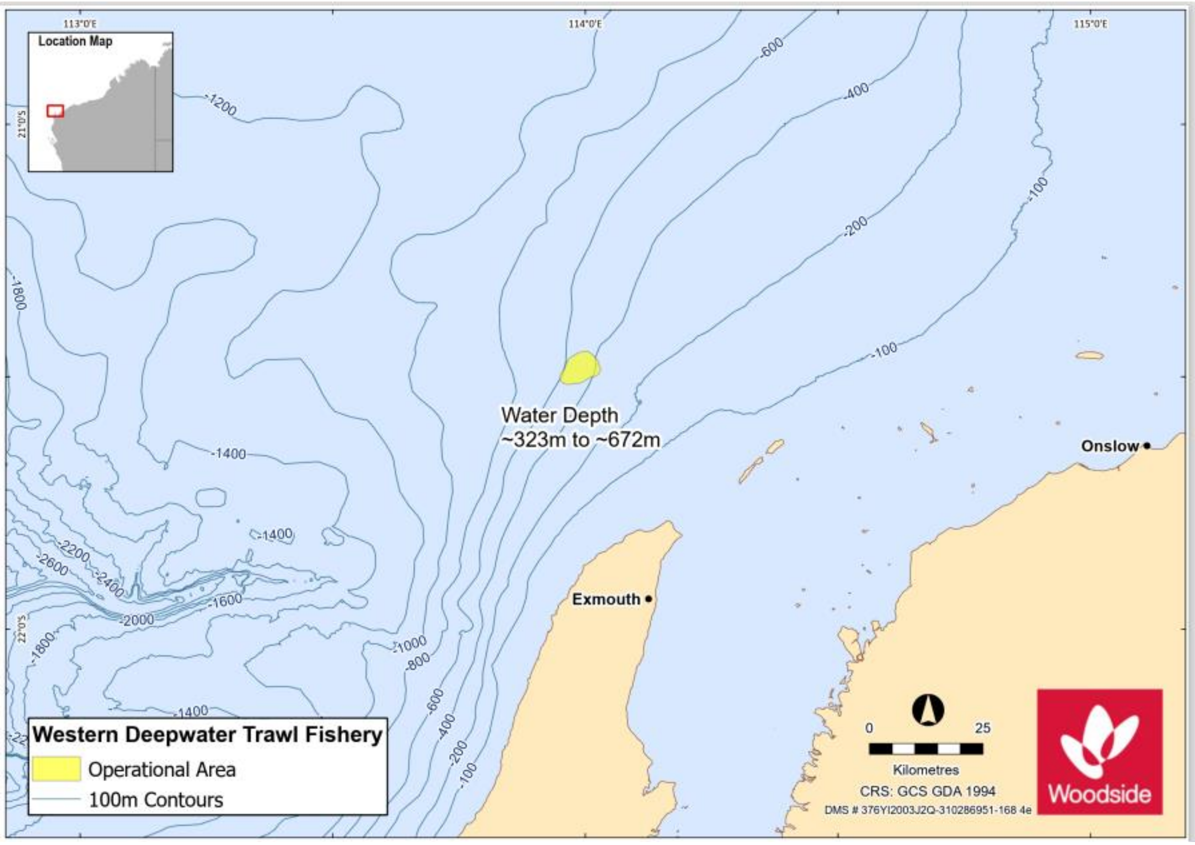
1.21 Commonwealth fisheries maps sent to AFMA, DAWE, CFA, ASBTIA and Tuna Australia (17 September 2021) and licence holders in the Western Deepwater Trawl Fishery (14 November 2021)



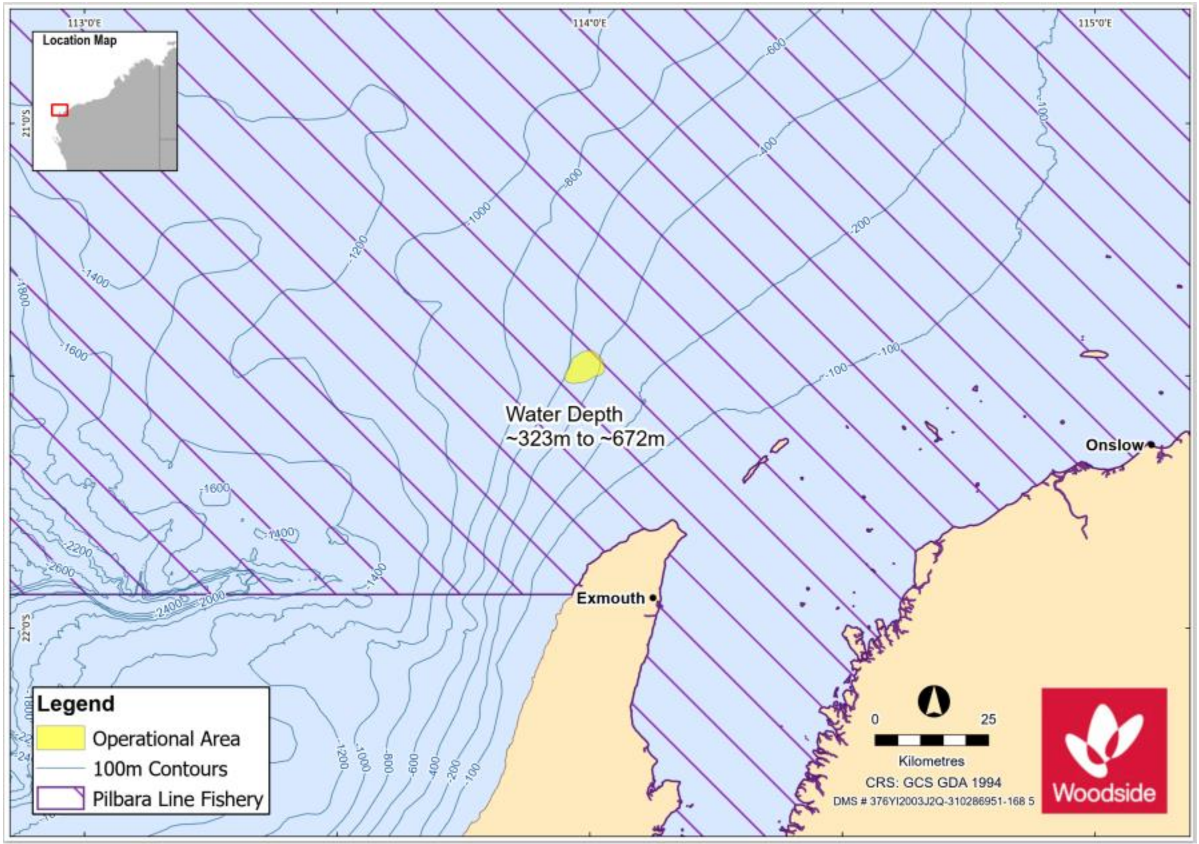



Location Map
Western Tuna and Billfish Fishery
Operational Area
100m Contours
Water Depth
~323m to ~672m
Exmouth
Onslow
Kilometres
CRS: GCS GDA 1994
Woodside

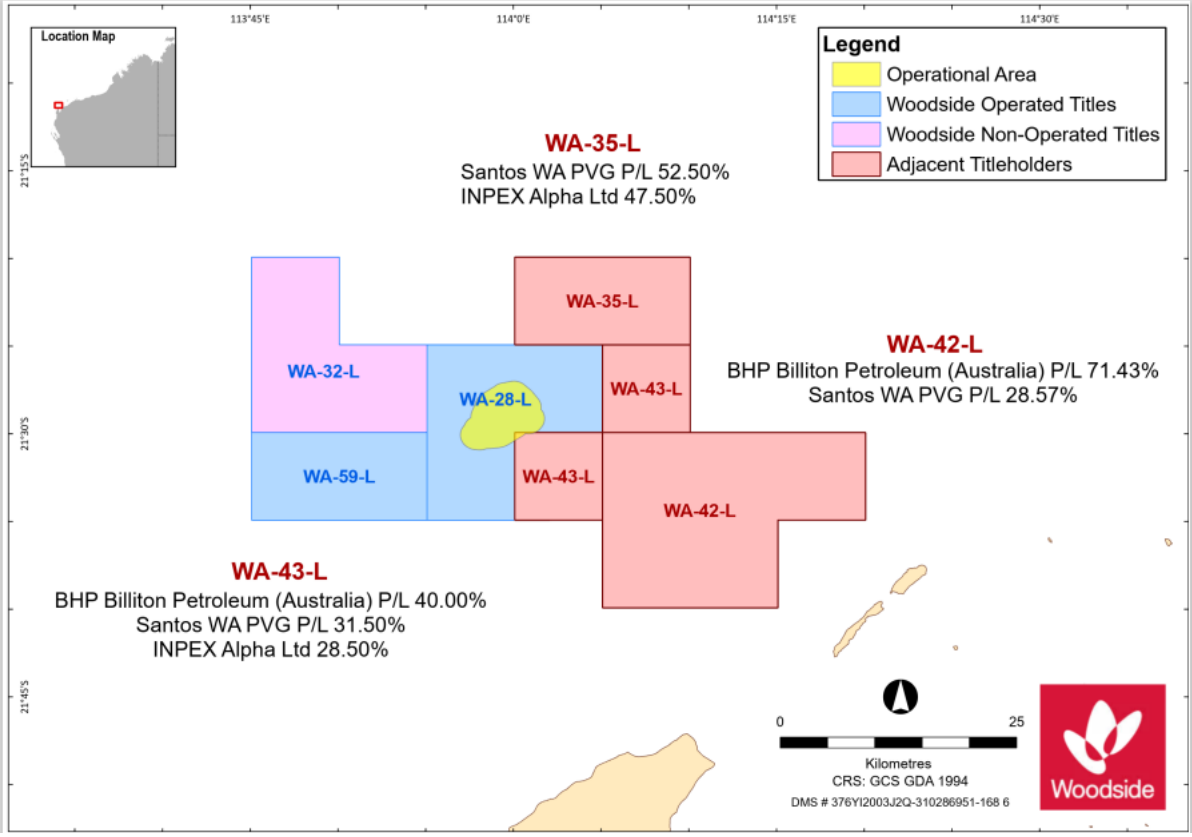

Location Map
North-West Slope Trawl Fishery
Operational Area
100m Contours
Water Depth
~323m to ~672m
Exmouth
Onslow
Kilometres
CRS: GCS GDA 1994
Woodside



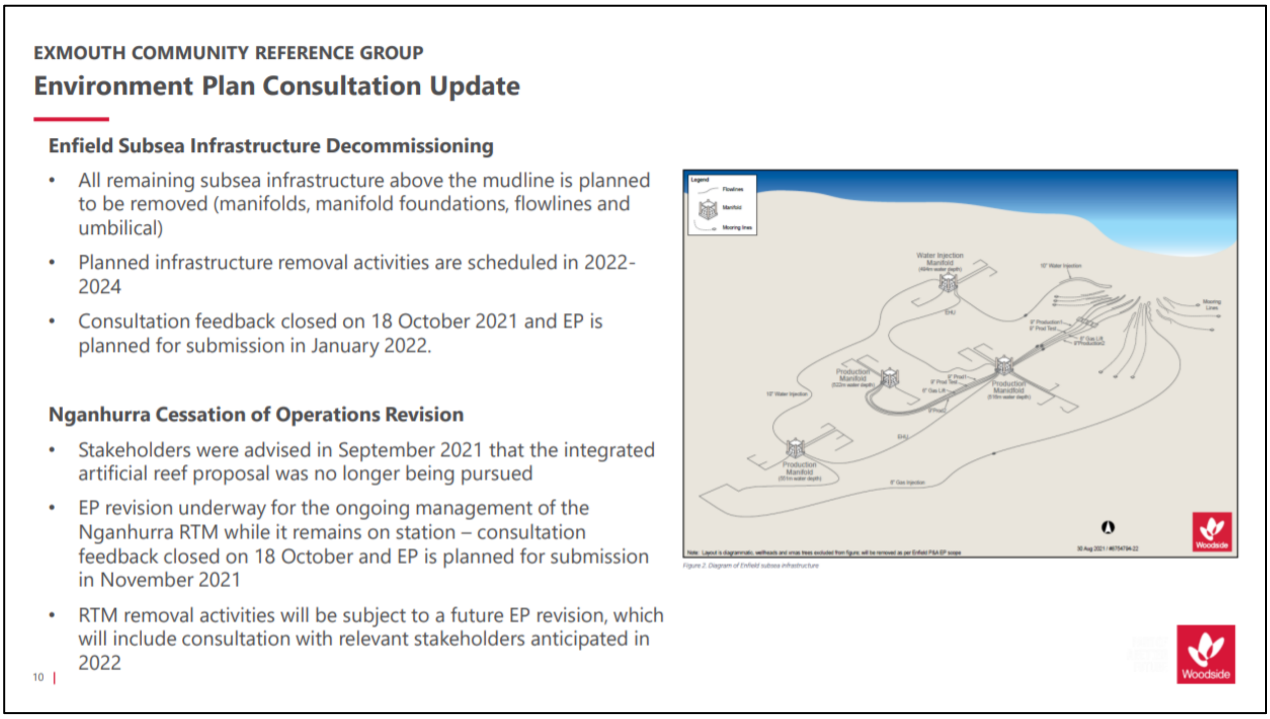
1.22 State fisheries map sent to DPIRD, WAFIC and licence holders in the Pilbara Line Fishery (17 September 2021)



1.23 Titleholder map sent to BHP, Inpex and Santos (17 September 2021)



1.24 Presentation to Exmouth Community Reference Group (4 November 2021)



1.25 Email sent to licence holders in the Western Deepwater Trawl Fishery (14 November 2021)

Dear Licence Holder

Woodside is planning to submit the final Environment Plan (EP) for the decommissioning of the Enfield Project in Permit Area WA-28-L in Commonwealth waters, approximately 38 km north of North West Cape, Western Australia.

The Enfield Oil project commenced production in 2006 and ceased production in 2018, following which the Nganhurra floating production, storage and offtake facility (FPSO) was used to flush, isolate and preserve the riser turret mooring and subsea infrastructure prior to the FPSO disconnecting and leaving the Enfield Field for the final time.

Woodside has since consulted stakeholders on plans to permanently plug and abandon 18 wells and the removal from the seabed of Xmas trees, flowbases and wellheads, including temporary guide bases (where installed).

Woodside is now seeking feedback as part of planning for the Enfield Subsea Infrastructure Decommissioning Environment Plan, which outlines activities for the removal of the remaining subsea infrastructure from the Enfield Project.

Activities proposed in this Environment Plan include the removal of manifolds, manifold foundations, flowlines and umbilicals above the mudline.

The infrastructure removal activity is planned to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024 and have the potential to be undertaken concurrently with other decommissioning activities within WA-28-L, including well plugging and abandonment.

An Information Sheet is attached, which provides background on proposed activities, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website. Maps are also attached showing the Western Deepwater Trawl fishery in relation to the proposed activities.

Activity:

Summary:	Removal of infrastructure above the mudline, including manifolds, manifold foundations, flowlines and umbilicals
Location:	Approximately 38 km north of North West Cape, Western Australia
Approximate Water Depth (m):	~400 m to 600 m
Schedule:	Planned infrastructure removal activities are scheduled in 2022-2024, subject to variables including approvals, vessel availability and weather constraints
Duration:	Preparation and removal of subsea infrastructure is expected to take up to approximately 12 months (cumulative time) to complete. Activities may be undertaken over multiple campaigns during the period 2022-2024.

	Seabed surveys are expected to take approximately 2 weeks, undertaken simultaneously with infrastructure removal activities or subsequently. When in progress, activities are anticipated to be 24 hours per day, seven days per week.
Relevant Fisheries:	State: Pilbara Line Fishery Commonwealth: Western Deepwater Trawl Fishery
Exclusionary/Cautionary Zone:	A 1500 m radius Operational Area will apply around the subsea infrastructure to allow for vessels to undertake decommissioning activities. This includes a temporary 500 m exclusion zone around the offshore support vessel to manage vessel movements.
Vessels:	Offshore support vessels are planned to be used to decommission and remove subsea infrastructure. General support vessels are planned to be used for transporting equipment and materials to and from the Operational Area, and for general re-supply and support.

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 five overlapping Commonwealth managed fisheries, listed below, of which the Western Deepwater Trawl fishery has been active in the Operational Area based on the recently released ABARES Fishery Status Report 2021.

- North-West Slope Trawl Fishery
- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Deepwater Trawl Fishery
- Western Skipjack Fishery

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at Feedback@woodside.com.au or +61 439 500 799.

Your feedback and our response will be included in our Environment Plans which will be submitted to 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 **15 December 2021**.

Regards

Corporate Affairs Adviser | Corporate Affairs

1.26 Reminder email to Australian Fisheries Management Authority, Department of Agriculture, Water and the Environment, Commonwealth Fisheries Association, Pearl Producers Association, and licence holders in the Pilbara Line fishery (6 December 2021)

Dear [stakeholder]

Woodside is seeking final feedback from stakeholders for activities to be managed under the Enfield Subsea Infrastructure Decommissioning Environment Plan.

Please let us know by **15 December 2021** if you would like to comment.

Regards

Corporate Affairs Adviser | Corporate Affairs

APPENDIX G DEPARTMENT OF PLANNING LAND, HERITAGE AND ABORIGINAL ENQUIRY SYSTEM RESULTS

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

Search Criteria

48 Registered Aboriginal Sites in Shapefile - EMBA_20210922. Warning: Search area complex so results may be inaccurate. Contact DPLH for assistance.

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at AboriginalHeritage@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.

Copyright

Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This a unique ID assigned by the Department of Planning, Lands and Heritage to the place.
Status:

- **Registered Site**: The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972.*
- **Other Heritage Place which includes:**
  - **Stored Data / Not a Site:** The place has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972.*
  - **Lodged:** Information has been received in relation to the place, but an assessment has not been completed at this *stage* to determine if it meets Section 5 of the *Aboriginal Heritage Act 1972.*

Access and Restrictions:

- **File Restricted = No:** Availability of information that the Department of Planning, Lands and Heritage holds in relation to the place is not restricted in any way.
- **File Restricted = Yes:** Some of the information that the Department of Planning, Lands and Heritage holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the informants who provided the information. To request access please contact AboriginalHeritage@dplh.wa.gov.au.
- **Boundary Restricted = No:** Place location is shown as accurately as the information lodged with the Registrar allows.
- **Boundary Restricted = Yes:** To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- **Restrictions:**
  - **No Restrictions:** *Anyone* can view the information.
  - **Male Access Only:** Only *males* can view restricted information.
  - **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.

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 DAA	800392mE 7559449mN Zone 49 [Reliable]	P07434
6498	DIRK HARTOG ISLAND	No	No	No Gender Restrictions	Registered Site	Man-Made Structure	*Registered Knowledge Holder names available from DAA	695143mE 7175147mN Zone 49 [Unreliable]	P06448
6596	POINT ANDERSON.	Yes	Yes	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter, Camp, Hunting Place, Shell, Water Source	*Registered Knowledge Holder names available from DAA	Not available when location is restricted	P06341
6606	CRAYFISH BAY 1	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter, Water Source	*Registered Knowledge Holder names available from DAA	729642mE 7083846mN Zone 49 [Unreliable]	P06351
6607	CRAYFISH BAY 2	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter, Quarry	*Registered Knowledge Holder names available from DAA	729642mE 7084646mN Zone 49 [Unreliable]	P06352
6608	ZUYTDORP POINT	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	729442mE 7078146mN Zone 49 [Unreliable]	P06353
6754	OSPREY BAY 6	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	792942mE 7538749mN Zone 49 [Reliable]	P06165
6755	OSPREY BAY INTERDUNAL 1	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	792342mE 7537149mN Zone 49 [Unreliable]	P06166
6756	OSPREY BAY INTERDUNAL 2	No	No	No Gender Restrictions	Registered Site	Midden / Scatter	*Registered Knowledge Holder names available from DAA	792642mE 7537149mN Zone 49 [Reliable]	P06167
6757	BLOODWOOD CREEK MIDDEN 1	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	794942mE 7544549mN Zone 49 [Reliable]	P06168
6758	BLOODWOOD CREEK MIDDEN 2	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	794942mE 7545049mN Zone 49 [Reliable]	P06169
6759	BLOODWOOD CREEK MIDDEN 3	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	795142mE 7544949mN Zone 49 [Reliable]	P06170

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
6760	BLOODWOOD CREEK SHORELINE	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	794942mE 7545249mN Zone 49 [Reliable]	P06171
6761	LOW POINT MIDDEN	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	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 DAA	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 DAA	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 DAA	799042mE 7555849mN Zone 49 [Unreliable]	P06176
6782	28 MILE CREEK NORTH 1	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	795242mE 7545949mN Zone 49 [Unreliable]	P06140
6784	MANDU MANDU CREEK SOUTH	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	796642mE 7548649mN Zone 49 [Unreliable]	P06142
6785	MANDU MANDU CREEK NORTH	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	796642mE 7548649mN Zone 49 [Unreliable]	P06143
6790	YARDIE CREEK SOUTH 1	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	788942mE 7527749mN Zone 49 [Reliable]	P06148
6798	YARDIE INTERDUNAL SWALE	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	789942mE 7528849mN Zone 49 [Reliable]	P06156
6799	YARDIE BEACH MIDDEN	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	789842mE 7529049mN Zone 49 [Reliable]	P06157
6800	OYSTER STACKS MIDDEN	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	797042mE 7549849mN Zone 49 [Reliable]	P06158

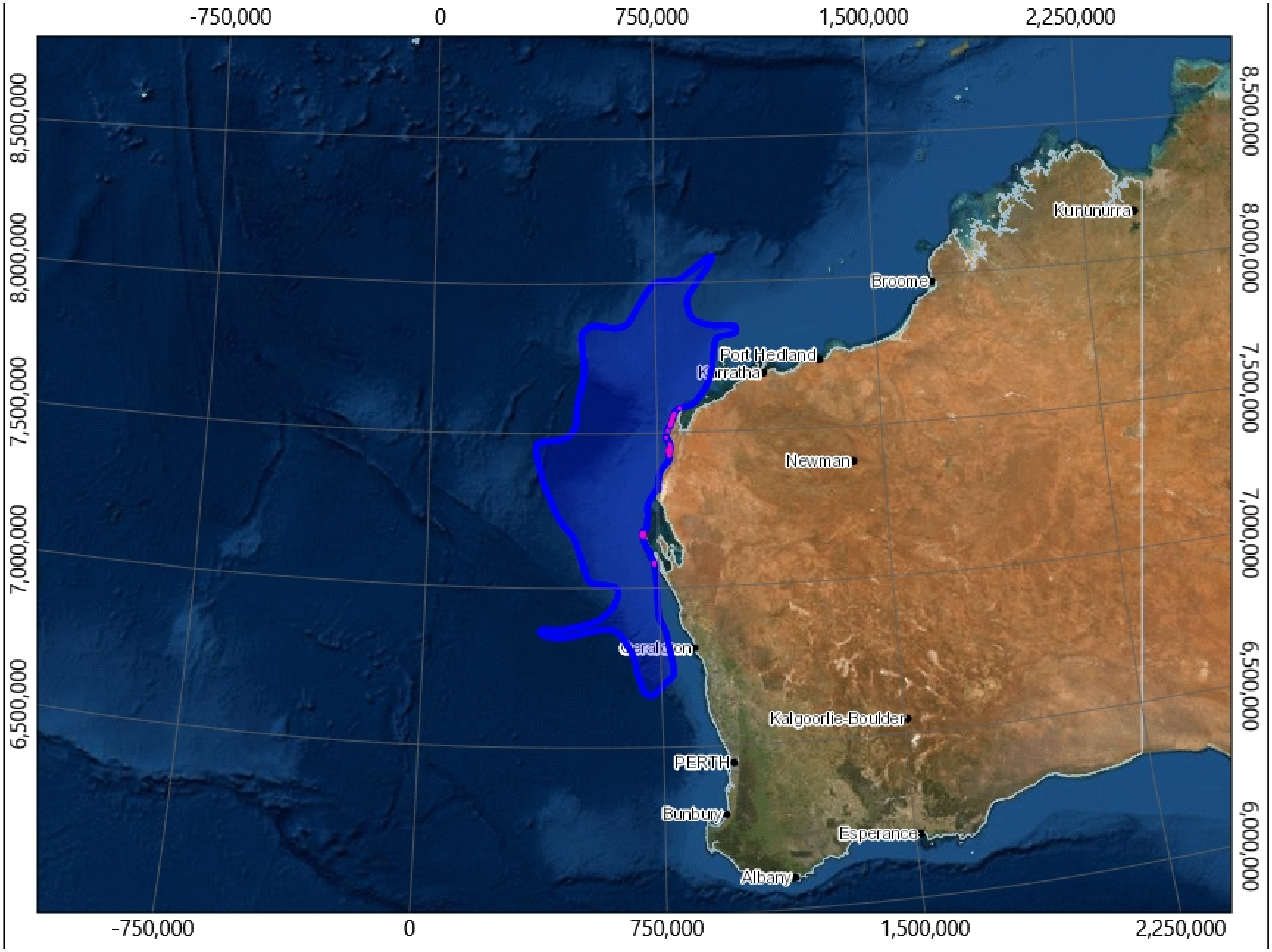
ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
6801	NORTH T-BONE BAY	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	801666mE 7562059mN Zone 49 [Reliable]	P06159
6802	OSPREY BAY 1	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	792742mE 7538149mN Zone 49 [Reliable]	P06160
6803	OSPREY BAY 2	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	792742mE 7538049mN Zone 49 [Reliable]	P06161
6804	OSPREY BAY 3	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	792542mE 7537849mN Zone 49 [Reliable]	P06162
6805	OSPREY BAY 4	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	792342mE 7537049mN Zone 49 [Reliable]	P06163
6806	OSPREY BAY 5	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	792742mE 7538149mN Zone 49 [Reliable]	P06164
6827	CORAL BAY SKELETON	No	No	No Gender Restrictions	Registered Site	Skeletal Material / Burial	*Registered Knowledge Holder names available from DAA	785143mE 7445149mN Zone 49 [Unreliable]	P06132
7126	MESA CAMP	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	798442mE 7554749mN Zone 49 [Unreliable]	P05792
7203	BAUBOODJOO POINT (Bruboodjoo Midden Site)	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter, Camp, Hunting Place	*Registered Knowledge Holder names available from DAA	789242mE 7456149mN Zone 49 [Reliable]	P05707
7205	TWIN HILL FISHING PLACE.	No	No	No Gender Restrictions	Registered Site	Hunting Place	*Registered Knowledge Holder names available from DAA	787042mE 7467649mN Zone 49 [Unreliable]	P05709
7254	SANDY BAY NORTH	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	793442mE 7539949mN Zone 49 [Reliable]	P05652
7265	LAKE SIDE VIEW	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	800942mE 7560549mN Zone 49 [Reliable]	P05664

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
7298	YARDIE CREEK ROCKSHELTERS	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter	*Registered Knowledge Holder names available from DAA	790635mE 7529704mN Zone 49 [Reliable]	P05644
7299	YARDIE CREEK	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	789642mE 7528649mN Zone 49 [Unreliable]	P05645
7300	MANDU MANDU CK ROCKSHELTERS	Yes	Yes	No Gender Restrictions	Registered Site	Artefacts / Scatter	*Registered Knowledge Holder names available from DAA	Not available when location is restricted	P05646
7303	TULKI WELL MIDDEN	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	798642mE 7554249mN Zone 49 [Reliable]	P05649
7304	PILGRAMUNNA BAY MIDDEN	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	794642mE 7543349mN Zone 49 [Reliable]	P05650
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 DAA	804142mE 7568149mN Zone 49 [Reliable]	P05651
10381	VLAMING HEAD	Yes	Yes	No Gender Restrictions	Registered Site	Ceremonial, Mythological	*Registered Knowledge Holder names available from DAA	Not available when location is restricted	P01799
10999	CRAYFISH BAY.	No	No	No Gender Restrictions	Registered Site	Historical, Man-Made Structure, Other: STOCKADES	*Registered Knowledge Holder names available from DAA	729642mE 7084646mN Zone 49 [Unreliable]	P01151
11458	NINGALOO (near)	No	No	No Gender Restrictions	Registered Site	Painting	*Registered Knowledge Holder names available from DAA	781642mE 7511649mN Zone 49 [Unreliable]	P00701
11552	FALSE ENTRANCE.	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter, Camp	*Registered Knowledge Holder names available from DAA	730642mE 7079646mN Zone 49 [Unreliable]	P00634
16597	Baler Bluff	No	No	No Gender Restrictions	Registered Site	Artefacts / Scatter, Midden / Scatter, Shell	*Registered Knowledge Holder names available from DAA	788977mE 7464149mN Zone 49 [Reliable]	
17193	Ningaloo Station	No	No	No Gender Restrictions	Registered Site	Skeletal Material / Burial	*Registered Knowledge Holder names available from DAA	775891mE 7489149mN Zone 49 [Unreliable]	

Department of Planning, Lands and Heritage
GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites



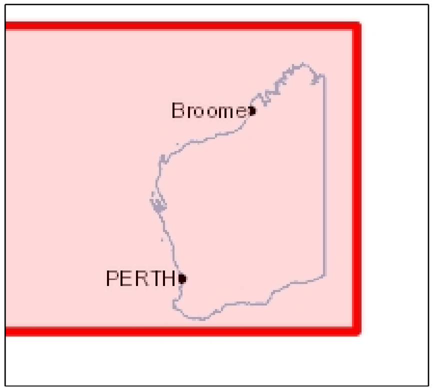
Legend

- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

684.40 kilometres

Map Scale 1 : 20,740,000

MGA Zone 49 (GDA94)



 Map created: 23/09/2021 9:02:41 AM by: GIS_NET_USER Identifier: 565580

Aboriginal Heritage Inquiry System

List of Other Heritage Places

Search Criteria

11 Other Heritage Places in Shapefile - EMBA_20210922

Disclaimer

The Aboriginal Heritage Act 1972 preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at AboriginalHeritage@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.

Copyright

Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Terminology (NB that some terminology has varied over the life of the legislation)

Place ID/Site ID: This a unique ID assigned by the Department of Planning, Lands and Heritage to the place.
Status:

- Registered Site: The place has been assessed as meeting Section 5 of the Aboriginal Heritage Act 1972.
- Other Heritage Place which includes:
  - Stored Data / Not a Site: The place has been assessed as not meeting Section 5 of the Aboriginal Heritage Act 1972.
  - Lodged: Information has been received in relation to the place, but an assessment has not been completed at this stage to determine if it meets Section 5 of the Aboriginal Heritage Act 1972.

Access and Restrictions:

- File Restricted = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the place is not restricted in any way.
- File Restricted = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the place is restricted if it is considered culturally sensitive. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the informants who provided the information. To request access please contact AboriginalHeritage@dplh.wa.gov.au.
- Boundary Restricted = No: Place location is shown as accurately as the information lodged with the Registrar allows.
- Boundary Restricted = Yes: To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the place is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- Restrictions:
  - No Restrictions: Anyone can view the information.
  - Male Access Only: Only males can view restricted information.
  - 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

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

Aboriginal Heritage Inquiry System

List of Other Heritage Places

ID	Name	File Restricted	Boundary Restricted	Restrictions	Status	Type	Knowledge Holders	Coordinate	Legacy ID
6783	28 MILE CREEK NORTH 2	No	No	No Gender Restrictions	Lodged	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	795452mE 7546377mN Zone 49 [Reliable]	P06141
6786	LAKESIDE COASTAL PLAIN	No	No	No Gender Restrictions	Lodged	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	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 DAA	798642mE 7554649mN Zone 49 [Unreliable]	P06147
7204	CHABJUWARDOO BAY.	No	No	No Gender Restrictions	Lodged	Hunting Place	*Registered Knowledge Holder names available from DAA	789442mE 7460849mN Zone 49 [Reliable]	P05708
7208	MILYERING ROCKS.	No	No	No Gender Restrictions	Lodged	Hunting Place	*Registered Knowledge Holder names available from DAA	800842mE 7560649mN Zone 49 [Reliable]	P05712
7212	GREYLING CLIFFS.	No	No	No Gender Restrictions	Lodged	Hunting Place	*Registered Knowledge Holder names available from DAA	788642mE 7447048mN Zone 49 [Unreliable]	P05716
10099	POINT MAUD, CORAL BAY	No	No	No Gender Restrictions	Lodged	Skeletal Material / Burial	*Registered Knowledge Holder names available from DAA	783342mE 7440448mN Zone 49 [Unreliable]	P02064
10100	GNARALOO BAY	No	No	No Gender Restrictions	Lodged	Skeletal Material / Burial	*Registered Knowledge Holder names available from DAA	755138mE 7365149mN Zone 49 [Reliable]	P02065
10595	CORAL BAY BURIAL	No	No	No Gender Restrictions	Lodged	Skeletal Material / Burial	*Registered Knowledge Holder names available from DAA	783942mE 7429848mN Zone 49 [Unreliable]	P01594
11801	COASTAL MIDDEN, 5 MILE	No	No	No Gender Restrictions	Lodged	Artefacts / Scatter, Midden / Scatter	*Registered Knowledge Holder names available from DAA	195638mE 7582655mN Zone 50 [Unreliable]	P00345
25076	Norwegian Bay Burial 01/2008	No	No	No Gender Restrictions	Lodged	Skeletal Material / Burial	*Registered Knowledge Holder names available from DAA	774175mE 7499790mN Zone 49 [Reliable]	

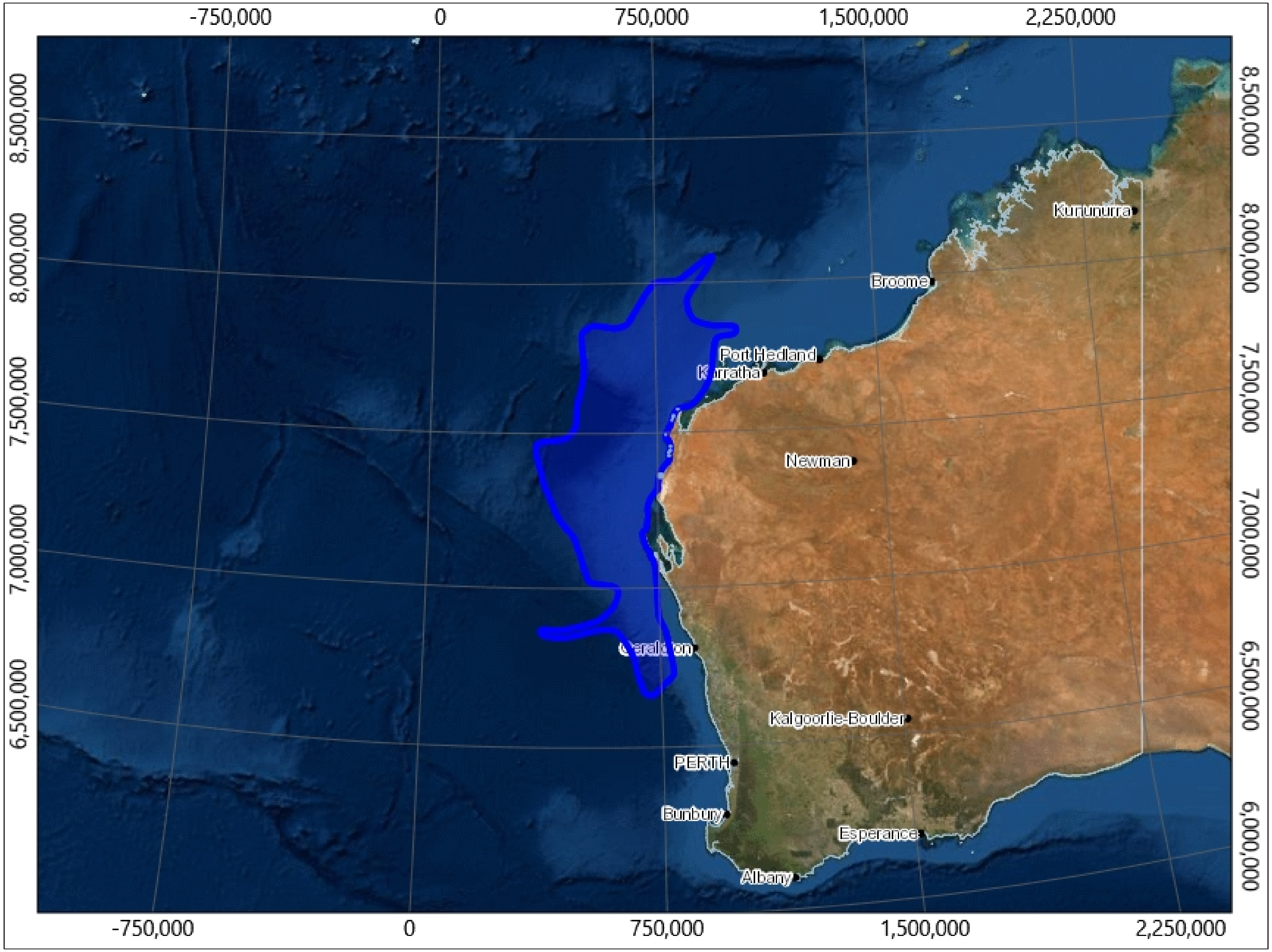
Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Other Heritage Places

For further important information on using this information please see the Department of Planning, Lands and Heritage's Disclaimer statement at https://www.dplh.wa.gov.au/about-this-website



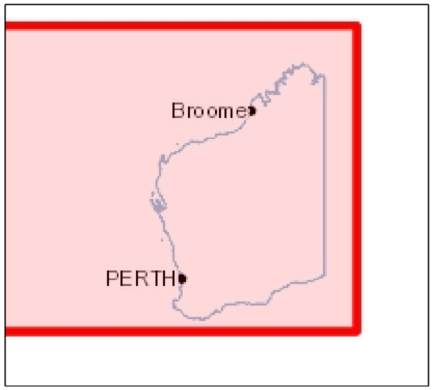
Legend

- Other Heritage Place
- Search Area
- Town
- Road
- River
- Local Government Authority

684.40 kilometres

Map Scale 1 : 20,740,000

MGA Zone 49 (GDA94)



APPENDIX H FIRST STRIKE PLAN

Enfield Subsea Infrastructure Decommissioning (WA-28-L) – Oil Pollution First Strike Plan

Security & Emergency Management
Hydrocarbon Spill Preparedness

January 2021
Revision 0

TABLE OF CONTENTS

ENFIELD SUBSEA DECOMMISSIONING OIL POLLUTION FIRST STRIKE PLAN

SPILL FROM VESSEL *(Note: SOPEP should be implemented in conjunction with this document)*	**CONTROL AGENCY (ALL LEVELS):**	**AMSA (Commonwealth waters)** **Department of Transport (DoT) (State waters) with response assistance from Woodside**

See **Table A** below for a guidance to incident characteristics of Levels 1 to 3.

Guidance to Oil Spill Incident Levels

The most significant characteristic of the below guidance should be considered when determining level or escalation potential.

Table A: Guidance to the characteristics of incident Levels 1 to 3

Characteristic	Level 1 Indicators	Level 2 Indicators	Level 3 Indicators
General Description	Generally able to be resolved within 24-48 hours.	Generally, a response is required beyond 48 hours.	Response may extend beyond weeks.
Woodside Emergency Management (EM)/Crisis Management Team (CMT) Activation	Onsite Incident Controller (IC), e.g. vessel master, activated. Use of ICC support may be required.	Handover of Control from Onsite IC to Corporate Incident Coordination Centre (CICC) Duty Manager (DM) in Perth.	Includes Perth based CMT activation.
Number of Agencies	First-response agency and Incident Management Team (IMT).	Multi-agency response.	Agencies from across government and industry.
Environment	Isolated impacts or with natural recovery expected within weeks.	Significant impacts and recovery may take months.	Significant area and recovery may take months to years. Remediation required.
Economy	Business level disruption (i.e. Woodside).	Business failure or 'Channel' impacts.	Disruption to a sector.
Public Affairs	Local and regional media coverage (WA).	National media coverage.	International media coverage.

For guidance on credible spill scenarios and hydrocarbon characteristics refer to Appendix A.

For Spills Entering State Waters

If a spill arising from a vessel impacts State waters/shorelines, then the Western Australia Department of Transport (DoT), as Hazard Management Agency (HMA), will become the Control Agency for the response in State waters/shorelines only. In the event DoT become the Control Agency, they will appoint an Incident Controller (IC) and form a separate Incident Management Team to manage the response.

Whilst not applicable for this activity, i.e. a spill arising from a vessel, if assistance is requested by DoT, the coordination structure for Woodside to interface with DoT is shown in APPENDIX E – Coordination Structure for a Concurrent Hydrocarbon Spill in Both Commonwealth And State Waters/Shorelines.

Initially Woodside would be required to make available an appropriate number of suitably qualified persons to work in the DoT IMT (see APPENDIX G). DoT's role as the Controlling Agency/HMA for spills arising from a vessel impacting State waters/shorelines 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/shorelines 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):

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 F.

Response Process Overview

Use the below to determine which parts of this plan are relevant to the incident.

For guidance on credible scenarios and hydrocarbon characteristics, refer to APPENDIX A.

Vessel Incident

Level 1

Implement Section 1, 2 & 4

Notify the WCC on [redacted]

Make relevant notifications in Table 1-1 of this Oil Pollution First Strike Plan.

Coordinate pre-identified tactics in Table 2-1 of this Oil Pollution First Strike 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.

Handover control to AMSA.

Level 2/3

Implement Section 1

Notify the WCC on [redacted] to stand up the CICC.

CICC DM to coordinate relevant notifications in Table 1-1 of this Oil Pollution First Strike Plan.

If requested by AMSA implement sections 3 &4 (continue below)

Undertake quick revalidation of the recommended strategies on Table 3-1 taking into consideration seasonal sensitivities and current situational awareness.

Undertake validated strategies.

Create an IAP for all ongoing operational periods

The content of the IAP should reflect the selected response strategies based on current situational awareness.

There are no RPA's and therefore no pre-operational NEBA has been prepared. A simplified NEBA was conducted and can be found in the OSPRMA at Appendix A.

1. NOTIFICATIONS (ALL LEVELS)

The Incident Controller or delegate must ensure the below notifications (**Table 1-1**) are completed within the designated timeframes.

For other environmental notifications required refer to the Enfield Subsea Infrastructure Decommissioning (WA-28-L) Environment Plan.

Table 1-1: Immediate Notifications

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
Notifications to be made for **ALL LEVELS** of spill *(For spills from a vessel the following notifications must be undertaken by a Woodside (WEL) representative).*							
In the event of an incident between Enfield and Nganhurra campaign vessels, activate relevant vessel Emergency Response Plans and/or Bridging Documents							
In the event of an incident impacting Enfield live well infrastructure, also activate Enfield Plug and Abandonment Oil Pollution First Strike Plan							
Immediately	Vessel Master	Woodside Communication Centre (WCC)	Duty Manager	[redacted]	Verbally notify WCC of event and estimated volume and hydrocarbon type.	Verbal	
Within 2 hours	Woodside Site Rep (WSR)	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).	App B Form 1	
Within 3 days	WSR				Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DMIRS).	App B Form 2	

[1] Notification to NOPSEMA must be from a Woodside Representative.

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
					NOPSEMA: [redacted]. NOPTA: [redacted] DMIRS: [redacted]		
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	
As soon as practicable if spill is likely to extend into WA State waters.	CICC DM or Delegate	WA Department of Transport	DoT Duty Manager	[redacted]	Marine Duty Manager to verbally notify DoT that a spill has occurred and, if required, request use of equipment stored in Karratha. 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.	App B Form 5	
As soon as practicable	CICC DM or Delegate	Department of Agriculture, Water and the Environment (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	Verbal	

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
					• confirmation of access to relevant monitoring and evaluation reports when available.		
Without delay as per Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cth), part II, section 11	Vessel Master	Australian Maritime Safety Authority (AMSA)	Response Coordination Centre (RCC)	[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.	App B Form 3	
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 **IC/CICC DM, CMT Leader or Oil Spill Preparedness Manager** 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.	App B Form 4	
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. For mobilisation of resources, send the Mobilisation Form to OSRL as soon as practicable. The mobilisation form requires to be signed by a nominated callout authority from Woodside.	Notification: App B Form 6a Mobilisation: App B Form 6b	

Notification timing	Responsibility	Authority /Company	Name	Contact Number	Instruction	Form/ Template	Mark Complete (✓)
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 Biodiversity, Conservation and Attractions	CICC DM or Delegate	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Duty Officer	[redacted]	Phone call notification	Verbal	
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]	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. LEVEL 1 RESPONSE

2.1 Mobilisation of Response Techniques

For the relevant hydrocarbon type, undertake quick revalidation of the recommended techniques and pre-identified tactics indicated with a 'Yes' in **Table 2-1**. Undertake all validated pre-identified tactics immediately. These tactics should be carried out using the associated plan identified under **Table 2-1** Operational Plan column.

All response techniques and pre-identified tactics have been identified from the pre-operational Net Environmental Benefits Analysis (NEBA) presented in the Enfield Decommissioning Environment Plan Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment).

Table 2-1: Level 1 Response Summary

Response Techniques	Hydrocarbon Type Marine Diesel Oil	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
Monitor and evaluate – tracking buoy (OM02)	Yes	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 KBSB Stockpile.	Operations	**DAY 1:** Tracking buoy deployed within two hours.		Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan.
Please consider instructing the CICC DM to activate or implement any of the following Pre-Identified tactics. The following tactics will assist in answering the '7 Questions of Spill Assessment' identified in Appendix C to increase situational awareness.						
Monitor and evaluate – predictive modelling (OM01)	Yes	Undertake initial modelling using the Rapid assessment oil spill tool and weathering fate analysis using ADIOS (or refer to the hydrocarbon information in Appendix A).	Intelligence or Environment	**DAY 1:** Initial modelling within six 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	Send Oil Spill Trajectory Modelling (OSTM) form (Appendix B Form 7) to RPS APASA response team (email [redacted]) and call RPS Response Duty Officer Phone [redacted]	Intelligence	**DAY 1:** Detailed modelling within four hours of APASA receiving information from Woodside.		
Monitor and evaluate – aerial surveillance (OM02)	Yes	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:** Two trained aerial observers. One aircraft available.		Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan). *Planning to download immediately and follow steps*
Monitor and evaluate – satellite tracking (OM02)	Yes	The Intelligence duty manager should be instructed to stand up KSAT to provide satellite imagery of the spill. [redacted]	Intelligence	**DAY 1:** Service provider will confirm availability of an initial		

Response Techniques	Hydrocarbon Type Marine Diesel Oil	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
				acquisition within two hours. Data received to be uploaded into Woodside Common Operating Picture.		
Monitor and evaluate – monitoring hydrocarbons in water (OM03)	Yes	Consider the need to mobilise resources to undertake water quality monitoring (OM03).	Planning or Environment	**DAY 3:** Water quality assessments access and capability.		Detecting and Monitoring for the Presence and Properties of Hydrocarbons in the Marine Environment (OM03 of The Operational Monitoring Operational Plan).
Monitor and evaluate – pre-emptive assessment of receptors at risk (OM04)	Yes	Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04).	Planning or Environment	**DAY 2:** In agreement with WA DoT, deployment of two specialist for each of the Response Protection Areas (RPA) with predicted impacts.		Pre-emptive Assessment of Sensitive Receptors (OM04 of The Operational Monitoring Operational Plan).
Monitor and evaluate – shoreline assessment (OM05)	Yes	Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	**DAY 2:** In agreement with WA DoT, deployment of two specialists in SCAT for each of the RPAs with predicted impacts.		Shoreline Assessment (OM05 of The Operational Monitoring Operational Plan).

3. LEVEL 2/3 RESPONSE

3.1 Mobilisation of Response Techniques

For the relevant hydrocarbon type, undertake quick revalidation of the recommended techniques and pre-identified tactics indicated with a 'Yes' in **Table 3-1.** Undertake all validated pre-identified tactics immediately. These tactics should be carried out using the associated plan identified under **Table 3-1** Operational Plan column.

All response techniques and pre-identified tactics have been identified from the pre-operational Net Environmental Benefits Analysis (NEBA) presented in the Enfield Subsea Decommissioning Environment Plan Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment).

Table 3-1: Level 2/3 Response Summary

Response Techniques	Hydrocarbon Type Marine Diesel Oil	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Complete ✓	Link to Operational Plans for notification numbers and actions
Please consider instructing the CICC DM to activate or implement any of the following Pre-Identified tactics. The following tactics will assist in answering the '7 Questions of Spill Assessment' identified in Appendix C to increase situational awareness.						
Monitor and evaluate – predictive modelling (OM01)	Yes	Undertake initial modelling using the Rapid assessment oil spill tool and weathering fate analysis using ADIOS (or refer to the hydrocarbon information in Appendix A).	Intelligence or Environment	**DAY 1:** Initial modelling within six hours using the Rapid Assessment Tool. Detailed modelling within four hours of RPS receiving information from Woodside.		Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01 of The Operational Monitoring Operational Plan).
	Yes	Send Oil Spill Trajectory Modelling (OSTM) form (Appendix B Form 7) to RPS ([redacted]) and call RPS Response Duty Officer Phone [redacted]	Intelligence	**DAY 1:** Detailed modelling within 4 hours of RPS receiving information from Woodside.		
Monitor and evaluate – tracking buoy (OM02)	Yes	Confirm whether the vessel on location has deployed a tracking buoy.	Operations	**DAY 1:** Tracking buoy deployed within two hours.		Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan) Deploy tracking buoy in accordance with APPENDIX D – Tracking buoy deployment instructions.
Monitor and evaluate – aerial surveillance (OM02)	Yes	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:** Two trained aerial observers. One aircraft available.		
Monitor and evaluate – satellite	Yes	The Intelligence duty manager should be instructed to stand up Kongsberg Satellite Services (KSAT) to provide satellite imagery of the	Intelligence	**DAY 1:** Service provider will confirm availability of		

tracking (OM02)		spill (email [redacted])		an initial acquisition within two hours. Data received to be uploaded into Woodside Common Operating Picture.		
Monitor and evaluate – monitoring hydrocarbons in water (OM03)	Yes	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).
Monitor and evaluate – pre-emptive assessment of receptors at risk (OM04)	Yes	Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04).	Planning or Environment	**DAY 2:** In agreement with WA DoT, deployment of two 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).
Monitor and evaluate – shoreline assessment (OM05)	Yes	Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	**DAY 2:** In agreement with WA DoT, deployment of two specialists in SCAT for each of the RPAs with predicted impacts.		Shoreline Assessment (OM05 of The Operational Monitoring Operational Plan).
Surface Dispersant	No	This response strategy is not recommended.				
Mechanical Dispersion	No	This response strategy is not recommended.				
Containment and Recovery	No	This response strategy is not recommended.				
In-situ Burning	No	This response strategy is not recommended.				

Shoreline Protection and Deflection	Yes	Equipment from Woodside, AMOSC and AMSA Western Australian Stockpiles mobilised. Consideration of mobilisation of interstate/international shoreline protection equipment (i.e. OSRL).	Logistics and Planning	**DAY 1:** In agreement with WA DoT, activate relevant Tactical Response Plans (TRPs) within 12 hours. In agreement with WA DoT, mobilise teams to RPAs within 12 hours of operational monitoring predicting impacts. In agreement with WA DoT, equipment mobilised from closest stockpile within 12-hours. Supplementary equipment mobilised from State, AMOSC, AMSA stockpiles within 24 hours **DAY 2:** Supplementary equipment mobilised from OSRL within 48 hours		Protection and Deflection Operational Plan *Logistics to download immediately and follow steps*
Shoreline Clean Up	Yes	Equipment from Woodside, AMOSC and AMSA Western Australian Stockpiles and relevant personnel mobilised. Consideration of mobilisation of interstate/international shoreline clean-up equipment and relevant personnel (i.e. OSRL).	Logistics and Planning	**DAY 1:** Equipment mobilised from closest stockpile within 12 hours TRPs available for at risk shorelines within 24 hours. **DAY 2:** Deployment of shoreline clean-up		Shoreline Clean-up Operational Plan *Logistics to download immediately and follow steps*

				teams to contaminated RPAs. Access to at least 2000 m^3 of solid and liquid waste storage available within 4 days upon activation of 3rd party contract.		
Oiled Wildlife Response	Yes	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	**DAY 5:** Contracted capability to treat up to an additional 250 individual fauna within a five-day period. Facilities for oiled wildlife rehabilitation are operational 24/7		Oiled Wildlife Response Operational Plan and relevant Tactical Response Plans
Scientific Monitoring (Type II)	Yes	Notify Woodside science team of spill event.	Environment			Oil Spill Scientific Monitoring Programme – Operational Plan

4. PRIORITY RECEPTORS

Based on hydrocarbon spill risk modelling results there are no sensitive receptors identified to have the potential to be contacted by hydrocarbon at or above impact threshold levels within 48 hours of a spill. Please note that impact thresholds (10 g/m^2 surface hydrocarbon concentration, 100 g/m^2 shoreline accumulation, and 100 ppb entrained hydrocarbon concentration) are used to determine the 'environment that may be affected' (EMBA) identified in the Environment Plan and are lower than response thresholds shown in **Table 4-1**.

Table 4-1: Response Thresholds

Surface Hydrocarbon (g/m^2)	Description
>10	Predicted minimum threshold for commencing operational monitoring[2]
50	Predicted minimum floating oil threshold for containment and recovery and surface dispersant application[3]
100	Predicted optimum floating oil threshold for containment and recovery and surface dispersant application
100	Predicted minimum shoreline accumulation threshold for shoreline assessment operations
250	Predicted minimum threshold for commencing shoreline clean-up operations

Table 4-2: Receptors for Priority Protection with Potential Impact within 48 Hours (Credible Scenario-01)

Receptor	Distance and Direction from Operational Area (km)	Minimum time to shoreline contact (above 100g/m^2) in days	Maximum shoreline accumulation (above 100g/m^2) in m^3	Tactical Response Plans (also available within the Data Directory DRIMS#9542566)
N/A – No contact at or above impact threshold levels within 48 hours				

Hydrocarbon spill modelling results indicate the sensitive receptors listed below have the potential to be contacted by hydrocarbons beyond 48 hours of a spill:

- Ningaloo Coast North (incl. WHA, 2.5 days)
- Ningaloo Coast Middle (incl. WHA, 4 days)
- Muiron Islands (incl. MMA-WHA, 5 days)

Tactical Response plans for these locations can be accessed via the Oil Spill Portal - Tactical Response Plans.[4]

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 4-1 illustrates the location of regional sensitive receptors in relation to the Enfield Subsea Decommissioning Operational Area and identifies priority protection areas.

[2] 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 WA DoT or AMSA.
[3] At 50g/m^2 containment and recovery and surface dispersant application operations are not expected to be particularly effective. This threshold represents a conservative approach to planning response capability and displaying the spread of surface oil.
[4] The Tactical Response Plans for the RPA's identified contain the details of potential forward operating bases and staging areas.
Incident Command Centre: For Level 1 incidents the in-field team and asset operator will lead the response on-scene. For level 2/3 Incident the Incident command Centre will be located in Perth at Woodside's Building. The Woodside CICC is fully equipped with communications equipment and technology to ensure the coordination of response activities for the overall response.

Consideration should be given to other stakeholders (including mariners) in the vicinity of the spill location. **Table 4-3** indicates the assets within the vicinity of the Enfield Subsea Decommissioning Operational Area.

Table 4-3: Assets in the vicinity of the Enfield Subsea Decommissioning Operational Area

Asset	Distance and Direction from Operational Area	Operator
Ngujima Yin FPSO	~ 5 km NE	Woodside
Ningaloo Vision FPSO	~ 8 km NE	Santos
Pyrenees FPSO	~ 9 km SE	BHP

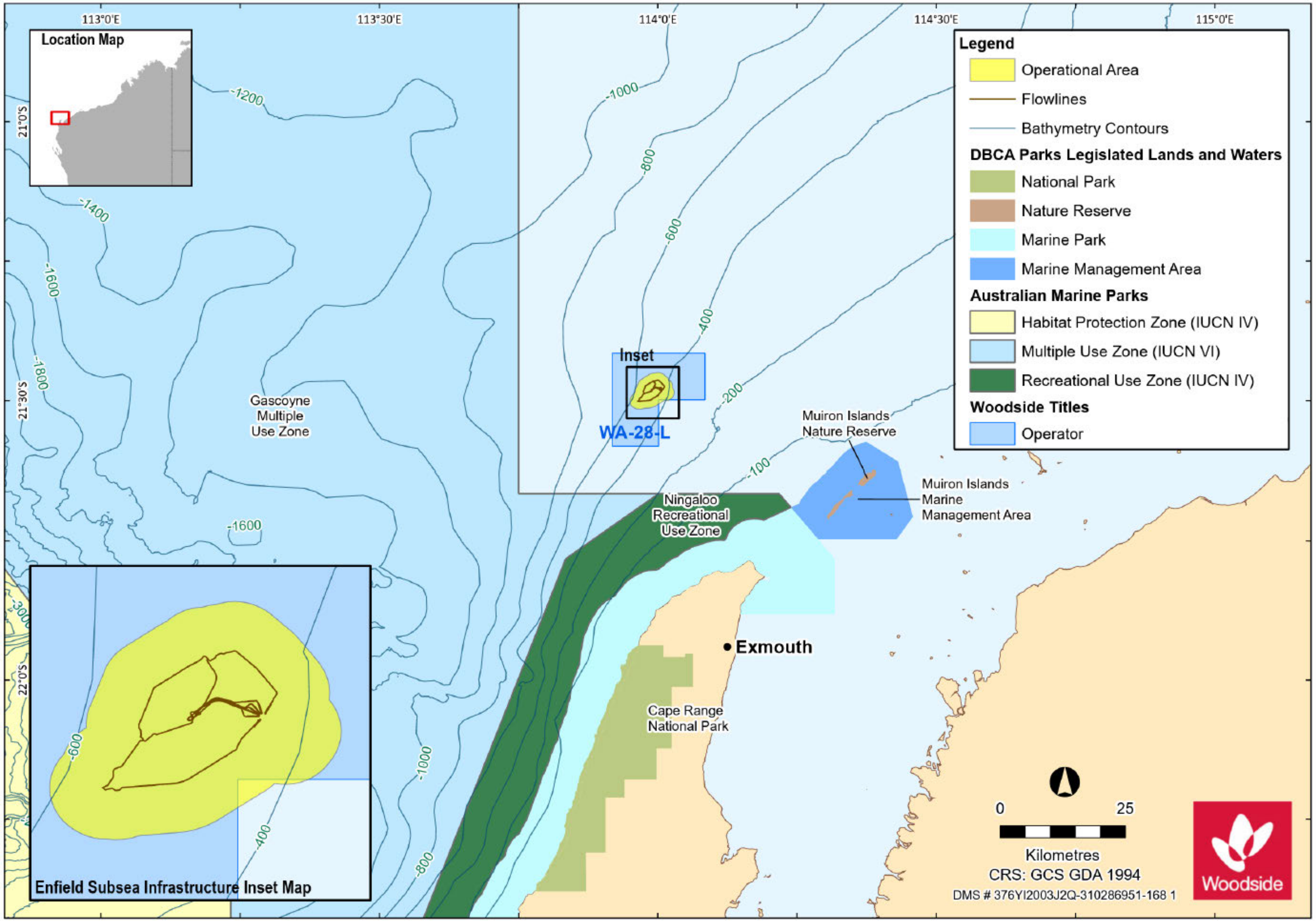


Figure 4-1: Regional sensitive receptors

5. DISPERSANT APPLICATION

Dispersant is not considered an appropriate response strategy for this activity as described in the Enfield Subsea Infrastructure Decommissioning (WA-28-L) Environment Plan Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment).

APPENDIX A – CREDIBLE SPILL SCENARIO AND HYDROCARBON INFORMATION

For more detailed hydrocarbon information see the [Hydrocarbon Data Directory]

Credible Spill Scenarios

Scenario	Product	Maximum Volumes	Suggested ADIOS2 Analogue*
CS-01 (WCCS) **Unplanned hydrocarbon release caused by marine vessel collision**	Marine diesel (API 37.2°)	500 m^3	Diesel Fuel Oil (API 37.2°)
CS-02 **Loss of containment caused by refuelling hose failure, coupling failure or operator error**	Marine diesel (API 37.2°)	8 m^3	Diesel Fuel Oil (API 37.2°)

*Initial screening of possible ADIOS2 analogues was done by considering hydrocarbons with similar APIs. Suggested selection was based on the closest distillation cut to WEL hydrocarbon. Only hydrocarbons with distillation cuts that showed results for > 380°C were included in selection process.

Marine Diesel (Group 2 Oil)

Marine diesel (API 37.2°) 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. The aromatic content of the oil is approximately 3%.

Under the test, variable-wind case, where the winds are of greater strength, entrainment into the water column is indicated to be significant. Approximately 2 days after the spill, around 45% of the oil mass is forecast to have entrained and a further 45% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface. The residual compounds will tend to entrain beneath the surface under conditions that generate wind waves (> ~6 m/s) (refer to **Figure A-0-1**).

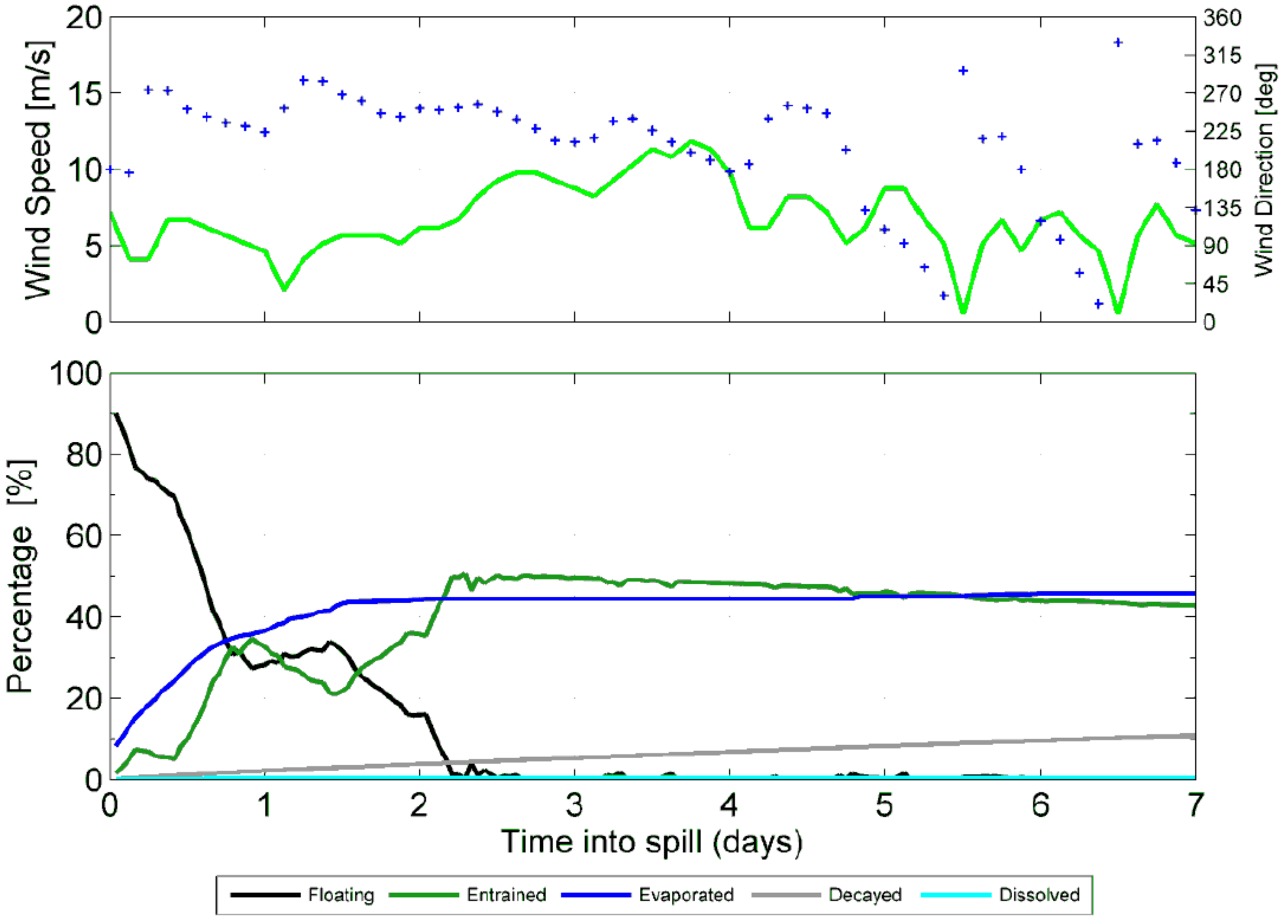


Figure A-0-1: Proportional mass balance plot representing the weathering of marine diesel spilled onto the water surface as a one-off release (50 m³ over one hour) and subject to variable wind at 27 °C water temperature and 25 °C air temperature

APPENDIX B – FORMS

Form 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 Note	[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]

FORM 1

Record of initial verbal notification to NOPSEMA

(NOPSEMA ph: [redacted])

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. Hydrocarbon source** □ **Platform**____________________ □ **Pipeline**____________________ □ **FPSO**____________________ □ **Exploration drilling**____________________ □ **Well**____________________ □ **Other (please specify)** ____________________ **4. Hydrocarbon type**____________________ **5. Estimated volume of hydrocarbon** ____________________ **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:

1. **NOPSEMA** [redacted]
2. **NOPTA** [redacted]
3. **DMIRS** [redacted]

FORM 2

[insert NOPSEMA Incident Report Form when printing]

[redacted]

FORM 3

[insert Marine Pollution Report (POLREP – AMSA) when printing]

[redacted]

FORM 4

[insert AMOSC Service Contract note when printing]

[redacted]

FORM 5

[insert Marine Pollution Report (POLREP – DoT) when printing]

[redacted]

FORM 6a

[insert OSRL Initial Notification Form when printing]

[redacted]

FORM 6b

[insert OSRL Mobilisation Activation Form when printing]

[redacted]

FORM 7

[insert RPS Response Oil Spill Trajectory Modelling Request form when printing]

[redacted]

FORM 8

[insert Aerial Surveillance Observer Log when printing]

[redacted]

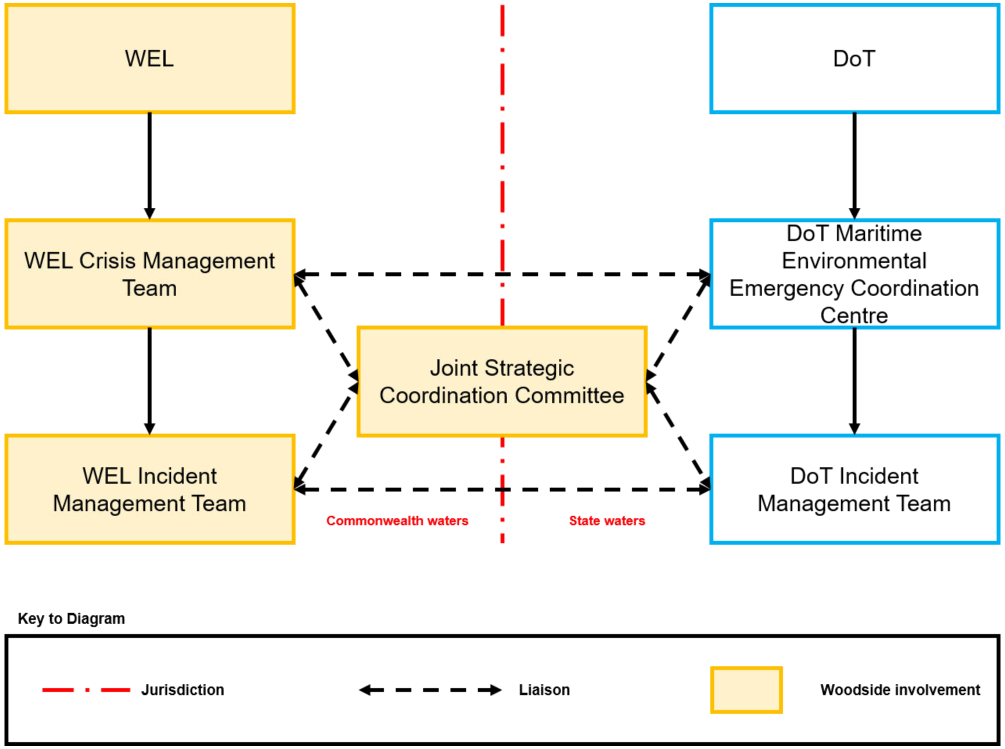
APPENDIX C – 7 QUESTIONS OF SPILL ASSESSMENT

WHAT IS IT? **Oil Type/name** **Oil properties** **Specific gravity / viscosity / pour point / asphaltenes / wax content / boiling point**	
WHERE IS IT? Lat/Long Distance and bearing	
HOW BIG IS IT? Area Volume	
WHERE IT IS GOING? Weather conditions Currents and tides	
WHAT IS IN THE WAY? Resources at risk	
WHEN WILL IT GET THERE? Weather conditions Currents and tides	
WHAT'S HAPPENING TO IT? Weathering processes	

APPENDIX D – TRACKING BUOY DEPLOYMENT INSTRUCTIONS

(Insert [redacted] when printing)

APPENDIX E – COORDINATION STRUCTURE FOR A CONCURRENT HYDROCARBON SPILL IN BOTH COMMONWEALTH AND STATE WATERS/SHORELINES[5]

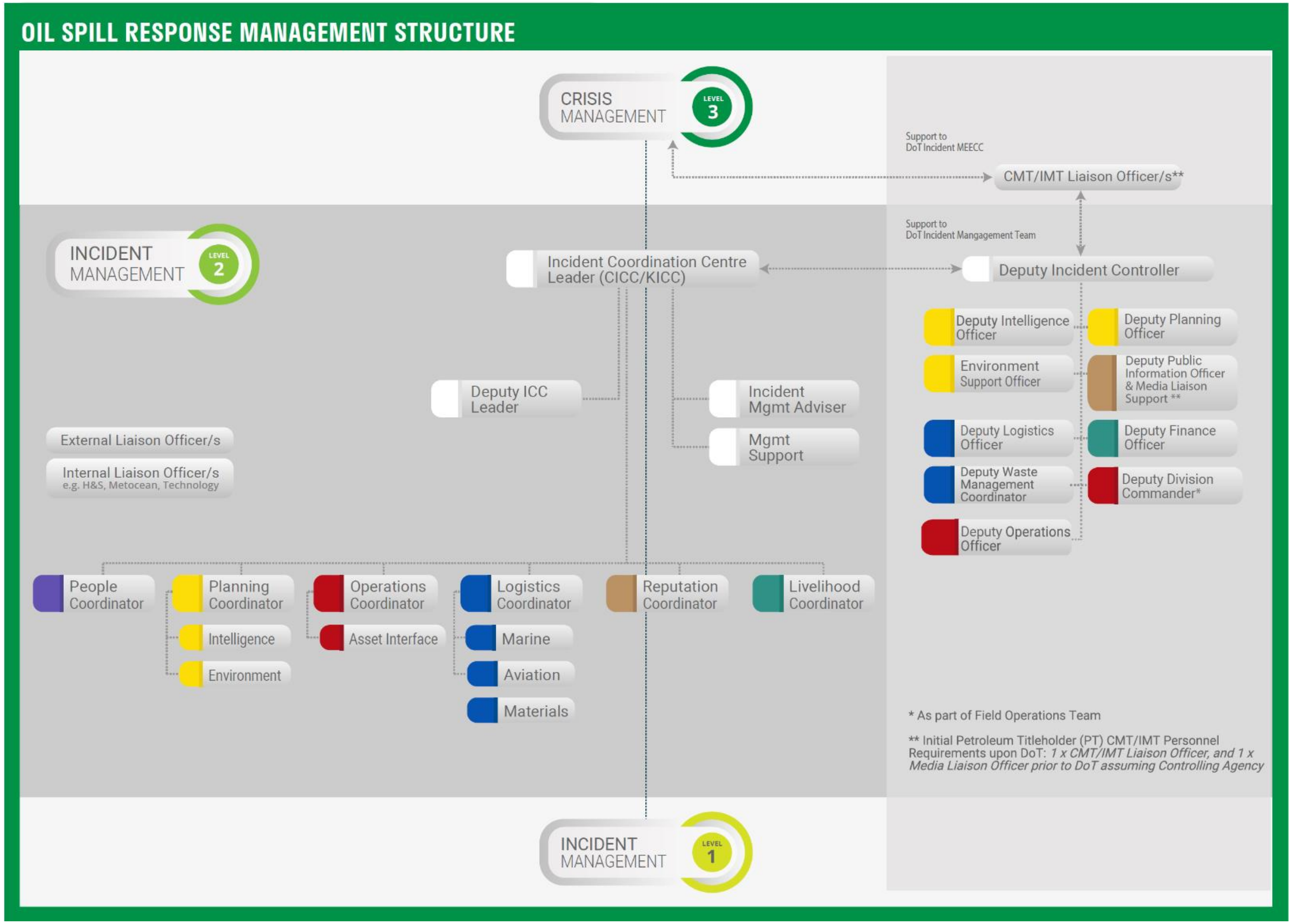


The Control Agency for a hydrocarbon spill in Commonwealth waters resulting from an offshore petroleum activity is Woodside (the Petroleum Titleholder).
The Control Agency for a hydrocarbon spill in State waters/shorelines resulting from an offshore petroleum activity is DoT. DoT will appoint an Incident 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 3.

APPENDIX F – WOODSIDE INCIDENT MANAGEMENT STRUCTURE

Woodside Incident Management Structure for Hydrocarbon Spill (including Woodside Liaison Officers Command Structure within DoT IMT if required).



APPENDIX G – WOODSIDE LIASON OFFICER RESOURCES TO DOT

Once DoT activates a State waters/shorelines IMT, Woodside will make available the following roles to DoT.

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
DoT 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. • Facilitate the provision of relevant mapping originating from the DoT IMT to the PT IMT.	1
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.	1

[6] See [redacted]

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
			• 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)**	
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. • 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.	1
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

Area	WEL Liaison Role	Personnel Sourced from[6]:	Key Duties	#
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
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

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:	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