Pluto Facility Operations Environment Plan

Australian Operations
September 2024
Rev 13

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1. INTRODUCTION

1.1 Overview

Woodside Burrup Pty. Ltd. (Woodside) is operator of the Pluto offshore facility and export pipeline on behalf of the Pluto Liquefied Natural Gas (LNG) Joint Venture Participants. The Pluto offshore facility (the facility), including the riser platform and subsea hydrocarbon gathering system, has been in production since 2012 and is operated by Woodside under the Petroleum Titles listed in Table 3-1. The facility is located offshore approximately 160 km northwest of Dampier, in WA-1-IL and WA-34-L, while the associated export pipeline and flowline are within WA-17-PL and WA-16-PL, respectively. The operation of the facility, Xena-03 Drilling and Tie-back activities, and recovery of well fluids from associated fields and subsea infrastructure is hereafter, collectively referred to as the Petroleum Activities Program. Well fluids are recovered from a series of fields via pipelines and subsea infrastructure, which are produced by the facility and exported to the onshore LNG plants for processing. Subsea tiebacks relevant to the facility include:

- Pluto
- Xena-03
- Pyxis.

The Pluto-Alpha platform (PLA) combines accommodation, utilities, operation of production facilities and the water treatment module (see Section 3). The platform is designed to be operated in both not-normally crewed and minimally crewed states. The offshore facilities are remotely operated from the Central Control Room (CCR), either from the CCR at Pluto LNG Park (PLP) or Remote CCR in Perth.

This Environment Plan (EP) has been prepared as part of the requirements under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth) (referred to as the Environment Regulations), as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

In accordance with the requirements of Regulation 41 of the Environment Regulations, Woodside has submitted a revision to the Pluto Facility Operations EP to NOPSEMA at least 14 days prior to the end of the five-year period from the original acceptance under what is now regulation 35 of the Environment Regulations. At the time of the original acceptance, the relevant provision was regulation 11 of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

In accordance with the requirements of Regulation 39 of the Environment Regulations, Woodside has revised the Pluto Facility Operations EP to incorporate a new stage of the activity which is the tie-back, commissioning and operation of the Xena-03 well. Key components of the Xena-03 tie back activity that represent a new stage of the Pluto Facility Operations EP include:

- The activity is a single well therefore the Xena-03 well and tie-back are proposed to form part of an existing production system.
- The activity would be conducted within the spatial area described in the existing Pluto Facility Operations EP, with a slight temporary expansion to the Operational Area during construction activities.
- The addition of the Xena-03 well forms an orderly continuation of the Pluto project (EPBC 2006/2968) within existing timeframes specified in EPBC approval.
- The operation of proposed Xena-03 well and subsea infrastructure is consistent with the activities already described within this Pluto Facility Operations EP.

- No further increase to the active number of wells producing to the Pluto offshore facility is planned[1].

1.2 Purpose of the Environment Plan

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

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

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

The EP defines activity-specific environmental performance outcomes, standards, and measurement criteria (MC). These form the basis for monitoring, auditing, and managing the Petroleum Activities Program to be undertaken by Woodside and its contractors. The implementation strategy specified in this EP provides Woodside and NOPSEMA with the required level of assurance that impacts and risks associated with the activity are reduced to ALARP and are acceptable.

1.3 Scope of the Environment Plan

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in Section 3, for a period of up to five years. The Petroleum Activities Area (PAA), as defined in Section 3.2.1, defines the spatial boundary of the Petroleum Activities Program.

This EP addresses potential environmental impacts from planned activities and potential unplanned events that originate from within the PAA. Transit to and from the PAA by project 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 PAA (e.g. transiting to and from port) are subject to applicable maritime regulations and other requirements and are not managed by this EP.

1.4 Environment Plan Summary

An EP summary will be prepared based on the material provided in this EP. Table 1-1 summarises the content that will be provided within the EP summary, as required by Regulation 35(7).

Table 1-1: EP Summary

EP Summary material requirement	Relevant section of this EP containing EP Summary material
The location of the activity	Section 3.2
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

[1] Accurate at the time of writing. Should development opportunities be identified during the validity of this EP, Woodside will engage with NOPSEMA to determine the appropriate environmental approval pathway prior to pursuit of the opportunity.

EP Summary material requirement	Relevant section of this EP containing EP Summary material
The arrangements for ongoing monitoring of the titleholder's environmental performance	Section 7.10
Response arrangements in the oil pollution emergency plan	Section 7.14
Consultation already undertaken and plans for ongoing consultation	Section 5
Details of the titleholder's nominated liaison person for the activity	Section 1.7.2

1.5 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 34(a): is appropriate for the nature and scale of the activity	Regulation 21: Environmental Assessment Regulation 22(1): Implementation strategy for the environment plan Regulation 24: Other information in the environment plan	The principle of 'nature and scale' applies throughout the EP	Section 2 Section 3 Section 4 Section 5 Section 6 Section 7
Regulation 34(b): demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable Regulation 34(c): demonstrates that the environmental impacts and risks of the activity will be of an acceptable level	Regulation 21(1)–21(7): 21(1) Description of the activity 21(2)(3) Description of the environment 21(4) Requirements 21(5)(6) Evaluation of environmental impacts and risks 21(7) Environmental performance outcomes and standards Regulation 24a)–24(c): A statement of the titleholder's corporate environmental policy A report on all consultations between the titleholder and any relevant person	Set the context (activity and existing environment) Define 'acceptable' (the requirements, the corporate policy, relevant persons) Detail the impacts and risks Evaluate the nature and scale Detail the control measures – ALARP and acceptable	Section 1 Section 2 Section 3 Section 4 Section 5 Section 6 Section 7
Regulation 34(d): provides for appropriate environmental performance outcomes, EPS and MC.	Regulation 21(7): Environmental performance outcomes and standards	Environmental Performance Objectives (EPOs) Environmental Performance Standards (EPSs) Measurement Criteria (MC)	Section 6
Regulation 34(e): includes an appropriate implementation strategy and monitoring,	Regulation 22: Implementation strategy for the environment plan	Implementation strategy, including: systems, practices and procedures performance monitoring	Section 7

Criteria for acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
recording, and reporting arrangements		Oil Pollution Emergency Plan (OPEP) and scientific monitoring ongoing consultation.	
Regulation 34(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	Regulation 21 (1)–21(3): 21(1) Description of the activity 21(2) Description of the environment 21(3) Without limiting [Regulation 21(2)(b)], particular relevant values and sensitivities may include any of the following: the world heritage values of a declared World Heritage property within the meaning of the EPBC Act; the national heritage values of a National Heritage place within the meaning of that Act; the ecological character of a declared Ramsar wetland within the meaning of that Act; the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act; the presence of a listed migratory species within the meaning of that Act; any values and sensitivities that exist in, or in relation to, part or all of: a Commonwealth marine area within the meaning of that Act; or Commonwealth land within the meaning of that Act.	No activity, or part of the activity, undertaken in any part of a declared World Heritage property	Section 3 Section 4 Section 6
Regulation 34(g): (i) the titleholder has carried out the consultations required by Section 25 (ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate	Regulation 25: Consultation with relevant authorities, persons and organisations, etc. Regulation 24(b): A report on all consultations under Regulation 25 of any relevant person by the titleholder, that contains: a summary of each response made by a relevant person; and an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates; and a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and (iv) a copy of the full text of any response by a relevant person;	Consultation in preparation of the EP	Section 5
Regulation 10A(h): Complies with the Act, this instrument and any other	Regulation 23: Details of the Titleholder and liaison person Regulation 24(c):	All contents of the EP must comply with the Act and the regulations	Section 1.6 Section 7.12

Criteria for acceptance	Content Requirements/Relevant Regulations	Elements	Section of EP
regulations made under the Act	Details of all reportable incidents in relation to the proposed activity.		

1.6 Description of the Titleholder

Woodside is the operator of the facility and associated infrastructure on behalf of itself and its Pluto LNG joint venture partners, MidOcean Pluto Pty Ltd and Kansai Electric Power Australia Pty Ltd. The Titleholder for this activity is Woodside (refer to Table 3-2 for a list of petroleum titles associated with the Petroleum Activities Program).

Woodside is Australia's leading natural gas producer. Woodside's operations are characterised by strong safety and environmental performance in remote and challenging locations. Wherever Woodside works, it is committed to living its values of integrity, respect, ownership, sustainability, courage, and working together.

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

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

1.7 Details of Titleholder and Nominated Liaison

In accordance with Regulation 23 of the Environment Regulations, details of the titleholder and nominated liaison and arrangements for the notification of changes are described below.

1.7.1 Titleholder

Woodside Burrup Ltd

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

ACN: 120 237 416

1.7.2 Nominated Liaison Person

Andrew Winter

Corporate Affairs Manager

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

E: feedback@woodside.com

1.7.3 Arrangements for Notifying Change

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

1.8 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 as outlined below (and illustrated in Figure 1-1):

- Our Values and Policies: Set the enterprise-wide direction for Woodside by governing our behaviours, actions, and business decisions and ensuring we meet our legal and other external obligations.
- Expectations: Set essential activities or deliverables required to achieve the objectives of the Key Business Activities and provide the basis for developing processes and procedures.
- Processes and Procedures: Processes identify the set of interrelated or interacting activities that transforms inputs into outputs, to systematically achieve a purpose or specific objective. Procedures specify what steps, by whom, and when required to carry out an activity or a process.
- Guidelines: Provide recommended practice and advice on how to perform the steps defined in Procedures, together with supporting information and associated tools. Guidelines provide advice on: how activities or tasks may be performed; information that may be taken into consideration; or, how to use tools and systems.

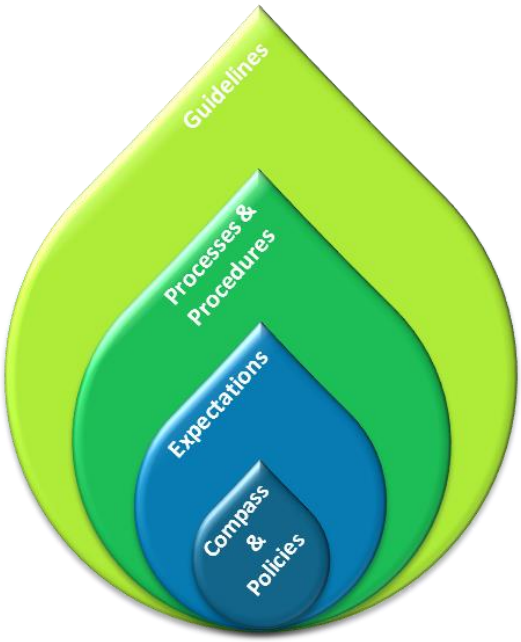

Figure 1-1: The four major elements of the Woodside Management System Seed

The WMS is organised within a Business Process Hierarchy based upon Key Business Activities so that the system remains independent of organisation structure, is globally applicable and scalable wherever required. These Key Business Activities are grouped into Management, Support, and Value Stream activities as shown in Figure 1-2. The Value Stream activities capture, generate and deliver value through the exploration and production lifecycle. The Management activities influence all areas of the business, while Support activities may influence one or more value stream activities.

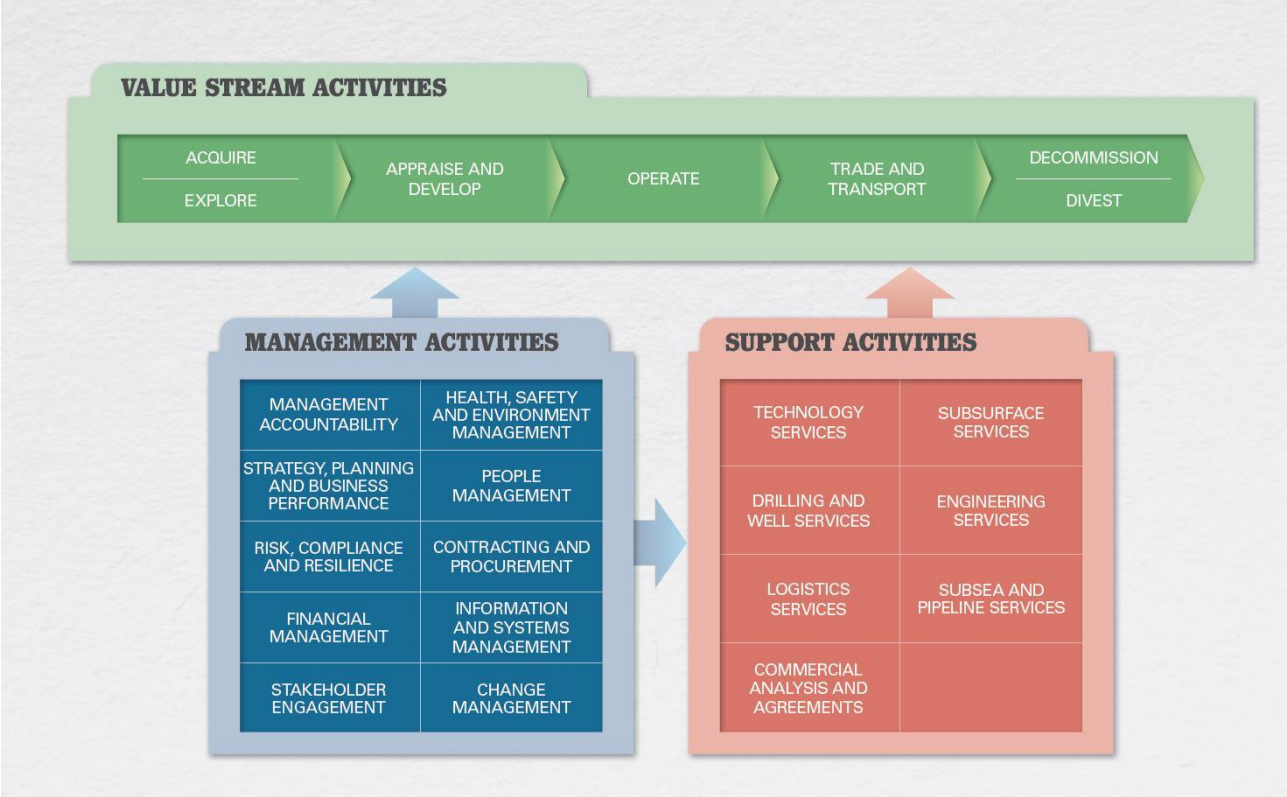

Figure 1-2: The Woodside Management System business process hierarchy

1.8.1 Environment and Biodiversity Policy

In accordance with Regulation 24(a) of the Environment Regulations, Woodside's Environment and Biodiversity Policy is provided in Appendix A of this EP.

As the objective of the policy, Woodside recognises the intrinsic value of nature and the importance of conserving biodiversity and ecosystem services to support the sustainable development of our society. We are committed to doing our part. We understand and embrace our responsibility to undertake activities in an environmentally sustainable way.

As part of the policy's principles, Woodside commits to:

- Implementing a systematic approach to the management of the impacts and risks of our operating activities on an ongoing basis, including emissions and air quality, discharge and waste management, water management, biodiversity and protected areas.
- Applying the mitigation hierarchy principle (avoid, minimise, restore) and a continuous improvement approach to ensure we maintain compliance, improve resource use efficiency and reduce our environmental impacts.
- Embedding environmental and biodiversity management, and opportunities, in our business planning and decision making processes.
- Complying with relevant laws and regulations and applying responsible standards where laws do not exist.
- Not undertaking new exploration or development of hydrocarbons within the boundaries of natural sites on the UNESCO World Heritage List (as specified at 1 December 2022). Existing activity may continue if compatible with maintenance of the listed outstanding universal values.

- Not undertaking new exploration or development of hydrocarbons within IUCN Protected Areas (as specified at 1 December 2022) unless compatible with management plans in place for the area. Existing activity may continue if compatible with management plans in place for the area.
- Achieving net zero deforestation1 associated with new projects that take a Final Investment Decision (FID) after 1 December 2022.
- Developing Biodiversity Action Plans for all new major projects (CAPEX >USD$2 billion) that take a FID after 1 December 2022.
- Supporting positive biodiversity outcomes in regions and areas in which we operate.
- Setting targets and publicly reporting on our environmental and biodiversity performance.

The application of the policy is the responsibility of all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of the policy in non-operated joint ventures.

The policy is reviewed regularly and updated as required. The version applicable to the activity covered in this EP was reviewed in December 2023.

1.9 Description of Relevant Requirements

In accordance with Regulation 21(4) of the Environment Regulations, a description of requirements, including legislative requirements, that apply to the activity and are relevant to the management of risks and impacts of the Petroleum Activities Program are detailed in Appendix B. This EP will not be assessed under the Environment Protection Act 1986 (WA) as the activity does not occur on State land or within State Waters.

1.9.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

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

The relevant requirements in Section 572 of the OPGGS Act are detailed in Table 1-3.

Table 1-3: Relevant requirements of Section 572 of the OPGGS Act

Section Number	Relevant Requirement	Relevant Section of the EP
Section 270 – Consent to surrender title[1]		
	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) made arrangements that are satisfactory to NOPSEMA in relation to that property; and	Not applicable
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 7.5

Section Number	Relevant Requirement	Relevant Section of the EP
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 and 7.5
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 7.5

1. There is no intent to surrender any titles in the scope of this EP.

Under the OPGGS Act, the Environment Regulations apply to petroleum activities in Commonwealth Waters and are administered by NOPSEMA. The objective of the Environment Regulations is to ensure petroleum activities are performed in a manner:

- consistent with the principles of ESDev
- by which the environmental impacts and risks of the activity will be reduced to ALARP
- by which the environmental impacts and risks of the activity will be of an acceptable level.

1.9.2 Environment Protection and Biodiversity Conservation Act 1999 (Cth)

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

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

1.9.3 Offshore Project Approval

The Pluto LNG Project (including both offshore and onshore infrastructure) was referred for assessment under the EPBC Act (EPBC 2006/2968) and the level of assessment was set as Public Environment Report (PER). The action was approved 12 October 2007 with conditions.

It should be noted that a Consolidated Approval Notice for EPBC 2006/2968 dated 14 June 2015 was issued to consolidate the approval conditions, and the approval conditions were subject to variation on the date of the notice. A key element to the variation relates to conditions requiring a plan for managing impacts of the action. The previous conditions required the Minister’s approval of such plans, with the variation now automatically deeming the plan to have been approved by the

Minister if the measures are included in an environment plan related to the action submitted to NOPSEMA after 27 February 2014 and in force under the Environment Regulations.

Conditions in relation to the EPBC Act approval that are considered relevant to the scope of this EP are provided in Table 1-4. See also Section 1.1 for further details.

Table 1-4: Conditions from Pluto Gas condensate field (EPBC 2006/2968) relevant to the Petroleum Activities Program

Condition Number	Condition	Relevant Section of EP
1[2]	The person taking the action must submit, for the Minister's approval, a plan (or plans) for managing the offshore impacts of the action. The plan (or plans) must include measures for: b) Construction and installation: design and construction that allow for the decommissioning of all structures and components on the sea floor impacts and management measures for reuse of any spoil ground material details of the final selection of wells, anchor type and placements and flowline paths hydrotest fluid type, handling and risk assessment of disposal impacts interaction procedures for supply vessels and aircraft that are consistent with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 cetacean and whale shark sightings reporting.	The Xena-03 tie-back project is the only planned construction and installation activity covered under this EP. Relevant sub-conditions are addressed in the following sections: i. Section 3.11 and 7.5 ii. Not relevant iii. Section 3.11 iv. Section 3.11.4 and 6.7.5 v. Section 6.7.3, 6.7.4 and 6.9.9 vi. Section 6.7.3, 6.7.4, 6.9.9 and 7.13.3.2
1	c) Operations: trading tanker vetting procedures the monitoring and disposal of produced water (PW), including the analysis of expected PW chemistry, baseline biological and physical information at the PW outfall site, toxic impacts of PW on marine flora and fauna based on ecotoxicological, bioaccumulation and biodegradation studies, industry best practice disposal of PW monitoring and reporting of biological and physical indicators and contingency measures if adverse impacts are indicated monitoring and management the collection, handling and disposal of naturally occurring radioactive materials (NORMs) interaction procedures for supply vessels and aircraft that are consistent with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 cetacean and whale shark sightings reporting. Individual offshore activities may not commence until the plan (or plans) for that specific activity has been approved. The approved plan (or plans) must be implemented.	i. Not applicable ii. Sections 6.7.5 and 6.7.7 iii. Sections 3.6.8 iv. Section 6.7.3, 6.7.4 and 6.9.9 v. Sections 6.7.3, 6.7.4 and 6.9.9.
4	The person taking the action must submit for the Minister's approval an oil spill contingency plan to mitigate the environmental effects of any hydrocarbon spills. The oil spill contingency plan must include: the types of dispersants, protective booms, clean up gear, and related equipment to be used in the event of an oil spill and the storage arrangements	Woodside's Emergency Preparedness and Response arrangements (refer to Section 7.14 and associated documents).

[2] Condition 1a), 2 and 3 (not shown) have been met through previous plans

Condition Number	Condition	Relevant Section of EP
	training of staff in oil spill response measures identification of sensitive areas, and specific response measures for these areas details of the insurance arrangements that have been made in respect of the costs associated with repairing any environmental damage arising from potential oil spills the reporting of oil spill incidents. Offshore construction may not commence until the plan is approved. The approved plan must be implemented.	
8	At least twelve months before the expiry of the period for which this approval has effect, the person taking the action Limited must submit a decommissioning plan for approval by the Minister that considers the removal of all structures and components above the sea floor, including subsea wells, manifolds and flowlines and any other associated infrastructure and the disposal and management of any NORMs. Decommissioning may not commence until the plan is approved. The approved plan must be implemented.	Decommissioning is beyond the scope of this EP.
11	If the person taking the action proposes to undertake any subsea tie-in[3] not included in approved plans pursuant to condition 1, the person taking the action must revise such plans or submit a new plan or plans to address the activities associated with, and potential environmental impacts of, the subsea tie-in. Activities associated with subsea tie-ins may not be commenced until each such plan or revised plan has been approved by the Minister. Each plan or revised plan that has been approved by the Minister must be implemented.	The resubmission and subsequent implementation of this EP is considered to meet this Condition (i.e. This EP is submitted as the 'revised plan' to address aspects of condition 1 applicable to the Xena-03 subsea tie-in operation).
12	If the person taking the action wishes to carry out any activity otherwise than in accordance with the plans referred to in conditions 1 ,3, 4, 5, 6 and 8 the person taking the action may submit for the Minister's approval a revised version of any such plan. If the Minister approved a revised plan so submitted the person taking the action must implement that plan instead of the plan as originally approved.	The Implementation of this EP is considered to meet this Condition (i.e. This EP is submitted as the 'revised plan' to address aspects of conditions applicable to the Xena-03 subsea tie-in operation).
15	A plan required by condition 1, 4, 8, 11 or 12 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: was submitted to NOPSEMA after 27 February 2014, and either: is in force under the OPGGS Environment Regulations, or has ended in accordance with Regulation 46 of the OPGGS Environment Regulations	The implementation of this EP is considered to meet this Condition.
15A	Where a plan required by condition 1, 4, 11 or 12 has been approved by the Minister and the measures (as specified	The implementation of this EP is considered to meet this Condition and supersedes previously approved plans.

[3] Subsea tie-ins: means the construction and operation of subsea wells, flowlines and other related infrastructure for the purpose of extracting gas from hydrocarbon reserves (other than the Pluto gas reservoir) within that area and conveying that petroleum to the platform located at the site of the Pluto hydrocarbon reservoir.

Condition Number	Condition	Relevant Section of EP
	in the relevant condition) are included in an environment plan (or environment plans) that: was submitted to NOPSEMA after 27 February 2014, and either: is in force under the OPGGS Environment Regulations, or has ended in accordance with regulation 46 of the OPGGS Environment Regulations, the plan approved by the Minister no longer needs to be implemented.	
15B	Where an environment plan, which includes measures specified in the conditions referred to in conditions 15 and 15A 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.	The implementation of this EP is considered to meet this Condition.

1.9.4 Recovery Plans and Threat Abatement Plans

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

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

In relation to offshore petroleum activities in Commonwealth waters, these requirements are now administered by NOPSEMA in accordance with commitments set out in the Programs. Relevant recovery plans or threat abatement plans relevant to the scope of this EP have been identified as described in Section 2.9 and assessed in Section 6.10.

1.9.5 Australian Marine Parks

Under the EPBC Act, Australian Marine Parks (AMPs), formerly known as Commonwealth Marine Reserves, are recognised for conserving marine habitats and the species that live and rely on these habitats. The Director of National Parks (DNP) is responsible for managing AMPs (supported by Parks Australia) and is required to publish management plans for them. Other parts of the Commonwealth Government must not perform functions or exercise powers in relation to these parks that are inconsistent with management plans (s.362 of the EPBC Act). Relevant AMPs are listed in Section 4.8 and in the Master Existing Environment (Woodside 2022; under Regulation 56 of the Environment Regulations, this Master Existing Environment was accepted on 3 March 2022 as Appendix C in the Goodwyn Alpha (GWA) Facility Operations Environment Plan). The North-west Marine Parks Network Management Plan describes the requirements for management.

- Specific zones within the AMPs have been allocated conservation objectives as stated below (International Union for Conservation of Nature [IUCN] Protected Area Category) based on the Australian IUCN reserve management principles outlined in Schedule 8 of the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) (EPBC Regulations 2000).
- Special Purpose Zone (IUCN category VI)—managed to allow specific activities though special purpose management arrangements while conserving ecosystems, habitats and native species. The zone allows or prohibits specific activities.
- Sanctuary Zone (IUCN category Ia)—managed to conserve ecosystems, habitats and native species in as natural and undisturbed a state as possible. The zone allows only 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.

Two planned activities are proposed within the Montebello Marine Park Multiple Use Zone (IUCN category VI): Subsea Inspection Maintenance and Repair activities along the existing pipeline (Section 3.4.5.2) and produced water discharge with associated environmental monitoring (Section 3.5.5). The principles for each zone determine what activities are acceptable within a protected area under the EPBC Act. The Australian IUCN Reserve Management Principles for Multiple Use Zone (IUCN category VI) are considered relevant to the scope of this EP are provided in Table 1-5.

Table 1-5: Australian IUCN Reserve Management Principles relevant to the Petroleum Activities Program

Condition number	Principle
7.01	The reserve or zone should be managed mainly for the sustainable use of natural ecosystems based on the following principles.
7.02	The biological diversity and other natural values of the reserve or zone should be protected and maintained in the long term.
7.03	Management practices should be applied to ensure ecologically sustainable use of the reserve or zone.
7.04	Management of the reserve or zone should contribute to regional and national development to the extent that this is consistent with these principles.

For the North West Marine Parks Network Management Plan (2018) petroleum activities including transportation of minerals by pipeline, and oil spill response are permittable subject to approval in Multiple Use Zone (IUCN category VI) and Special Purpose Zone Trawl (IUCN category VI). Proposed mining operations conducted under usage rights that existed immediately before the declaration of a marine park do not require approval.

Petroleum Activities (including environmental monitoring in connection with a particular petroleum activity) occurring within these zones are approved by a class approval (Director of National Parks 2018a). Conditions of the Class Approval that are considered relevant to the scope of this EP are provided in Table 1-6.

Table 1-6: Conditions of Class Approval relevant to the Petroleum Activities Program

Condition number	Condition	Relevant section of the EP
1	The Approved Actions must be conducted in accordance with: (a) an Environment Plan accepted under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023; - (b) the EPBC Act; (c) the EPBC Regulations (d) the North-west Network Management Plan; (e) any prohibitions, restrictions or determinations made under the EPBC Regulations by the Director of National Parks; and (f) all other applicable Commonwealth and state laws (to the extent those laws are capable of operating concurrently with the laws and instruments described in paragraphs (a) to (e)).	Conditions 1a, b, c, f are met by the submitted EP (Section 1.2) 1d The impacts on the marine park values have been considered in Section 6.7.2, 6.7.5 and 6.7.7. 1e Consultation has been undertaken with the Director of National Parks and no prohibitions, restrictions or determinations have been made (Section 5).
2	If requested by the Director of National Parks, an Approved Person must notify the Director prior to conducting Approved Actions within Approved Zones.	Section 5 describes requirements to notify the DNP prior to activities within the Montebello Multiple Use Zone.
3	If requested by the Director of National Parks, an Approved Person must provide the Director with information relating to undertaking the Approved Actions (or gathered while undertaking the Approved Actions), that is relevant to the Director's management of the Approved Zones.	If requested by the Director of National Parks, information relating to undertaking the Approved Actions (or gathered while undertaking the Approved Actions), that is relevant to the Director's management of the Approved Zones will be provided.

1.9.6 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 1-7.

Table 1-7: Relevant Management Principles under Schedule 5—Australian World Heritage management principles of the EPBC Act.

Number	Principle	Relevant Section of the EP
3	Environmental impact assessment and approval 3.01 This principle applies to the assessment of an action that is likely to have a significant impact on the World Heritage values of a property (whether the action is to occur inside the property or not). 3.02 Before the action is taken, the likely impact of the action on the World Heritage values of the property should be assessed under a statutory environmental impact assessment and approval process. 3.03 The assessment process should: identify the World Heritage values of the property that are likely to be affected by the action; and examine how the World Heritage values of the property might be affected; and provide for adequate opportunity for public consultation. 3.04 An action should not be approved if it would be inconsistent with the protection, conservation, presentation or transmission to future generations of the World Heritage values of the property. 3.05 Approval of the action should be subject to conditions that are necessary to ensure protection, conservation, presentation or transmission to future generations of the World Heritage values of the property. 3.06 The action should be monitored by the authority responsible for giving the approval (or another appropriate authority) and, if necessary, enforcement action should be taken to ensure compliance with the conditions of the approval.	3.01 and 3.02: Assessment of significant impact on World Heritage values is included in Section 6. Principles are met by the submitted EP. 3.03 (a) and (b): World Heritage values are identified in Section 4.8 and considered in the assessment of impacts and risks for the Petroleum Activity in Section 6. 3.03l): Relevant persons consultation and feedback received in relation to impacts and risks to the Ningaloo World Heritage Property are outlined in Section 5 3.04, 3.05 and 3.06: Principles are considered to be met by the acceptance of this EP.

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

2. ENVIRONMENT PLAN PROCESS

2.1 Overview

This section outlines the process taken by Woodside to prepare this EP, once the activity was defined as a petroleum activity. The process describes the activity, the existing environment, followed by the environmental risk management methodology used to identify, analyse and evaluate risks to meet ALARP levels and acceptability requirements, and develop EPOs and EPSs. This section also describes Woodside's risk management methodologies as applied to implementation strategies for the activity.

Regulation 21(5) of the Environment Regulations requires the EP to include details of the environmental impacts and risks for the Petroleum Activities Program, and an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact and risk. The objective of the risk assessment process described in this section is to identify risks and associated impacts of an activity, so they can be assessed, and appropriate control measures applied to eliminate, control or mitigate the impact/risk to ALARP, and to determine if the impact or risk level is acceptable.

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

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

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

2.2 Environmental Risk Management Methodology

2.2.1 Woodside Risk Management Process

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

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. WMS risk management procedures, guidelines and tools provide guidance of specific techniques for managing risk, tailored for particular areas of risk within certain business processes. Procedures applied for environmental risk management include (Section 0):

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

The risk management methodology provides a framework to demonstrate that risks and impacts are continually identified, reduced to ALARP and assessed to be at an acceptable level, as required by the Environment Regulations. The key steps of Woodside's Risk Management Process are shown in Figure 2-1. A description of each step and how it is applied to the scopes of this activity is provided in Section 2.2 to Section 2.12.

Figure 2-1: Woodside's Risk Management Process

2.2.2 Health, Safety and Environment Management Procedure

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

2.2.3 Impact Assessment Procedure

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

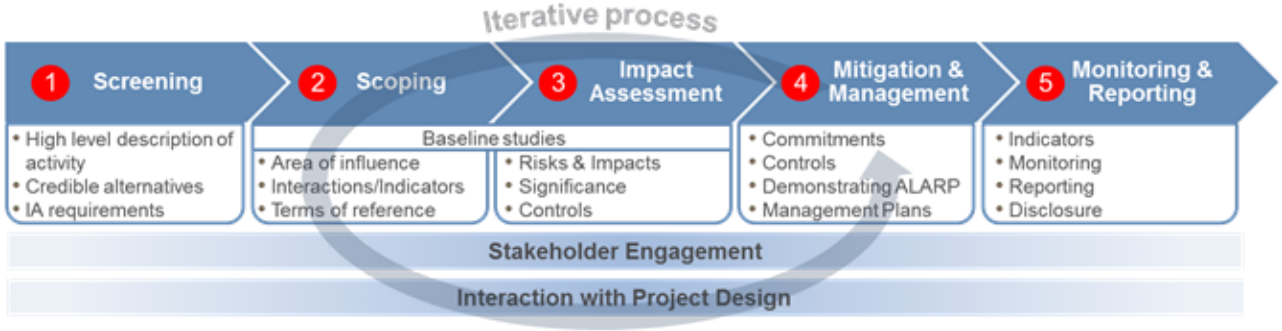

Figure 2-2: Woodside's Impact Assessment Process

2.2.4 Process Safety Management Procedure and Process Safety Risk Assessment Procedure

Due to the nature and scale of petroleum activities, Woodside's Process Safety Management Procedure establishes Woodside's framework for Process Safety Management (Section 7.2.5). This framework includes the Process Safety Risk Assessment Procedure (PSRA). The PSRA is a key part of Woodside's process safety management framework for managing the integrity of systems and processes that handle hazardous substances over the exploration and production lifecycle. The PSRA sets out methods so that process safety risks are understood and controlled, including that all process safety hazards are systematically identified, assessed and treated so that the associated risks are reduced to a level that is tolerable and ALARP.

2.3 Environment Plan Development Process

The EP development process is illustrated in Figure 2-3. Each element of this process is discussed further in Section 2.5 to Section 2.12.

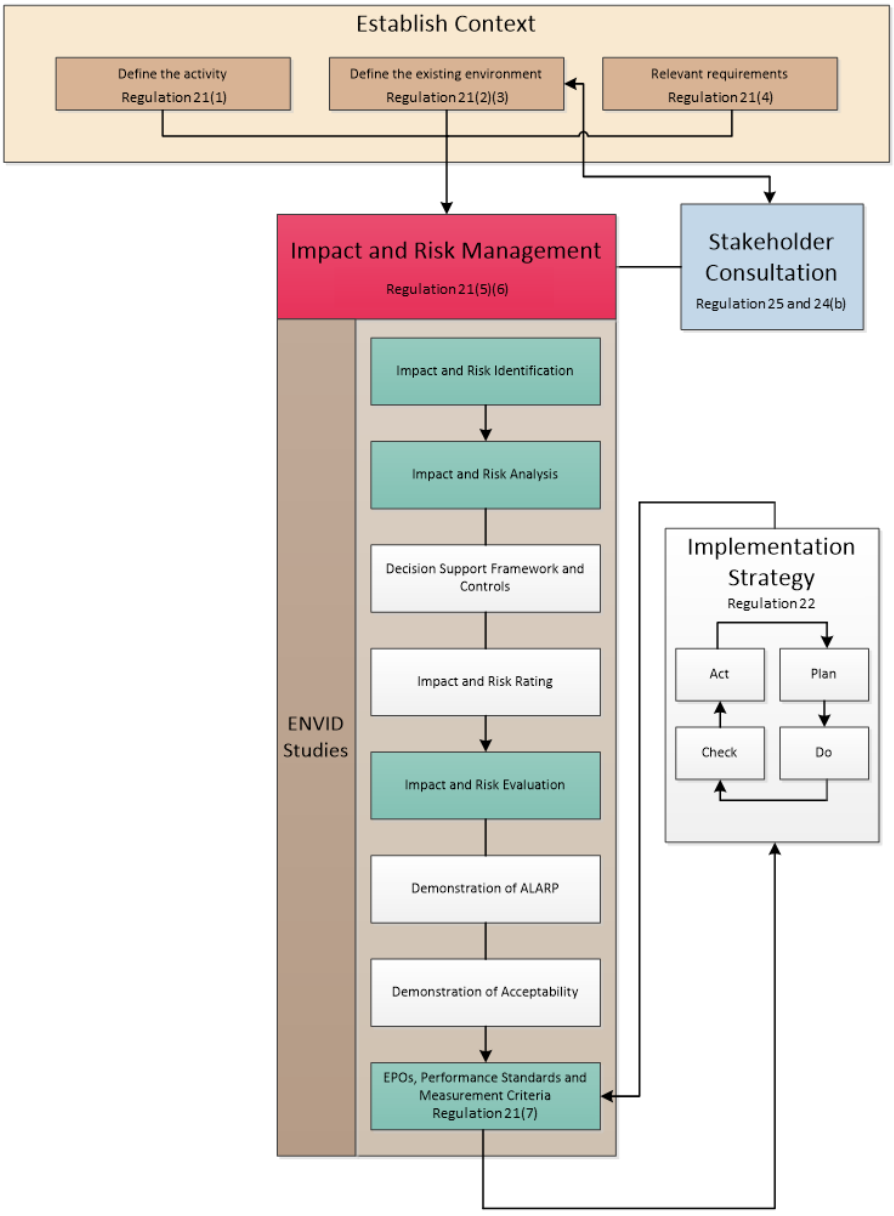

Figure 2-3: Environment Plan Development Process

2.4 Establish the Context

2.4.1 Define the Activity

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

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

The 'what' and 'how' are described in the context of 'environmental aspects'[4] to inform the risk and impact assessment for planned (routine and non-routine) and unplanned (accidents/ incidents/ emergency conditions) activities.

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

2.4.2 Define the Existing Environment

The context of the existing environment is described and determined by considering the nature and scale of the activity (size, type, timing, duration, complexity, and intensity of the activity), as described in Section 4. The purpose is to describe the existing environment that may be impacted by the activity, directly or indirectly, by planned or unplanned[5] events.

The Existing Environment (Section 4) is structured into subsections defining the physical, biological, socio-economic and cultural attributes of the area of interest, in accordance with the definition of environment in Regulation 5 of the Environment Regulations. These subsections make particular reference to:

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

By grouping potentially impacted environmental values by aspect (as presented in Table 2-1), the presentation of information about the receiving environment is standardised. This information is then

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

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

consistently applied to the risk evaluation section to provide a robust approach to the overall environmental risk evaluation and its documentation in the EP.

Table 2-1: Example of the Environment Values Potentially Impacted which are Assessed within the Environment Plan

Environmental Value Potentially Impacted Regulations 21(2)(3)						
Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitats	Species	Socio-economic

2.4.3 Relevant Requirements

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

The Woodside Risk Management Policy, Climate Policy as well as Environment and Biodiversity Policy are presented in Appendix A.

2.5 Impact and Risk Identification

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

The environmental impact and risk assessment presented in this EP has been informed by recent and historic hazard and environmental risk identification studies (e.g. HAZID/ENVID), consequence modelling studies for high consequence, low probability environmental risks, bowtie risk assessments for MEEs as required by Woodside's PSRA processes, desktop reviews and studies associated with the Petroleum Activities Program. Impacts, risks and potential consequences were identified based on planned activities and unplanned events (based on the description in Section 3), the existing environment (Section 4) and the outcomes of Woodside's consultation process (Section 5). The environmental outputs of applicable risk and impact workshops and associated studies are referred to as ENVID in this EP.

An environmental impacts and risks identification and assessment workshop was undertaken by multidisciplinary teams comprising relevant operational and environmental personnel with sufficient breadth of knowledge, training and experience to reasonably assure that risks and impacts were identified, and their potential environmental consequences assessed. Impacts and risks were identified, during the workshop, for both planned (routine and non-routine) activities and unplanned (accidents/incidents/emergency conditions) events. During this process, risks identified as not applicable (not credible) were removed from the assessment.

Impacts and risks were evaluated and tabulated for each planned activity and unplanned events respectively. Environmental impacts and risks were recorded in an environmental impacts and risk register. The output of the workshop is used to present the risk assessment and form the basis of performance outcomes, standards, and measurement criteria. This information is presented in Section 6, following the format presented in Table 2-2.

Table 2-2: Example of Layout of Identification of Risks and Impacts in Relation to Risk Sources

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

2.6 Impact and Risk Analysis

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

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

- identify the Decision Type in accordance with the decision support framework.
- identify appropriate control measures (preventive and mitigation) aligned with the Decision Type
- assess the risk rating.

2.6.1 Decision Support Framework

To support the risk assessment process and Woodside's determination of acceptability (Section 2.8.2), Woodside's HSE risk management procedures include the use of a decision support framework based on principles set out in the Guidance on Risk Related Decision Making (Oil and Gas UK, 2014). This concept is integrated into the environmental impacts and risks identification and assessment workshop to determine the level of supporting evidence that may be required to draw sound conclusions regarding risk level and whether the risk is acceptable and ALARP (Section 2.8). Application of the decision support framework confirms:

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

The framework provides appropriate tools, commensurate to the level of uncertainty or novelty associated with the risk/impact (referred to as the Decision Type A, B, or C). The Decision Type is selected based on an informed discussion around the uncertainty of the risk/impact and is documented in impact and risk register worksheets.

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

2.6.1.1 Decision Type A

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

2.6.1.2 Decision Type B

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

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

2.6.1.3 Decision Type C

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

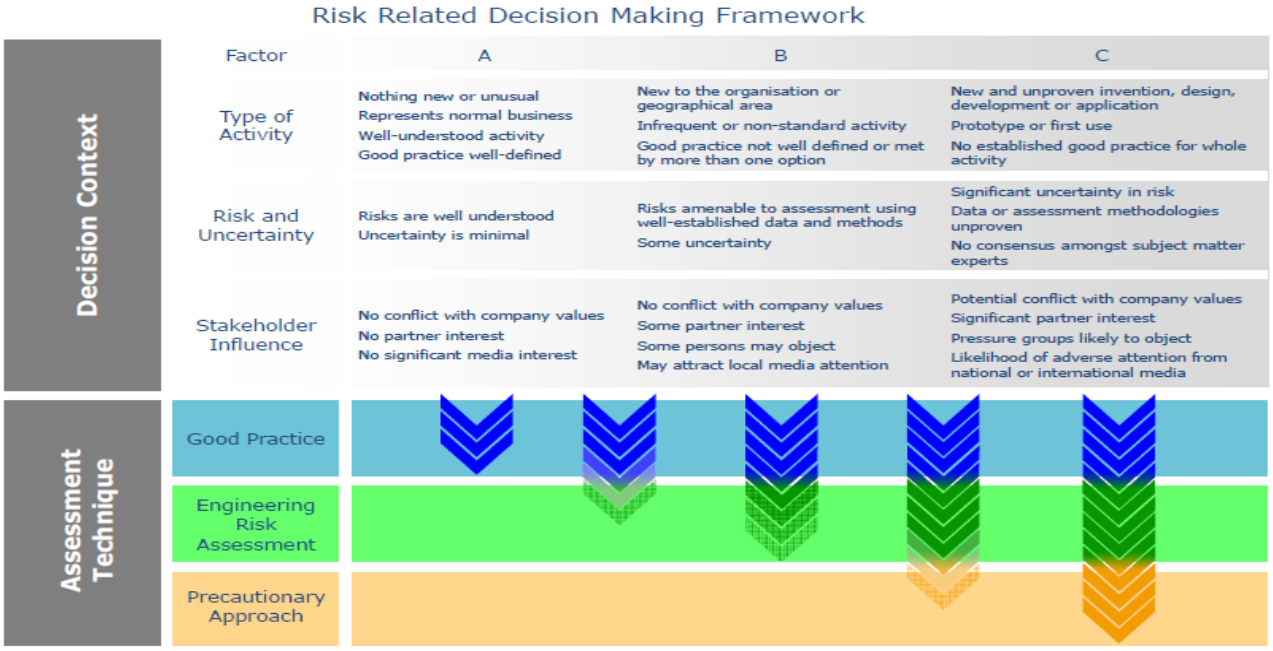

Figure 2-4: Risk-related Decision-making Framework (Oil and Gas UK, 2014)

2.6.1.4 Decision Support Framework Tools

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

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

2.6.1.5 Decision Calibration

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

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

Where appropriate, additional calibration tools may be selected specific to the Decision Type and the activity.

2.6.2 Control Measures (Hierarchy of Controls)

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

- Elimination of the risk by removing the hazard.
- Substitution of a hazard with a less hazardous one.
- Engineering Controls include design measures to prevent or reduce the frequency of the risk event, or detect or control the risk event (limiting the magnitude, intensity and duration) such as:
- Prevention: design measures that reduce the likelihood of a hazardous event occurring.
- Detection: design measures that facilitate early detection of a hazardous event.
- Control: design measures that limit the extent/escalation potential of a hazardous event.

- Mitigation: design measures that protect the environment if a hazardous event occurs.
- Response Equipment: design measures or safeguards that enable clean-up/response after a hazardous event occurs.
- Procedures and Administration includes management systems and work instructions used to prevent or mitigate environmental exposure to hazards.
- Emergency Response and Contingency Planning includes methods to enable recovery from the impact of an event (e.g., protection barriers deployed near the sensitive receptor).

2.6.3 Impact and Risk Classification

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

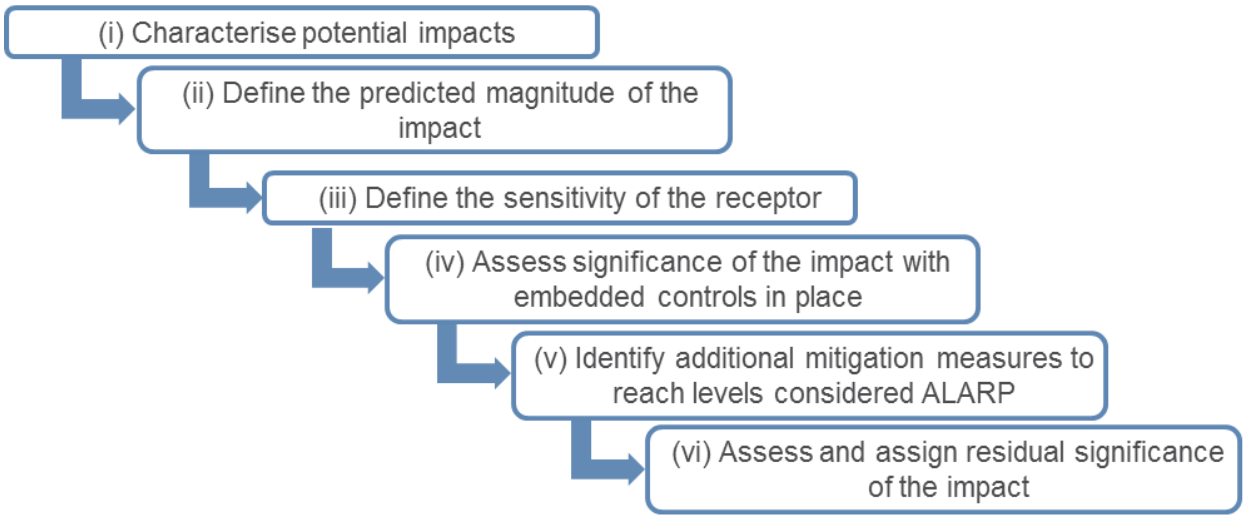

Figure 2-5: Environmental Risk and Impact Analysis

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

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

Table 2-3: Woodside Risk Matrix (Environment and Social and Cultural) Consequence Descriptions

Environment	Social and Cultural	Consequence Level
Catastrophic, long-term impact (>50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	Catastrophic, long-term impact (>20 years) to a community, social infrastructure or highly valued area/item of international cultural significance.	A
Major, long-term impact (10–50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	Major, long-term impact (5–20 years) to a community, social infrastructure or highly valued area/item of national cultural significance.	B
Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	Moderate, medium-term impact (2–5 years) to a community, social infrastructure or highly valued area/item of national cultural significance.	C

Environment	Social and Cultural	Consequence Level
Minor, short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	D
Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	Slight, short-term impact (<1 year) to a community or area/item of cultural significance.	E
No lasting effect (<1 month). Localised impact not significant to environmental receptor.	No lasting effect (<1 month). Localised impact not significant to area/item of cultural significance.	F

2.6.4 Risk Rating Process

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

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

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

2.6.5 Select the Consequence Level

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

2.6.6 Select the Likelihood Level

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

Table 2-4: Woodside Risk Matrix Likelihood Levels

Likelihood Description						
Frequency	1 in 100,000–1,000,000 years	1 in 10,000–100,000 years	1 in 1,000–10,000 years	1 in 100–1,000 years	1 in 10–100 years	>1 in 10 years
Experience	Remote: Unheard of in the industry	Highly Unlikely: Has occurred once or twice in the industry	Unlikely: Has occurred many times in the industry but not at Woodside	Possible: Has occurred once or twice in Woodside or may possibly occur	Likely: Has occurred frequently at Woodside or is likely to occur	Highly Likely: Has occurred frequently at the location or is expected to occur
Likelihood Level	0	1	2	3	4	5

2.6.7 Calculate the Risk Rating

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

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

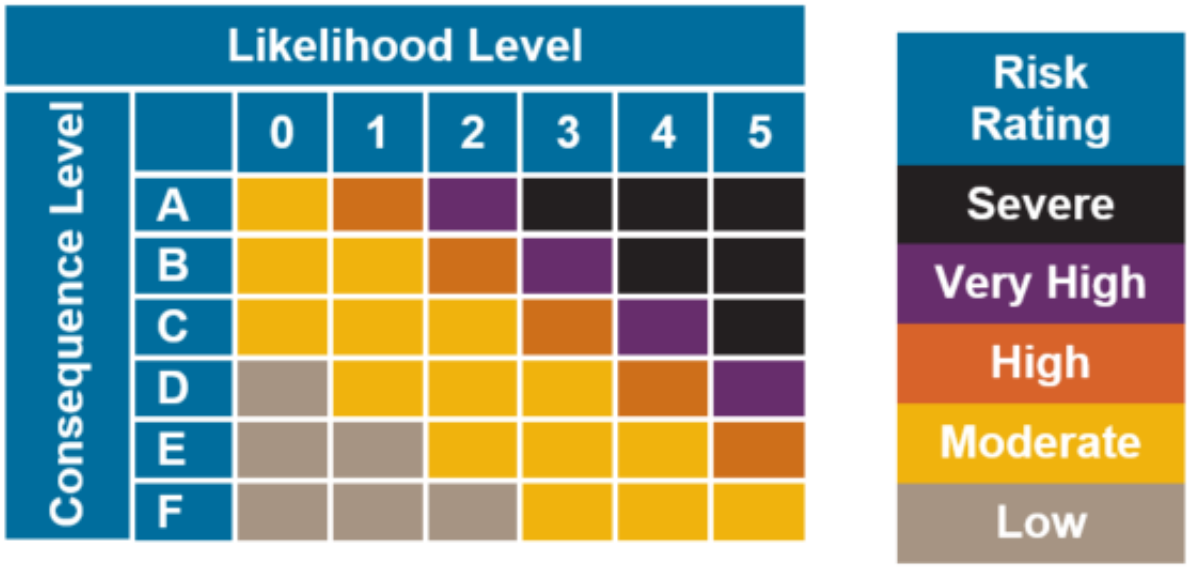

Figure 2-6: Woodside Risk Matrix – Risk Level

To support ongoing risk management (as a key component of Woodside's Process Safety Management Framework – refer to the implementation strategy in Section 7), Woodside uses the concept of 'current risk' and applies a Current Risk Rating to indicate the current or 'live' level of risk, considering controls that are currently in place and effective on a day-to-day basis. The Current Risk Rating is effective in articulating potential divergence from baseline risk, such as if certain controls fail or could potentially be compromised. Current Risk Ratings aid in communicating and making visible the risk events and for the continual management of risk to ALARP by identifying risk reduction measures and assessing acceptability.

2.7 Classification and Analysis of Major Environment Events

For Woodside's production facilities, a further level of analysis is undertaken to identify, classify and analyse MEEs. This extra level of rigour is applied so that sufficient controls are in place for risks with potential Level B and above consequences. In the health and safety area, Major Accident Events (MAEs) are identified using a similar process, which supports consistency in managing key risks within Woodside in accordance with Process Safety Risk Management Procedures.

Woodside defines a MEE as an event with potential environment, reputation (pertaining to environment events), social or cultural consequences of level B or higher as per Woodside's Risk Matrix (Figure 2-6). MEEs are evaluated against credible worst-case scenarios that may occur when all controls are absent or have failed.

2.7.1 Major Environment Event Identification

The ENVID process identifies numerous sources of risk with differing consequence levels. These risks are screened for those risk events that meet the MEE criteria, and MEE risks are analysed further through detailed consequence modelling and probability/ frequency studies and examined for 'appropriateness' of controls in a bowtie risk assessment.

Risks that do not meet the MEE definition, although screened out of the MEE process, are still evaluated for ALARP and risk acceptability using the methodology described in Section 2.8. Some high consequence/low probability events which do not meet the MEE consequence threshold may still undergo additional consequence and probability assessment where they could have a high

adverse impact on the company's reputation or relationships with relevant persons, beyond requirement to demonstrate ALARP and acceptable risk levels following application of controls.

2.7.2 MEE Classification

A standard naming convention has been established for MEEs which is based around ensuring the MEE titles reflect the cause of the event (e.g. 'subsea system loss of containment') rather than the event itself (e.g. significant hydrocarbon spill to the marine environment). The MEEs are assigned a unique identification code (e.g. MEE-01, MEE-02, etc).

2.7.3 Bowtie Analysis

MEEs are subject to more detailed analysis using the bowtie risk assessment technique, which illustrates cause outcome pathways for each MEE and controls in place to prevent the 'top event' or mitigate the consequences (outcomes). The key drivers for adopting the bowtie technique for MEEs are that it:

- identifies the controls (prevention and mitigation barriers) necessary so that the risk is acceptable and ALARP.
- supports the process of demonstrating ALARP (described in Section 2.8.1).
- enables verification of and linking to the relevant sections of the WMS that supports barriers.
- improves the capacity for lessons learnt and incident prevention by being able to directly relate causes of an incident to those controls that failed.
- ensures greater visibility and granularity in the assessment process and enables complex risk scenarios to be presented in an easy to understand format.

The bowtie technique (an example bowtie diagram is shown in Figure 2-7) shows the relationships between the 'Causes' that may lead to a particular unwanted event ('Top Event'), together with the range of potential escalation paths that can lead to a variety of 'Outcomes' (or consequences). A bowtie also shows the preventive barriers that may prevent a Top Event from occurring specific to each Cause, and the mitigation barriers in place to limit the potential effects once the Top Event has been realised, specific to each credible MEE Outcome.

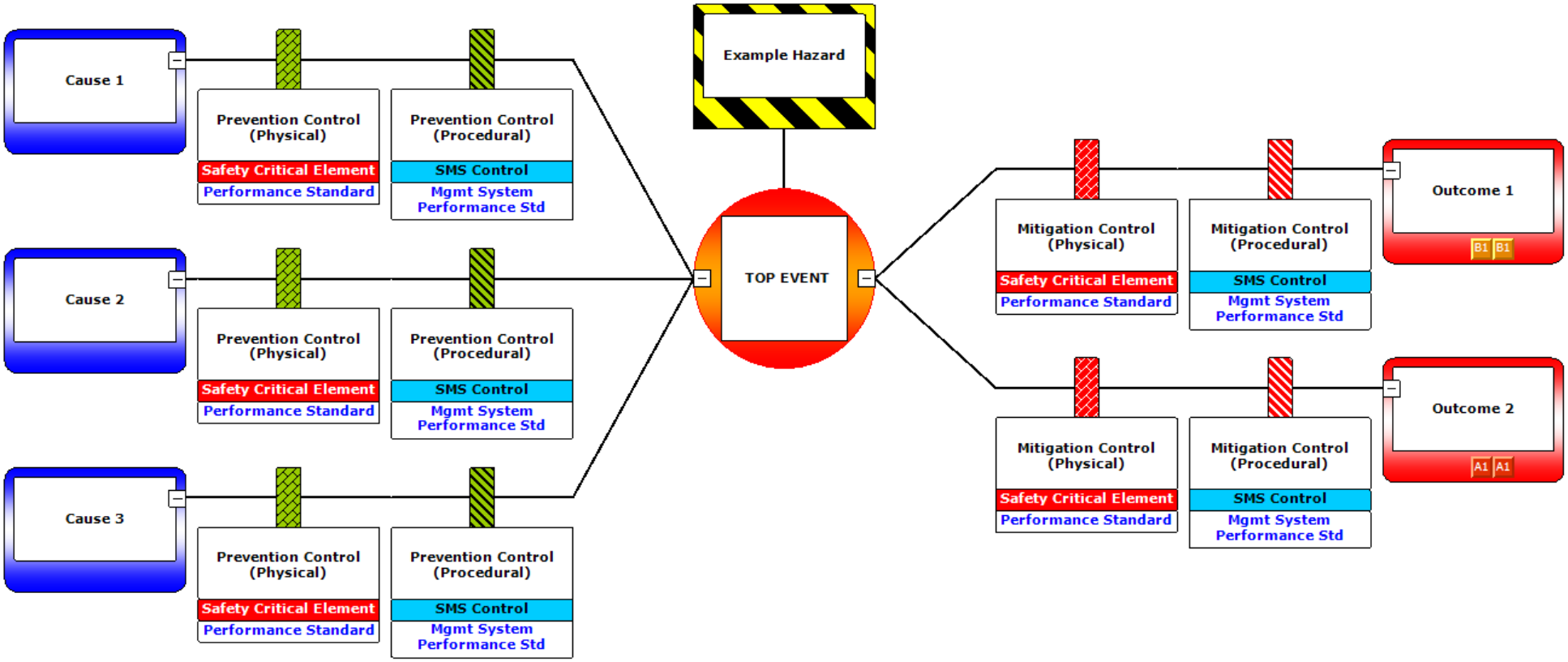

Figure 2-7: Example of Bowtie Diagram Structure

2.7.4 MEE Register

A MEE Register is prepared for each production facility after completing the bowtie diagrams. The purpose of the MEE Register is to record the MEE identification process, groupings, bowtie diagrams and datasheets in a consolidated format. Datasheets are prepared for each MEE, which summarise the hazard description, hazard management, emergency response, ALARP summary and a list of critical barriers identified on the bowties (known as Safety and Environment Critical Elements (SCEs)).

Potential common causes that contribute to MAEs/MEEs, or that can result in failure or degradation of the controls in place to protect against MAEs/MEEs, include some generic mechanisms of SCE failure and generic human error. These are represented in bowties applicable to multiple MEEs and identified in the MEEs applicable to this EP.

2.7.5 Safety and Environment Critical Elements and Technical Performance Standards

Woodside identifies and manages SCEs technical and management system performance standards in accordance with Process Safety Management Procedures, Risk Management Procedures and Change Management Procedures (further described in the implementation strategy in Section 7). SCEs are identified for MAEs and MEEs. An SCE is a hardware control, the failure of which could cause or contribute substantially to, or the purpose of which is to prevent or limit the effect of a MAE, MEE or Process Safety Event. In addition, Woodside defines Safety and Environment Critical Component (SCC) as an item of equipment or structure forming part of a hardware SCE that supports the SCE in achieving the safety function.

Once an SCE is identified as an MEE barrier for the operated facility, technical performance requirements are developed for the facility SCE in accordance with the Global SCE Performance Standards and process described in the SCE Management Procedure and form the SCE Facility Performance Standard. Each SCE Performance Standard represents a statement of the performance required of an SCE (e.g., functionality, availability, reliability, survivability). SCE Performance Standard requirements are used to establish agreed assurance tasks for each SCE, support the management of operations within acceptable safety and/or environment risk levels, and for the continuous management of risk to ALARP. An assurance task is an activity carried out by the operator to confirm that the SCE meets, or will meet, its SCE Performance Standard. Examples of assurance tasks include inspection routines, maintenance activities, test routines, instrumentation calibration, and reliability monitoring.

SCE Facility Performance Standards do not always align directly with EPSs. They are used in conjunction with the WMS to identify and treat potential step-outs from expected controls performance or integrity envelopes and so that SCE performance can be optimised. Woodside's HSE Event Reporting Guideline describes the process for identifying 'Failure to meet Facility Performance Standard', which is when the SCE does not meet the goal as stated in the relevant Performance Standard. (see Section 7.4). Situations where SCEs fail to meet Facility Performance Standards represent a potential increase in risk that, if not addressed immediately, have the potential to result in a process safety event, or worsen the consequences of one. Recording SCE Failure to Meet Performance Standard Events into the Event Reporting Database is important to highlight risk, investigate causes, manage risks and meet potentially applicable external reporting requirements. For applicable SCEs, 'Failure to meet Facility Performance Standard' represent scenarios that may fail to achieve an EPS presented in this EP.

The results of the MEE classification and analysis for Pluto Offshore operations are presented in Section 6.8.1 of this EP. More detail on the SCE and Performance Standards process, and the interrelationships to other parts of the SCE Management Procedures, is described in Section 7.4.

2.7.6 Safety-critical Management System Barriers

For each MEE, Safety-critical Management System specific measures are also identified. These are management system components (generally WMS processes) that are key barriers to, or measures for, managing MEEs.

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 ESDev – 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 Section 7)
- external context – the environment consequence (Section 6) and stakeholder acceptability (Section 5)
- other requirements – ensuring the proposed controls and risk level are consistent with national and international standards, laws and policies.

In accordance with Regulations 34(a), 34(b), 34(c) and 34(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

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

Table 2-5: Summary of Woodside's Criteria for ALARP Demonstration

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

2.8.2 Demonstration of Acceptability

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

Table 2-6: Summary of Woodside's Criteria for Acceptability

Risk	Impact	Decision Type
Low and Moderate	***Negligible, Slight, or Minor (D, E or F)***	***A***
Woodside demonstrates these risks, impacts and Decision Types are 'Broadly Acceptable' if they meet legislative requirements, industry codes and standards, applicable company requirements and industry guidelines. Further effort towards risk reduction (beyond using opportunistic measures) is not reasonably practicable without sacrifices that are grossly disproportionate to the benefit gained.		
High, Very High or Severe	***Moderate and above (C, B or A)***	***B and C***
Woodside demonstrates these higher order Risks, Impacts and Decision Types are 'Acceptable if ALARP' if it can be demonstrated using good industry practice and risk based analysis (RBA), if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained. In undertaking this process for Moderate and High risks, Woodside evaluates: • the Principles of ESD as defined under the EPBC Act • the internal context – the proposed controls and consequence/risk level are consistent with Woodside policies, procedures and standards • the external context – consideration of the environment consequence (Section 6) and stakeholder acceptability (Section 5) are considered • other requirements – the proposed controls and consequence/risk level are consistent with national and international industry standards, laws and policies ad consideration of applicable plans for management and conservation advices, conventions and significant impact guidelines (e.g. MNES). For potential C or above consequence/impact levels where significant uncertainty exists in analysis of the risk or impact (such as, for predicted or potential high risk of significant environmental impacts, significant project risk/exposure, novel activities, lack of consensus on standards, and significant stakeholder concerns e.g. Decision Type C), acceptability may be required to be conducted separately for key receptors. This is not applicable for risks, given the consequence of an unplanned risk event occurring may not be acceptable and, therefore, acceptability is demonstrated in the context of the residual likelihood of an event occurring and subsequent impacts. Additionally, Very High and Severe risks require 'Escalated Investigation' and mitigation. If after further investigation the risk remains in the Very High or Severe category, the risk requires appropriate business engagement with increasing involvement of senior management in accordance with Woodside's Risk Management Procedure to accept the risk. This includes due consideration of regulatory requirements.		

2.9 Recovery Plan and Threat Abatement Plan Assessment

A separate assessment is undertaken to demonstrate that the EP is not inconsistent with any relevant recovery plans or threat abatement plans (refer Section 6.10). An assessment of associated national objectives and action areas contribute to the demonstration of acceptability. The steps in this process are:

- Identify relevant listed threatened species and ecological communities (Section 4).
- Identify relevant recovery plans and threat abatement plans (Section 6.10).
- List all objectives and (where relevant) the action areas of these plans and assess whether these objectives/action areas apply to government, the Titleholder, and the Petroleum Activities Program (Section 6.9).
- For those objectives and 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 Outcomes, Environmental Performance Standards, and Measurement Criteria

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

2.11 Implement, Monitor, Review and Reporting

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

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

The implementation strategy is presented in Section 7.

2.12 Consultation

Woodside consults relevant persons in the course of preparing an EP in accordance with regulation 25 of the Environment Regulations. Woodside's consultation methodology is presented in Section 5. Woodside's consultation record is at Appendix F.

3. DESCRIPTION OF THE ACTIVITY

3.1 Overview

This section has been prepared in accordance with Regulation 21(1) of the Environment Regulations and describes the activities to be undertaken as part of the Petroleum Activities Program under this EP. It includes the location of the activity, general details of the facility associated infrastructure, the operational details of the activity, and additional information relevant to consideration of environmental risks and impacts.

The Pluto facility currently produces gas and condensate from the Pluto, Pyxis and Xena fields via the Pluto subsea hydrocarbon gathering system (Section 3.4). This EP includes the ongoing operation of the Pluto facility and Xena-03 Drilling and tie-back activities associated with the Xena-03 well, in the Xena field. An overview of the Petroleum Activities Program (PAP) is provided for in Section 1.1 and Table 3-1..

3.1.1 Pluto Facility Operations Overview

The Pluto offshore facility (the facility) and export pipeline is outlined in Figure 3-1. The facility produces wet gas and condensate from the Pluto, Pyxis and Xena fields in Production Licence WA-34-L. The platform is designed to be operated in both not-normally-crewed (NNC) and minimally crewed states. The offshore facilities are remotely operated from the Central Control Room (CCR), either from the Central Control Room at Pluto LNG Park or Remote Central Control Room in Perth. Gas and condensate are transported onshore for processing via a 180 km long export pipeline.

A water handling module has been installed on the riser platform to enable the processing and discharge of produced water at the platform. Wet gas will be processed through the water handling module, with gas and condensate transported to the onshore LNG Plant for processing. These activities are outlined in Table 3-1.

3.1.2 Xena-03 Tie-back Overview

Woodside is resuming plans to drill and complete the Xena-03 infill production well within the Petroleum Activities Program in this EP revision. The work includes drilling one new well in the Xena field, installing an associated wellhead and xmas tree, and connecting the well to the existing Pyxis Hub subsea infrastructure (Section 3.4). The well will be located at approximately 177 m water depth.

The well will be drilled and completed using a moored or hybrid mobile offshore drilling unit (MODU). Typically, two or three support vessels will support the MODU during drilling activities, with at least one vessel in the vicinity to complete standby duties, if required. Supply vessels from Dampier Port will frequent the MODU at regular intervals throughout drilling operations, as required.

Installation of the subsea infrastructure will be undertaken using an installation vessel. Another installation vessel, similar to vessels used for IMMR, may be used to install the xmas tree and for cold commissioning the wells and during start-up (if required). Support vessels associated with subsea installation activities may transit between the PAA and port, however transit activities are not included in the scope of this EP.

The scope for this EP covers the tie-back of the Xena-03 well, including drilling, completion, and subsea installation (including minor changes to existing infrastructure) along with pre commissioning, cold commissioning and start-up. These activities are outlined in Table 3-1 and described in detail in Section 3.4.2.3.

Table 3-1: Petroleum Activities Program overview

Item	Description
Production Licences	WA-1-IL, WA-34-L
Pipeline Licences	WA-16-PL, WA-17-PL
Platform Location	115° 22' 5.582" E 19° 59' 46.476' S
Water depth (lowest astronomical tide (LAT)) at Pluto topsides location	85 m
Key components of the facilities	Fixed platform, processing equipment, pipelines; subsea infrastructure Pluto, Xena and Pyxis wells, wellheads, manifolds, umbilicals, chemical supply lines, risers, flowlines, flexible jumpers.
Key components of pipeline subsea infrastructure	Xmas trees, flowlines/pipelines and umbilicals
Number of wells	11 existing production wells (PLA01, PLA02, PLA03, PLA04, PLA05, PLA06, PLA07, XNA01, XNA02, PYA01, and PL-PYA02) 1 new well to be constructed in 2024 (PLA08) 1 new well proposed to be constructed in 2025 (XNA03)
Subsea infrastructure	Existing: Pluto riser platform Pluto Export Pipeline Pluto/Xena-03/Pyxis subsea infrastructure (including umbilicals and flowlines) Xena-03 Proposed (planned installation Q3, 2025): One subsea xmas tree and wellhead One flexible flowline One set of flying leads One electrohydraulic umbilical (EHU) and associates umbilical termination assemblies (UTAs).
MODU	Moored MODU or hybrid MODU.
Vessels	Pluto Operations: Platform support vessels, ASV, subsea support vessels Xena-03 Tie-back: MODU, MODU support vessels including AHVs, installation vessel/s
Key activities	Pluto Operations: routine production routine inspection, maintenance, monitoring and repair of the platform and associated subsea infrastructure. well unloading and clean-up installation and operation of the water handling unit non-routine and unplanned activities and incidents associated with the above. Xena-03 Tie-back: subsea infrastructure stabilisation mooring installation for the MODU development drilling and completions activities via MODU installation of xmas tree site surveys installation of flowline, flying leads, subsea tree, subsea distribution unit tie-in to existing subsea infrastructure

Item	Description
	pre-commissioning of the new subsea infrastructure cold commissioning of the well and xmas tree start-up to the Pluto facility including unload of well to onshore LNG Plant and performance testing contingent intervention, workover, or re-drill for the new well

3.2 Location

The riser platform is located in Commonwealth waters off WA, in Production Licence Area WA-1-IL approximately 160 km north west of Dampier and 75 km north of Barrow Island (Figure 3-1). Gas and condensate produced from the facility are exported via the 180 km long pipeline and associated 6-inch chemical supply line, to onshore for processing. Currently, gas is produced from two wells in the Xena field (Xena-01 and Xena-02) which are tied into the Pluto flowlines, ~16 km from the riser platform. An additional well in the Xena field (Xena-03) is proposed in this EP, 11 km from the riser platform. Additional wells are planned for Pyxis, Pluto and Xena as part of field development (the drilling of these wells and associated activities will be subject to a separate EP).

The riser platform is marked on nautical charts and surrounded by a 500 m petroleum safety zone (PSZ). The riser platform is marked on general aviation maps and categorised as a Danger Area for civil aircraft. The danger-type is listed in the General Pilots Manual as “avoid flight over facility between surface and 1500 feet”. The export pipeline is also marked on nautical charts.

The coordinates and permit areas of the facility and associated infrastructure are presented in Table 3-2.

Table 3-2: Approximate location details for the Petroleum Activities Program including all relevant infrastructure.

Structure	Water depth (approx. m LAT)	Latitude	Longitude	Title
Riser Platform	85	-19° 54’ 49.24’’	115 ° 7 ‘ 54.47 ‘’	WA-1-IL
Pluto A and B flowlines	85-830	-	-	WA-16-PL
Export pipeline (Commonwealth)	41-85	-	-	WA-17-PL
PLA01ST1 Well	830	-19° 54’ 48.23’’	115 ° 7 ‘ 54.75 ‘’	WA-34-L
PLA02 Well	830	-19° 54’ 48.57’’	115 ° 7 ‘ 55.79 ‘’	WA-34-L
PLA03ST1 Well	830	-19° 54’ 48.70’’	115 ° 7 ‘ 56.33 ‘’	WA-34-L
PLA04 Well	830	-19° 54’ 48.69’’	115 ° 7 ‘ 55.57‘’	WA-34-L
PLA05 Well	830	-19° 54’ 49.24’’	115 ° 7 ‘ 54.47 ‘’	WA-34-L
PLA06 Well	830	-19° 54’ 48.26’’	115 ° 7 ‘ 54.14 ‘’	WA-34-L
PLA07ST1	830	-19° 54’ 47.61”	115° 07’ 54.95”	WA-34-L
PLA08[6] Well	~830	-199° 54’ 42.00”	115° 08’ 02.42”	WA-34-L
PYA01 Well	958	-19° 49’ 40.33”	115° 10’ 34.94”	WA-34-L
PL-PYA02	862	-19° 52’ 34.88”	115° 09’ 00.65”	WA-34-L
Xena tie-in	~180	-19° 58’ 15.25’’	115 ° 12 ‘ 45.47 ‘’	WA-34-L
XNA01 Well	178	-19° 58’ 13.57’’	115 ° 12 ‘ 46.17 ‘’	WA-34-L

[6] *PLA08 is planned to be drilled in 2024. This drilling activity is covered in WA-34-L Pyxis Drilling and Subsea Installation Environment Plan accepted 21 December 2023.*

Structure	Water depth (approx. m LAT)	Latitude	Longitude	Title
XNA02 Well	180	-19° 57’ 49.13”	115° 13’ 02.76”	WA-34-L
Proposed XNA03 Well	~177	-19° 56’ 28.91”	-115°13’44.30	WA-34-L

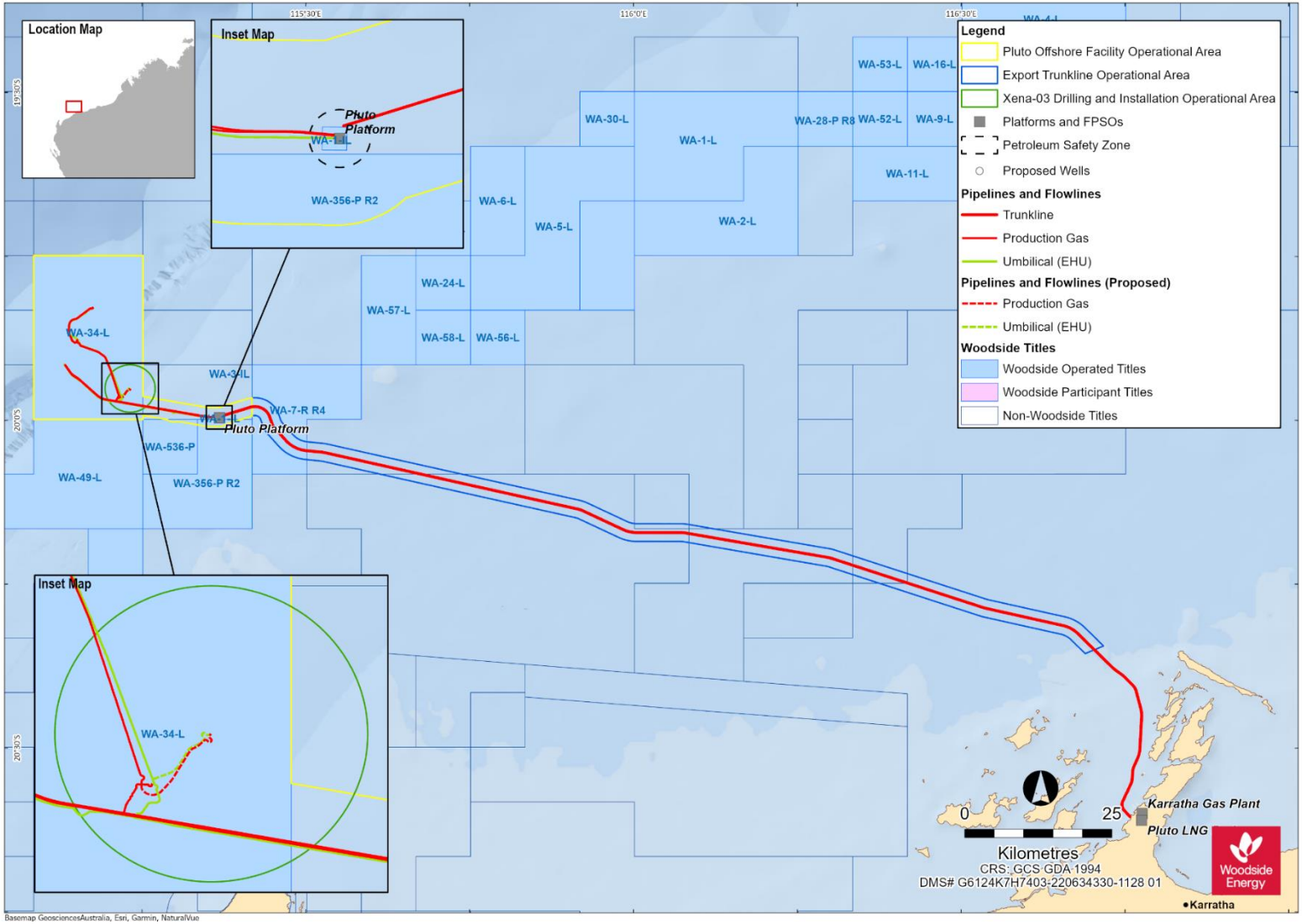

Figure 3-1: Location of the Petroleum Activities Program.

3.2.1 Petroleum Activities Area

The spatial boundary of the Petroleum Activities Program has been described and assessed using three Operational Areas, the Pluto Facility Operational Area, Export Pipeline Operational Area (collectively referred to as the Pluto Operational Area), and the Xena-03 Operational Area. The Operational Areas are collectively referred to as the Petroleum Activity Area (PAA) in this EP, with specific Operational Areas referred to where relevant.

Vessel-related activities within the PAA will comply with this EP. Vessels transiting to the PAA are outside the scope of this EP and are covered by applicable maritime regulations and other requirements during that time.

3.2.2 Pluto Operational Area

The Pluto Operational Area, risk assessed and managed by this EP, includes vessel-related petroleum activities within the PAA and includes:

- the riser platform and the area within a 500 m PSZ around the riser platform.
- the export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and an area encompassing 1500 m around the subsea pipeline infrastructure.
- Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.

For the purposes of the Description of the Existing Environment (Section 4) and for the Environmental Impact and Risk Assessments (Section 6) the Pluto Operational Area has been divided into two sections where relevant:

the Facility Operational Area (all elements of the Pluto platform and subsea hydrocarbon gathering system (wells, xmas trees, flowlines, spools, jumpers, umbilicals, etc.)).

the Export Pipeline Operational Area (pipeline to the boundary between Commonwealth and WA State waters).

3.2.3 Xena-03 Operational Area

The Xena-03 Operational Area has a radius of 4000 m centred on the Xena-03 well location, to allow for MODU mooring operations, drilling of the Xena-03 well, installation of subsea infrastructure (including installation and connection of the Xena-03 flowline), pre-commissioning and related petroleum activities.

The Xena-03 Operational Area allows for MODU mooring operations, including the possible installation of pre-laid moorings and vessel-related petroleum activities. It also includes a 500 m Safety Exclusion Zone (SEZ) around the MODU to manage vessel movements, which will be under the control of the MODU Person in Charge. The Primary Installation Vessel (PIV), operating within the Xena-03 Operational Area, will also be surrounded by a 500 m SEZ when on-location, which will be under the control of the vessel master.

For the purposes of the Description of the Existing Environment (Section 4) and for the Environmental Impact and Risk Assessments (Section 6) the Xena-03 Tie-back Operational Area has been referred to where relevant.

3.3 Timing

3.3.1 Pluto Operations

The facility commenced production in 2012. The riser platform is designed to be operated with minimal crewing, thus minimising risk exposure to personnel. Maintenance activities are undertaken to support the day-to-day operations of the facility as required.

Mid case estimated end of life of the Pluto, Xena and Pyxis fields is expected in 2032, beyond the life of this EP. Tie-back opportunities are continuously being reviewed for Woodside's offshore facilities, which have the potential to extend the life of the fields. Any future decommissioning or drilling will be subject to a separate EP.

3.3.2 Xena-03 Tie-back Activities

Drilling of the Xena-03 well is anticipated to commence in Q2 2025 and take around 60 days to complete (Table 3-3). Subsea installation is anticipated to follow in Q3 2025 and to have a cumulative duration of around 3 weeks (including mobilisation, demobilisation and contingency). Drilling and installation of subsea infrastructure may be performed over multiple campaigns.

Timing and duration of activities is subject to change due to project schedule requirements, MODU/vessel availability, unforeseen circumstances and weather constraints.

When tie-back activities are underway, activities are 24 hours per day, seven days per week. There are no planned concurrent drilling activities under the EP. Simultaneous Operations (SIMOPS) activities with subsea installation may occur. Timing and duration of all activities is subject to change due to project schedule requirements, MODU/vessel availability, unforeseen circumstances and weather.

The EP has risk-assessed activities associated with the drilling and tie-back of the Xena-03 well as if they were to occur at any time during the year, this includes drilling activities, subsea infrastructure installation, pre-commissioning activities and intervention, workover, or re-drilling activities. This provides operational flexibility for requirements and schedule changes and vessel/MODU availability. The timeframes are therefore subject to change within the defined calendar years and, as no particular windows have been nominated for avoidance based on environmental and/or stakeholder sensitivities, changes to the above will not be interpreted as 'new stages' against Regulation 39(1).

Table 3-3: Summary of timing for Tie-back Activities

Activity	Approximate timing (and cumulative duration in the field)
Installation and removal of anchors for MODU	2025 (7 – 10 days per activity)
Drilling and completions	Q2 2025 (~60 days) 2026 (contingency)
Subsea installation and pre-commissioning / cold commissioning	Q3 2025 (~3 weeks) 2026 (contingency)
Well start-up and performance testing	2025 (~3 weeks) 2026 (contingency)

3.4 Facility Layout and Description

This section provides a high-level overview of the facility and associated infrastructure, as relevant to consideration of the environmental risks and impacts of the Petroleum Activities Program.

3.4.1 PLA Topsides

The riser platform topsides comprise of five decks with separated by two major vertical trusses (Figure 3-2). A pedestal crane is located on the northeast end of the facility. The flare boom is inclined and located at the northern end of the facility. A water handling module has been installed on the western side of the riser platform. The helideck is located above the southern corner. Figure 3-3 shows the riser platform topsides layout and layout of the water handling unit (new infrastructure in yellow and green).

Other facilities include pig launchers and receivers for the flowlines and export pipeline, vessels for handling pigging fluids, metering for inflow streams, chemical injection facilities (for monoethylene glycol (MEG), water clarifier and corrosion inhibitors), diesel power generators, emergency flare, pedestal crane, temporary waste storage, helideck, bunkering facility, telecommunications, monitoring, control and safety systems and marine navigational aids.

Power generation was upgraded during installation of the water handling module, including a gas engine utilising fuel gas as the primary fuel source, supported by two diesel generators. Chemical storage and injection facilities (corrosion inhibitors and water clarifier) are also part of the water handling module.

Although the riser platform is NNC, permanently installed accommodation facilities are provided on the southern end of the topsides to accommodate personnel required for campaign maintenance, significant modifications and pigging activities.

The potential environmental impacts from planned and unplanned activities are discussed in Section 6.

Figure 3-2: Photograph of the PLA riser platform

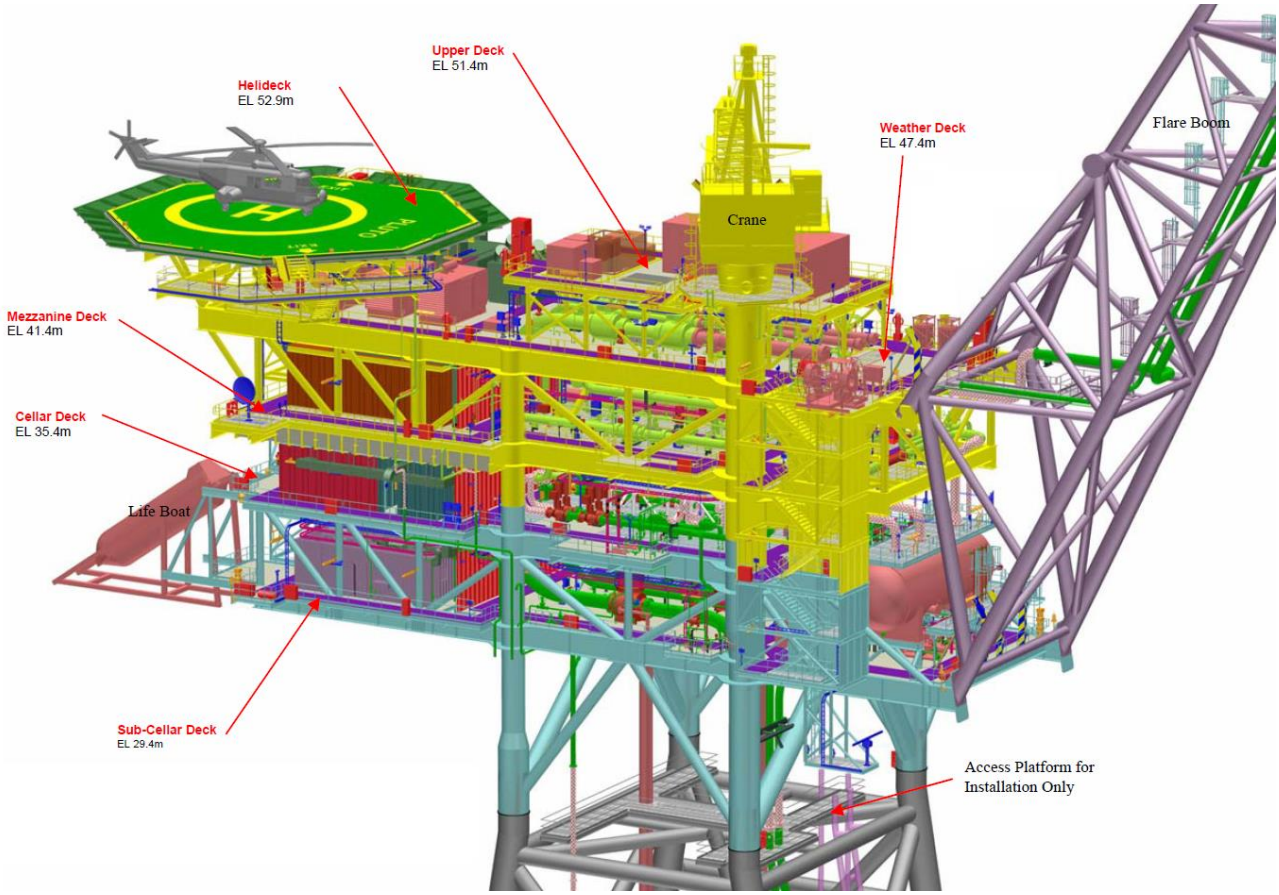

Figure 3-3: PLA Facility Platform Layout

3.4.2 Wells and Reservoirs

3.4.2.1 Pluto Wells

Gas and condensate from the Pluto reservoir are currently produced through eight big bore gas production wells (PLA01-07 and PL-PYA02) which are configured in a cluster arrangement around a central manifold at the drill centre (Figure 3-4). The primary reservoir isolations are provided by the actuated valves within the tree, and a down-hole Surface Controlled Sub-Surface Safety Valve (SCSSV) is included in the well design as emergency barrier in the event of tree / wellhead catastrophic failure. The wells are completed with a subsea tree system. An additional well (PLA-08), is planned to be drilled in the Pluto field with completions planned for Q3 2024, and is proposed to be operated during the life of this EP.

3.4.2.2 Xena Wells

Condensate and gas from the Xena reservoir are currently produced through two gas production wells (XNA01 and XNA02). The wells are independently isolated and controlled via a spur tie-in to the existing Pluto electro-hydraulic umbilical, located close to the existing tee locations. MEG and other chemicals as required are distributed to the wells via a dedicated flowline between an existing MEG Pipeline End Termination (PLET) on the chemical supply line. The existing wells are completed with a subsea tree system, similar to those installed on the Pluto wells. The primary reservoir isolations are provided by the actuated valves within the tree, and a down-hole SCSSV is included in the well design as emergency barrier in the event of tree / wellhead catastrophic failure.

An additional infill well from the Xena reservoir (Xena-03) is proposed to be operated during the life of this EP.

3.4.2.3 Pyxis Wells

Condensate and gas from the Pyxis reservoir is produced through one gas production well (PYA01), approximately 25 km north north-east of the existing Pluto A flow line tie-in PL-PYA02 exploits the Pluto gas field but is considered part of the Pyxis development.

The wells are independently isolated and controlled via a spur tie-in to the existing Pluto electro-hydraulic umbilical, located close to the existing tee locations (Figure 3-4). MEG and other chemicals are distributed to the well via a new integrated service umbilical supplied from an existing MEG PLET on the chemical supply line. The wells were completed with a subsea tree system, similar to those installed on the Pluto wells. The primary reservoir isolations are provided by the actuated valves within the tree, and a down-hole SCSSV is included in the well design as emergency barrier in the event of tree / wellhead catastrophic failure.

3.4.3 Flowline and Riser System

Production from the Pluto wells is routed approximately 27 km through dual 20-inch flowlines with an adjacent chemical supply line, up the continental slope to the riser platform (Figure 3-4).

During water production through the water handling module, Flowline B operates in wet mode, with Flowline A remaining unchanged as a dry flowline. The Xena well (and proposed future Xena-03 well) is connected to the production flowline via the following subsea infrastructure:

- a flexible production jumper
- mid-line connector system (MLCS) to the existing flowline tees.
- The Pluto and Pyxis wells are connected to the production flowlines via the following subsea infrastructure:
- an approximately 25 km flexible flowline up to 12-inch
- an 8” flexible production jumper from the flowline end terminal to existing MLCS-A and Pluto flowline A in-line tee.

The flowlines are configured as loops to allow round trip pigging of the flowlines from either end, with flowline pig launcher/receivers installed on the topsides. The flowlines and subsea system are sized to match the peak offtake rate required by the onshore LNG plant.

3.4.4 Pipeline and 6-inch Chemical Supply Line

Gas, condensate and other fluids (process chemicals and produced water) are currently transported from the riser platform to the LNG Plant via a 36-inch pipeline. Flow assurance is aided by the supply of MEG and other process chemicals in small concentrations (including corrosion inhibitor, biocide, oxygen scavenger, scale inhibitor, etc.) as required to protect the integrity of the pipeline. These chemicals are supplied from onshore storage and MEG regeneration infrastructure and pumped via the 6-inch chemical supply line piggy-backed to the pipeline from onshore to the riser platform. MEG, containing supporting chemicals are then supplied from the riser platform to the wells via a 4-inch chemical supply line.

The offshore gas pipeline and 6-inch chemical supply line route between the shore and the facility is approximately 180 km in length with a shore crossing at Holden Point, just north of the Pluto export jetty. The portion of the pipeline in State waters is not included in the scope of this EP. The offshore pipeline route is shown in Figure 3-1.

3.4.5 Subsea Infrastructure

The scope of this EP includes all subsea infrastructure associated with facility. The main components of subsea infrastructure include wells, xmas trees, umbilicals, spools, jumpers, manifolds, flowlines,

riser, chemical supply lines and the export pipeline. The layout of Pluto existing and proposed subsea infrastructure is shown in Figure 3-4.

The subsea system is remotely operated via satellite links and includes:

- rigid spools transporting hydrocarbons from the wells to the manifold/MLCS where the fluids flow through the 20-inch flowlines to the riser platform for onwards processing at the onshore facility
- jumpers and umbilicals which provide hydraulic and electric power, communications and chemical supplies
- valves which control subsea operations and processes
- chokes which control pressure and flow rates of hydrocarbon
- subsea control module (SCM) which contain sealed and pressure compensated electro-hydraulic units (typically found on manifold and/or wellheads) and links the surface and subsea controls.

Emergency shutdown (ESD) valves exist at various locations in the offshore facilities, including at the top of each flowline and pipeline riser to the riser platform. A non-return valve (NRV) is also provided on the 36-inch pipeline close to the riser platform as an emergency barrier to reduce the potential for uncontrolled backflow from the pipeline to the riser platform.

A number of subsea valves may also be overridden manually from either a Remotely Operated Vehicle (ROV) or by divers.

3.4.5.1 Flowlines Interactions

The following facilities and equipment are near the Pluto flowlines:

- The 44” Wheatstone pipeline was installed in 2014 and crosses the Pluto flowlines at approximately KP 19.1. It also crosses the 4” MEG line and subsea umbilical.
- The 18” Julimar and Brunello flowlines were also installed over the Pluto flowlines, 4” MEG line and subsea umbilical crossing at flowline KP21 in 2014
- The Scarborough 36” trunkline (under construction) crosses both Pluto flowlines and MEG/umbilical lines in 152m water depth, and the Scarborough trunkline 32” section crosses the Pyxis flexible flowline in 1007m water depth.

The design of the crossings ensures that the safety and integrity of any new infrastructure can be assured over its design life whilst not compromising the safety, integrity and operability of the existing facilities.

3.4.5.2 Export Pipeline Interactions

Connected on each side of the Pluto Export Pipeline are the PLA platform and the Pluto LNG Park. The following facilities and equipment are also in the vicinity of the Commonwealth waters section of the Pluto Export Pipeline:

- 36-inch export pipeline runs adjacent to the 40-inch 1TL within Mermaid Sound (for ~40km); and
- the 36-inch Scarborough Trunkline runs adjacent to the Pluto 36-inch export pipeline from the shore-crossing in Mermaid Sound for approximately 161 km.
- 16-inch Reindeer gas pipeline crossing at KP 75.

3.4.5.2.1 Reindeer Pipeline Crossing

The Santos Reindeer pipeline was installed in late 2010 and crosses the 36-inch pipeline and 6-inch MEG pipeline at KP 75. The design of the Reindeer crossing incorporates sufficient stabilisation of the pipelines, sufficient clearance and was subject to independent validation by DNV.

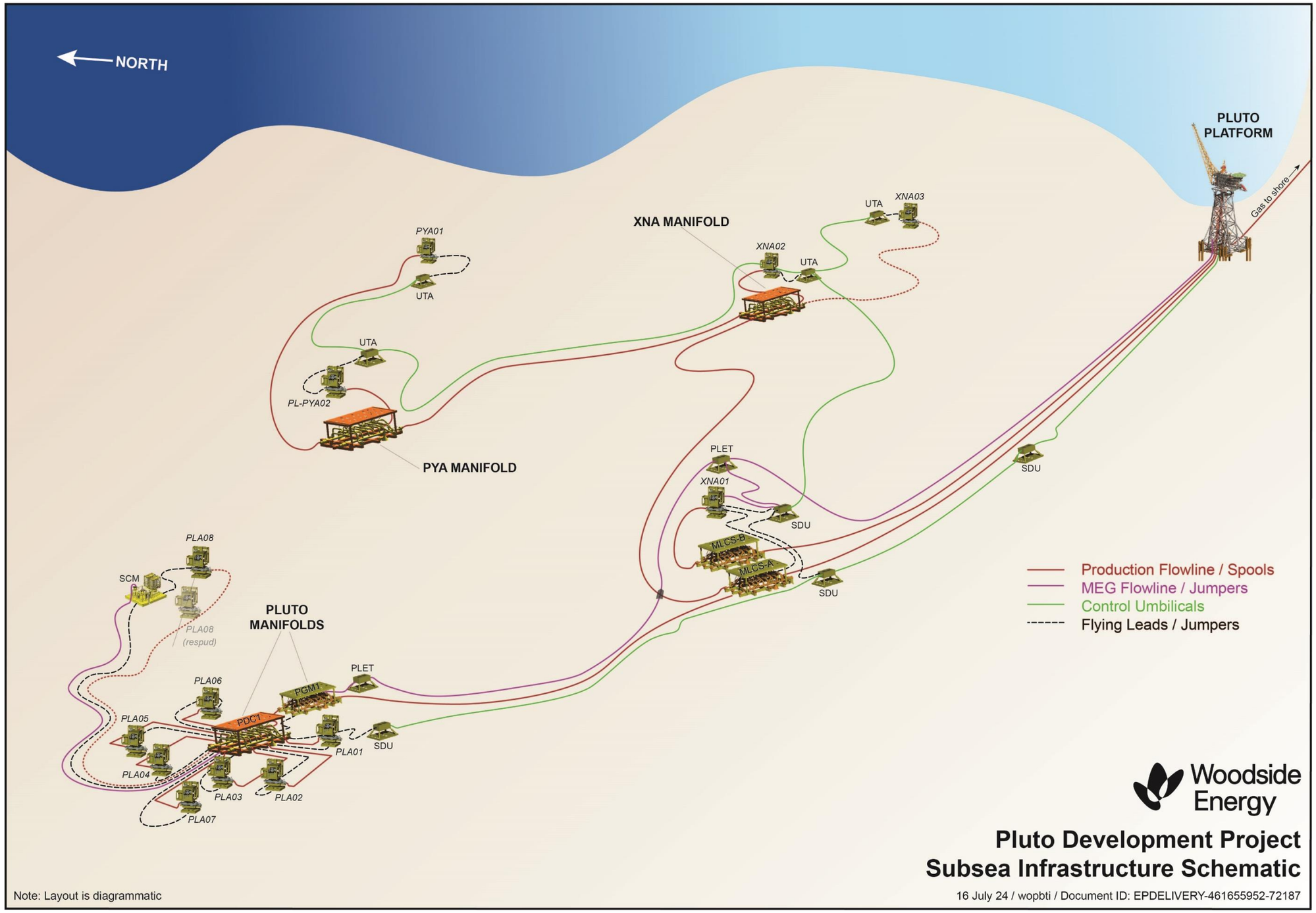

Figure 3-4: Layout of the Pluto facility subsea infrastructure

3.4.6 Field Inventory

The layout of the Pluto subsea infrastructure, including location of the fields, is shown in Figure 3-4 and described in Table 3-4.

Table 3-4: Inventory of subsea wells and key infrastructure, including status

Infrastructure[1]	Status[2]	Decommissioning Planning
Pluto		
7 x wells, 2 x active pipe support, 2 x flowline termination assembly, 2 x manifolds, 7 x SDU, 3 x PLET	Maintained for production	**Section 7.3**
17 x rigid spools (2 x 6", 7 x 8", 2 x 14", 4 x 20", 2 x 36" - total length ~2.0 km), 5 x flowlines (2 x 4", 1 x 6", 2 x 20" - total length ~263 km), 1 x 36" trunkline (~181 km)	Maintained for production	
5 x umbilicals (total length ~28 km), 25 x flying leads, 65 x jumpers	Maintained for production	
1 x well (PL08), 1 x SCM control skid, 2 x 8" flowlines – total length ~433 m), 10 x jumpers	To be commissioned	
Pyxis		
2 x wells, 1 x manifold, 2 x SDU/UTAs	Maintained for production	**Section 7.3**
3 x flowlines (1 x 8", 1 x 10", 1 x 12" - total length ~22 km)	Maintained for production	
2 x umbilicals (total length ~21 km), 11 x jumpers	Maintained for production	
Xena (existing)		
2 x wells, 3 x manifolds, 3 x SDUs, 1 x skid sensor	Maintained for production	**Section 7.3**
2 x 8" rigid spools - total length ~800 m, 3 x flowlines (2 x 8", 1 x 10" - total length ~1.8 km)	Maintained for production	
1 x umbilical (~1.4 km), 29 x jumpers	Maintained for production	
1 x jumper	Maintained for decommissioning	
Xena-03 (proposed)		
1 x well, 2 x UTAs	To be commissioned	**Section 7.3**
1 x 10" flowline (~3.0 km)	To be commissioned	
1 x umbilical (~2.2 km), 6 x jumpers	To be commissioned	

[1] Inventory of subsea infrastructure in the title areas or proposed to be installed in the title areas at time of submission of this EP
[2] Status at time of submission of this EP

The subsea infrastructure is recorded and tracked using a database. This database is updated as equipment is brought into title, which may include new or replacement equipment. Remotely Operated Vehicle (ROV) as found and as left surveys are undertaken to identify the location of items placed on the seabed. At the completion of an IMMR campaign this data is used to update the inventory for the title. Material items dropped to the marine environment and not recovered are added to the inventory for the title.

The subsea system has been designed, fabricated and installed in accordance with best practice and international standards. The pipelines, flowlines and wells are marked on nautical charts. Decommissioning planning for infrastructure no longer in use**.**

3.5 Operational Details

This section provides a description of the main operations associated with the facility. It includes key elements in relation to interaction between the activity and the environment, described under the following headings:

- Process Description (Section 3.5.4)
- Utility Systems (Section 3.6)
- Facility Operations (Section 3.7)
- Support Vessel Operations (Section 3.8)

The facility is designed to operate without operator intervention. Normal operations are controlled remotely via satellite links from the Pluto Remote Operations Centre (PROC). Activities which require manning are:

- engineering projects
- campaign maintenance
- unplanned corrective (breakdown) maintenance
- inspections/audits
- planned facility shutdowns.

Operations fall under any one of the following modes of operation:

- production remote operations
- major projects
- maintenance, including subsea inspection, maintenance, monitoring and repair (IMMR) activities
- well maintenance.

These modes of operation are described below. Production, maintenance and project activities may occur concurrently.

3.5.1 Production Remote Operations

The platform is designed to be operated with minimal/NNC crewing and is remotely operated, monitored, controlled, restarted and diagnosed from the Central Control Room (CCR), either from the Central Control Room at Pluto LNG Park or Remote Central Control Room in Perth.

The Process Control System for the facility provides the following monitoring and control functions:

- basic monitoring of key performance indicators
- adjustment of devices on the facility such as control valves, pumps, and variable speed drives
- alarm signals
- automatic management of duty/standby and lead/lag equipment.

3.5.2 Major Projects

Major projects involve refurbishment, modification or major maintenance on the facility. The Projects function is responsible for undertaking these projects. Potential environmental impacts related to projects are managed through the process outlined in Section 0.

3.5.3 Maintenance including IMMR Subsea Activities

Inspection, monitoring, maintenance and repairs, including those undertaken subsea, are intended to maintain safe and sustainable production within the platform.

Maintenance teams routinely visit the facility for:

- planned maintenance campaigns undertaken during routine interventions. Campaigns typically last for 14 days, with ten campaigns planned per year;
- unplanned corrective (breakdown) maintenance, as required;
- shutdown maintenance;
- pigging of the pipeline/flowlines for sand and debris removal, liquid management, inline inspection, well clean up and hydrate remediation. The frequency of pigging operations is defined in Pluto Pipeline System Inspection, Monitoring and Maintenance (IMM) Plan; and
- contingent manning on the riser platform involving continuous manning for indefinite periods to address low probability equipment failures, operational issues or major projects, such as maintenance of the water handling module.

The specific team sizes deployed to the facility are based on maintenance requirements, helicopter carrying capacity, availability of accommodation and safety considerations.

When the facility is crewed, primary control is retained by the PROC, with personnel on Pluto communicating with the PROC. Operational control of equipment is handed to ‘local control’ on the facility on an as-required basis.

3.5.4 Process and Production Description

The riser platform receives well fluids (gas, condensate, associated produced water and other fluids such as process chemicals) from the Pluto, Xena and Pyxis production wells. The facility then exports gas and condensate from the riser platform via the pipeline to the onshore gas plant for processing. With the installation of water handling module, the facility has the ability to separate and discharge PW. The riser platform also receives chemicals from the 6-inch chemical supply line, and transports these to the wells via the 4-inch chemical supply flowlines.

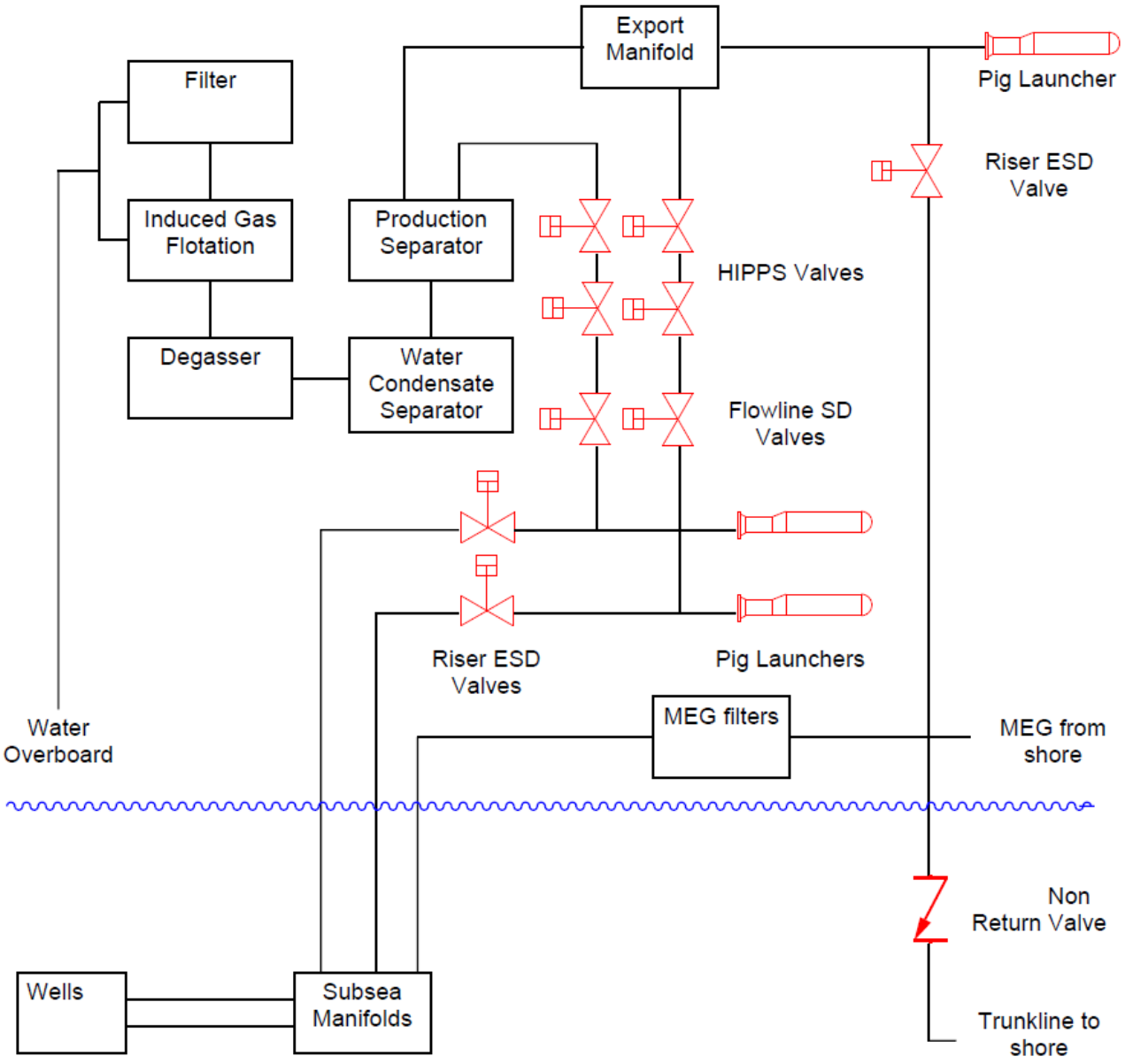

Figure 3-5: High-level Process flow diagram

3.5.5 Produced Water System

Due to the increasing ingress of water in the Pluto reservoir towards the production wells, PW treatment and disposal is required on the Pluto facility, as the volumes exceed the treatment capacity of the onshore facility. Woodside has recently installed a water handling module on the riser platform to treat PW. The maximum design case for water treatment is 3500 m3/day. The rate of PW is forecast to range from as low as 30 m3/day up to a maximum of 3500 m3/day, dependent on the number of wells producing water and their associated flowrate. As the operation of the module is dependent on volumes of PW, its operating times may vary.

The Pluto water handling module includes a two-phase production separator, water condensate separator, degasser and a secondary horizontal induced gas floatation (HIGF) vessel, to aid oil in water (OIW) separation. To safeguard from any excursions or process upsets, coalescing filters have been installed prior to the end of the process for intermittent use, where OIW concentrations from the HIGF outlet do not meet the required specification for overboard discharge. The filters are in

place to manage high OIW without process disruption. They are not suitable for permanent use due to NNC philosophy, as described in Section 6.7.7.

3.5.5.1 Produced Water Treatment System

The PW treatment module directs all wet production fluids from Flowline B through a two-phase production separator and water condensate separator to the PW system, which operates at a low pressure to maximise the removal of dissolved gas. The system consists of a degasser which separates dissolved gas followed by a HIGF unit, which distributes small gas bubbles through the PW in the vessel to enhance OIW separation. In this process, oil and fine solids particles present in the water adhere to the gas bubbles and float to the surface where they are skimmed off as a reject stream to the Oily Water Separator (OWS). PW is then discharged overboard in accordance with OIW monitoring requirements above the water line at +8 m LAT.

If water exiting the HIGF exceeds discharge limits due to excursion or process upset, the water can be routed through a set of coalescing filters for further treatment prior to being discharged overboard. This mitigation stage has been provided to minimise the requirement for reactive platform visits (increased safety risk) in the event of a process upset or excursion of produced water and will allow remote troubleshooting of the process, while maintaining the oil in water specification within operational discharge limits.

The water treatment system includes provision for injection of water clarifier chemical injection if increased efficiency in OIW separation is required. Contingency for demulsifier chemical injection upstream of the inlet separator has also been provided. Use of either is circumstantial based on engineering/operations judgement. In addition, the PW stream can also be routed via coalescing filters, which can be used in upset or non-routine scenarios to reduce OIW concentrations.

Reject streams with residual condensate from the Degasser, HIGF and coalescing filters will flow to the Oily Water Separator (OWS). Separated condensate is pumped to the pipeline and water is routed back to the main PW stream either upstream of the PW Pumps or upstream of the HIGF. The evolved gas from the degasser and HIGF is routed to the high pressure (HP) flare; the flowrate will be proportional to the PW rate. Water from the OWS can also be comingled with Produced Water Pump discharge (downstream of filters) and discharged overboard.

3.5.5.2 PW Discharge Oil in Water Monitoring

The measurement of OIW in the PW stream is undertaken prior to discharge to the ocean. OIW will be measured using online OIW analysers. The analysers are designed specifically for offshore operations and reports total petroleum hydrocarbons (TPH), where TPH is defined as all hydrocarbons that are soluble in the extraction solution and are present in the solvent extract after filtration through Florisil. Two OIW analysers will be installed on the module, with at least one analyser online at any one time in case of instrument failure.

Woodside has contracted external studies to advise on suitable OIW analyser technologies. Lessons from other Woodside assets were also heeded. The application of the analyser in a low aromatic, gas condensate field like Pluto has been verified with other operators of the selected analyser technology.

3.5.5.3 PW Discharge Monitoring

PW discharge on the facility is managed in accordance with the Offshore Marine Discharges Adaptive Management Plan (OMDAMP). This plan has been developed to detail the disposal of routine marine discharges from Woodside's offshore production facilities in accordance with Woodside's Environmental Performance Procedure. Implementation of the plan also verifies the discharges are managed in a way that reduces the potential environmental risks and impacts to ALARP.

In addition to continuous OIW monitoring, PW discharge monitoring includes routine chemical characterisation and ecotoxicity assessments of the PW. This information, combined with dilution modelling is used so that the discharge of PW is in accordance with the required standards outlined in Section 6.7.7. Refer to Section 6.7.7 for a detailed discussion and ALARP justification regarding PW discharge from the Pluto facility.

3.5.6 Utility Gas and Flare System

The riser platform currently has a combined high-pressure flare and utility gas system. A schematic showing the utility gas and flare system is presented in Figure 3-6.

With the water handling module installed, fuel gas is the primary fuel source for the gas engine. The fuel gas conditioning facilities (filtering and super heating) have been installed as part of the module.

Utility gas is required:

- for continuous purging of the flare header to prevent air ingress
- to supply pilot gas for the flare tip pilots
- to supply to the induced gas floatation unit for gas injection to maximise oil in water separation.

The flare system safely collects, contains and disposes relief, blowdown and vent flows from the topsides (pressure safety valves, manual and automatic blowdowns). A flare header collects relieved, entrained or condensed liquids and routes them into a knock-out drum. Liquids in the drum are periodically pumped into the export pipeline. The vapour flows via a riser, mounted on a cantilever boom to the elevated flare tip for burning.

The water handling module introduces additional process waste streams directed to the flare including the degasser, Induced Gas Floatation vessel and oily water separation tank.

The utility gas system is equipped with a meter that records total utility gas used and a meter that detects the volume of gas purging the flare. Remote operational monitoring of the flare system is in place via:

- flare gas flow metering
- monitoring of the pilot flare operation through ionisation detectors at each of the three tips
- monitoring of the utility gas pressure (with back-up systems activating on low pressure)
- closed circuit TV for visual checks.

The system allows for sustained flaring up to 100 MMscfd, when the flowlines are pigged or in the event depressurisation of the flowlines is necessary.

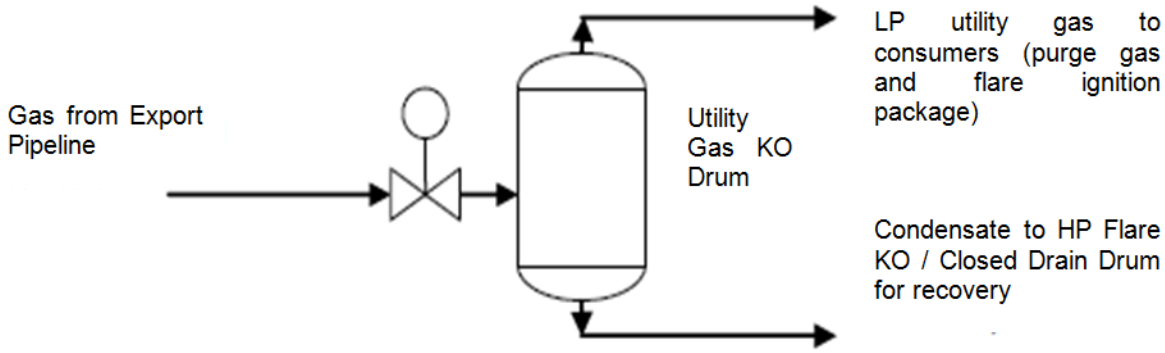

Figure 3-6: Riser Platform Utility Gas System

3.5.7 Drainage Systems

The open and closed drains system consists of both hazardous and non-hazardous open drains. The open drains system is required for disposal of water and hydrocarbons, which are at atmospheric pressure (e.g., deck water). Drains from hazardous areas are totally segregated from drains from non-hazardous areas, to prevent ingress of gases into a non-hazardous area via the drains system.

3.5.7.1 Closed Drains

The closed drain system is designed to safely collect, contain and recycle depressurized hydrocarbons, chemicals and other liquids from normally pressurized and hazardous equipment and is fully contained. The drained liquids are routed to the flare knock-out drum during normal operations and then pumped into the export pipeline for transfer to shore.

3.5.7.2 Hazardous Open Drains

The hazardous open drains system collects non-pressurised spillage, overflows, contaminated deck wash-down and some rainwater from the open drain boxes, tundishes and equipment drip trays in areas designated as hazardous. The PLA hazardous open drains flow to the hazardous open drains collection tank (working volume 11.6 m3) when the facility is crewed and work is being undertaken in the area. Areas of the facility have secondary spill protection (bunding) depending on the location, protection and spill risk of each component of the facility to contain and direct flows to the hazardous open drains system.

The hazardous open drains collection tanks are periodically pumped to a waste oil storage tank (capacity 4 m3) then transported onshore for disposal. The transfer of liquids from the collection tanks to the waste oil storage tank is a manual operation only undertaken while the facility is crewed.

The collection tanks are provided with a submerged centrifugal pump to transfer liquids from the tank at the sub-cellar deck to the waste oil storage tank located in a bunded area on the upper deck.

As part of installation of the water handling module to the facility, an additional open drains collection tank (working volume 10.7 m3) was added below the sub cellar deck of the module, designed to contain spillage (such as during chemical decant), leakage or washdown during maintenance activities on the module. Pump-out from the module open drain collection tank can be remotely operated to decant to the PLA open drain tank collection tank if required, or transferred directly during crewed activities for disposal onshore via the waste oil storage tank.

3.5.7.3 Non-hazardous Open Drains

The non-hazardous area open drains system collects liquids from open drain boxes, tundishes and equipment drip trays in areas designated as non-hazardous. It is segregated from all other drainage systems to eliminate the risk of hydrocarbon vapour transmission from hazardous to non-hazardous areas. Drains from the diesel generator bunds/tanks are part of the non-hazardous area open drains system. Water and any contamination are routed to the non-hazardous area open drains collection tank. This tank is sized for containing in excess of the full volume from a diesel generator day tank and has a working volume of 2 m3 (with max capacity of 2.6 m3).

The collected liquids are manually drained to the hazardous area open drains collection tank during every facility campaign maintenance visit (if it contains any liquid) so that the full working volume of the non-hazardous area collection tank is available for spill capture.

3.6 Utility Systems

3.6.1 Platform Lighting

The riser platform has appropriate lighting for there to be a safe working environment during 24-hour operations. Lighting is split between emergency and normal lighting. The emergency light fittings

have been located to illuminate the designated escape routes on the facility. Navigational lights are located on the riser platform flare tower and on the booms and towers of the pedestal crane. Helideck lighting is also provided to assist helicopter landing.

Unless required to support over the side activities (such as bunkering and lifting operations), lighting on the facility is directed to the work area when crewed, which limits light spill to the marine environment.

3.6.2 Heating, Ventilation and Air Conditioning System

The heating, ventilation and air conditioning (HVAC) system comprises HVAC equipment, ductwork and associated pipework. It provides independent and interdependent sub-systems with pressurised, conditioned, purge and exhaust air services to all living to various areas including accommodation and various modules which can be operated on an as required basis or continuous basis.

3.6.3 Potable Water

Commercially supplied water from onshore is provided for drinking and domestic use on the riser platform, which is bunkered by support vessels and transferred into a storage tank. The service water passes through a UV disinfection unit to ensure water quality for users.

3.6.4 MEG System

Lean MEG is filtered onshore, then transferred to the riser platform via the 6-inch subsea chemical supply line. The lean MEG concentration is selected as 90% by weight, which is the optimum concentration to maximise capacity of the distribution system. The topsides arrival pressure of the MEG from the 6-inch chemical supply line is 22 Mpa(g) under normal operations. Once on the riser platform, the MEG is again filtered and distributed to the Pluto/Xena/Pyxis wells via the 4-inch chemical supply line. The MEG flow is controlled by manual adjustments in subsea injection chokes, which are controlled via the PROC.

MEG ensures the water in the flowlines is inhibited against hydrates. Other chemicals, such as corrosion inhibitors, biocides, oxygen scavengers, and scale inhibitors, may be mixed with the MEG to aid in integrity and asset protection. These chemicals are injected into the wells in dilute concentrations as required for technical requirements. Chemicals used on the riser platform are discussed further in Section 3.9.

Injected (rich) MEG normally flows back from the wells with the production fluids in the flowlines to the riser platform, then via the pipeline to the onshore processing facility. It is then separated from the production fluids and stored and regenerated at the onshore processing facility for re-use.

The MEG supply lines have the following size and capacity:

- six-inch chemical supply line (onshore to the riser platform) – 715 m3/day
- four-inch chemical supply line (riser platform to Pluto subsea manifolds) – 354 m3/day.

When MEG is required to be injected into the Wet flowline for hydrate management, this diluted MEG will be processed through the water processing module and discharged overboard via the PW discharge pipe, these volumes are limited and frequency intermittent as detailed in Section 3.5.5. Continuous low rate MEG discharge to the flowlines and production system and PW discharge may be seen up to 2 m3/day associated with MEG injection bleed into the production system.

If required for intervention purposes, MEG or methanol may also be transferred onto the facility via iso-tanks to a 10 m^3 storage vessel.

3.6.5 Wet Flowline Conversions

To segregate wet wells for processing through the water handling module, the Pluto flowline B may need to be converted between dry flowline mode and wet flowline modes. Prior to flowline pigging operations (approximately four-yearly) and in case of infrequent planned/proactive shutdown management; the flowline may be required to be converted between wet and dry modes to treat the flowline with MEG for integrity management and prevent hydrate blockages. Upon restart, the flowline is required to be converted from dry mode back to wet mode. As part of this, up to 52 tonnes of diluted MEG will be displaced from the flowlines and wells, which will enter the water treatment process on the facility and be discharged overboard.

If the wet flowline is shut down, MEG is required to be dosed into in each wet well (~1.6 tonnes) and uninsulated sections of the flowlines subsea (14 tonnes) which will be displaced to the separation and PW treatment process on the facility and discharged overboard.

3.6.6 Power Generation

As the riser platform is NNC and includes no processing, the power demand of the facility is characterised by long periods of very low power demand and short duration peaks in demand. Continuous power during normal operations is required by the utility gas pre-heater, to maintain charge in the uninterruptible power supply (UPS) batteries, and for lighting and navigational aids. Peaks in demand occur during flowline pigging (which requires running of the flare knock-out drum pumps) and recovery from an extended blackout (which requires the UPS batteries to be heavily recharged).

Historically, power for the facility was provided by three small diesel generators located on the platform, with capacity of 240 kW per generator. One out of the three diesel generators remained online during normal operating mode, with the other two on standby. For operations requiring additional power, one of the standby generators was brought online.

Operation of the water handling module increases the operating requirements of the production equipment, thus increasing the base load for the facility. Peaks in demand occur during flowline pigging and process upset conditions (such as restart activities) and recovery from an extended blackout. The generator tanks are located in a bunded area which drains into the non-hazardous open drains system (refer Section 3.5.7).

Following installation of the water handling module, power for the facility is provided by two diesel-fuelled generators, one gas-fuelled generator and a Grid Stability Module (GSM) located on the water handling module. The fundamental components of the GSM are a rectifier/inverter and a battery supply. The generators are integrated with a GSM to eliminate the requirement for a hot standby generator and increase fuel efficiency. The gas-fuelled engine generator is the preferred unit for operation. If fuel gas is not available, or the unit is unavailable, the other diesel units will be started. In the event of a generator trip, the GSM shall maintain the load with no breaks (i.e. seamless) during the transition to an alternate generator supply. When a generator supply is restored, the GSM shall re-commence charging. The generators and GSM shall be capable of online changeover, synchronisation and load sharing. For operations requiring additional power, one of the standby generators is brought online.

3.6.7 Sewage and Putrescible Wastes

No sewage or putrescible wastes are produced from the riser platform during uncrewed periods. When the facility is crewed, the sanitary drainage system is a combined black and grey water system, with black and grey water discharged to the marine environment as untreated, un-macerated waste. Sewage is disposed via a dedicated overboard caisson. The caisson is a 300 mm carbon steel pipe that discharges at approximately 7.5 m below LAT. A rodding point is also provided at the top of the disposal caisson.

When the facility is crewed, putrescible waste (principally food scraps) are bagged and transported to shore for disposal as domestic waste, in accordance with the requirements of Woodside's Waste Management Plan for Offshore Facilities. During planned maintenance campaigns, shutdown maintenance or major projects additional crew will be present at the Pluto facility. During these times of increased personnel, an accommodation support vessel (ASV) may also be utilised on station to accommodate crew. Sewerage and putrescible discharges associated with the ASV are discussed in Section 3.8.3.

3.6.8 Sand Management

Subsea wells are equipped with downhole sand control (expandable sand screens or open hole gravel pack), acoustic sand detectors and erosion probe located on the subsea xmas trees. The facility basis of design assumes there is a low probability of sand production. Hence, any sand produced in normal operation should not cause any significant erosion or corrosion impact in the flowlines. In the event of sand production and depending on the mode of production (wet or dry), produced sand is expected to accumulate in the onshore facilities (dry mode) or Pluto Water Handling equipment (wet mode).

Sand and other material (sludge, scale, etc.) with the potential to be contaminated with NORMs is tested and disposed of in accordance with Woodside's Waste Management Plan for Offshore Facilities.

3.6.9 Diesel Fuel System

Low sulphur diesel is transferred to the riser platform in bulk from supply vessels via a hose reel located at the dedicated bunker station on the platform. Diesel is bunkered directly into the crane pedestal diesel bulk storage tank which has a maximum storage capacity of 80 m3. Filters provided on the diesel inlet assist in preventing blockage of the tank level devices. Diesel is metered and distributed to users via a continuously pressurised ring main. Unused diesel is recycled back to the crane pedestal. The tank is equipped with level fall alarms and remote shut-off systems to allow shutdown of the system locally or from the PROC.

Diesel is required for:

- crane tank
- lifeboat tank
- diesel generators.

With the installation of the water handling module and the change to fuel gas being the primary source for power generation, diesel consumption is forecast to reduce which is expected to reduce the bunkering frequencies.

3.6.10 Hydraulic Fluid System

The riser platform is provided with a hydraulic power unit (HPU) hydraulic fluid storage tank of 4 m3 capacity. A glycol based hydraulic fluid is supplied to actuate valves on the topsides and subsea facilities including shutdown valves, blowdown valves, high integrity pressure protection system (HIPPS) valves, control valves and subsea xmas tree, surface-controlled sub surface safety valve and choke valves.

Hydraulic fluid is supplied in high- and low-pressure modes with two independent headers. A common production hydraulic power unit is located on the sub-cellar deck to provide both low pressure (LP) and HP hydraulic power for operation of both subsea and topsides valves. The topsides hydraulic system has a supply reservoir and a return reservoir (closed loop), four hydraulic supply pumps and a reservoir pump. Hydraulic fluid supplied to the subsea facilities is in an open-loop configuration, and each actuation of a valve will release a small quantity of the fluid at the SCM vent port.

All safety critical valves are designed for fail safe operation, in the case of the HPU losing pressure (e.g. in the highly unlikely event of a major platform or umbilical failure).

Oceanic HW443, typically is used in the hydraulic system, which is a MEG-based hydraulic fluid and rated D under the non-Chemical Hazard and Risk Management (CHARM) Offshore Chemical Notification Scheme (OCNS) rating system but carries a CEFAS substitution warning. Chemical selection and use is detailed in Section 3.9.

The water handling module will feature an independent closed loop topsides HPU located on the sub-cellar deck for supplying fluid power to the module actuated on/off valves and control valves. The HPU is proposed to have a total system capacity of 2 m3 in the supply reservoir, with an additional 1 m3 storage tank permanently connected to the HPU. This system will utilise an oil based fluid; this is required due to the lubrication requirements of the valve solenoids, which improves the reliability and reduces maintenance requirements on the NNC platform.

Hydraulic power is the only instrument utility available for motive power on the facility. If an activity requires the use of an air powered tool, then portable air compressors will be transported from shore as required. Maintenance of this equipment occurs onshore.

3.7 Facility Operations

3.7.1 Operational Flaring

Flaring is expected to occur during a range of operational circumstances; key operational flaring events are explained in further detail in the following sections. Annual internal facility flare targets are set based on operational activities planned for the year. This target is used to assess facility flare performance.

3.7.2 Normal Operations

A relatively small quantity of gas is required to be continuously flared associated with purge and pilot of the flare system and disposal of waste streams that are not suitable to be recovered to the process.

Continuous flows to the flare are approximately 4000 tpa. Sources include:

- flare header purges
- flare pilot
- PW degasser
- PW induced gas floatation
- leakage past flare header values such as pressure safety valves (PSVs) and blowdown valves (BDVs)
- oily water separator tank.

3.7.3 Intermittent Process Upsets and Activities

During process upsets or blowdowns, the process control valves on the main process equipment open to relieve topsides system pressure to the flare. The following sources make up intermittent flaring.

3.7.3.1 Operational Pigging

Flaring to facilitate round-trip pigging of the flowlines is an integral part of operation of the facility and occurs as required (approximately once every four years). Produced gas is flared during flowline pigging operations, with liquids exiting the flowlines stored in the flare knock-out drum. Pipeline gas is used to propel the pig in the first half of the flowline loop. Well fluid is used to propel the pig in the

second half of the flowline loop, with produced gas and liquids from flowline pigging directed to the pipeline.

The system is sized to flare at a rate of 100 MMscf per day gas during flowline pigging. Additionally, initial depressurisation of the flowlines to flare is required for approximately two hours prior to pig launch to reduce the flowline pressure sufficiently to successfully launch the pigs using pipeline pressure. Each pigging campaign requires three pigging runs each for gauging, cleaning and inspection. The pigging activity typically results in an additional 8300 tonnes (approx.) in years that flowlines are pigged.

3.7.3.2 Emergency Blowdown

The topsides equipment and piping are divided into isolatable sections, each with a dedicated BDV. During an ESD, each section is separately depressurised to the flare. Each section contains actuated BDVs which allows blowdown of the riser platform inventory. The total volume depressurised is 7 tonnes. With the water handling module on the platform, this has increased to approximately 8 tonnes as a result of additional process vessels and pipework.

3.7.3.3 Manual Depressurisation

Manual depressurisations will result in intermittent flaring of hydrocarbons, triggered by routine equipment maintenance, planned ESD testing and/or depressurisation of equipment and piping to remove the equipment from service. Furthermore, equipment must be depressurised prior to draining as the closed drains system is not intended for high pressure service.

3.7.3.4 Subsea Flowline Depressurisation

The well fluid in the subsea flowlines (which carry hydrocarbons from the subsea wells to the riser platform) may on rare occasions need to be routed to the flare to allow the pressure in the flowlines to be reduced. The flowlines may require depressurisation for the following reasons:

- for flowline hydrate management: depressuring must be completed prior to flowlines cooling to seabed temperature when the production system is offline
- over-pressurisation of flowlines above integrity limit
- leak-off testing of well or subsea isolation valves
- production flowline maintenance (if required)
- to facilitate remediation in the event of an unplanned hydrate blockage in the subsea equipment

3.7.3.5 Estimated Flare Volumes

The amount of gas that may be flared on an annual basis is a dependent of continuous and intermittent process sources, planned activities requiring flaring, and unplanned process upsets. The estimated annual amount of gas flared ranges between approximately 8,500 tpa and 16,800 tpa.

3.7.4 Greenhouse Gas Emissions

The main sources of greenhouse gas (GHG) emissions associated with Pluto production are shown in Table 3-5. GHG sources that are not part of the Pluto facility (e.g. from onshore processing emissions) are included for completeness. In the context of this EP, the emissions are classified as direct and indirect emissions.

Table 3-5: Direct and indirect GHG emissions sources from the Pluto facility and supply chain

Emission type	Emissions source	Location	Jurisdiction	Process
Direct	Pluto facility process	Offshore	Commonwealth	GHG emissions from fuel, flares, fugitives and process vents
Indirect	Support vessels (on charter)	Offshore	Commonwealth	GHG emissions from engines and fugitives on vessels
	Onshore processing*	Onshore	State (WA)	GHG emissions from venting reservoir CO2, combustion of gas as fuel, flares and fugitives associated with processing gas to products such as LNG, LPG, condensate and domestic gas
	Transport	Transit	Subject to consumer location	GHG emissions from transport of products to market, including regassification and distribution of LNG in customer markets
	Regassification, distribution and combustion by third party user	Market	Subject to consumer location	GHG emissions from combustion of products as part of power generation and other energy solutions within the final market

**ISO 19694:2021 defines indirect GHG emissions as GHG emission that is a consequence of an organization's operations and activities, but that arises from GHG sources that are not owned or controlled by the organization. For the purposes of this EP the "organization" is the Pluto facility and therefore onshore processing and support vessel operations are considered indirect emissions sources.*

3.7.5 Lifting Operations

A pedestal crane is located on the east side of the riser platform at the weather deck, providing the necessary coverage for all on-deck material handling requirements and lifting between the riser platform and supply vessels. The pedestal crane is powered by diesel.

3.7.5.1 Routine Lifting from Platform Support Vessels

Routine lifting operations primarily include transferring stores and equipment from a support vessel to the facility. Support vessels are equipped with dynamic positioning (DP) control for holding station during lifting operations. The types of 'lifted equipment' may vary but generally include containers or skips of various sizes. The stores and equipment required by the facility are secured inside the skip or container. Containers for supply of chemicals are routinely lifted. Equipment is to be appropriately rated for offshore lifting.

After offloading from the supply vessel is complete, the facility then backloads to the supply vessel any items to be returned to shore. These primarily include empty skips or containers or skips containing waste for onshore disposal.

3.7.5.2 Lifting Around the Facility

Once lifted to the lay down area, there may be a need to re-position equipment at various locations throughout the facility for operational purposes. This includes lifting stores or equipment to various landing areas throughout the facility for unloading or use, and moving waste bins to required areas.

There may be occasions where a non-routine piece of equipment may need to be lifted. On these occasions, the equipment is packed up in a container or an approved lifting frame.

3.7.5.3 Operational Lifting (Non-crane Based)

There is also a requirement to undertake operational lifting utilising rigging, chain blocks or electric hoists. This lifting is primarily undertaken for maintenance or repairs and involves lifting and removing equipment such as valves, spools and motors.

Maintenance areas are in close proximity to all major equipment. Material handling corridors are provided to allow transportation of materials and equipment.

Once lifted to the lay down area, there may be a need for re-positioning of equipment at various locations throughout the facility for operational purposes. Where required, lifting of material and equipment in/out is achieved via beam clamps. General purpose floor trolleys and skates are used for moving material and equipment to/from laydown areas. Pad-eyes are provided for equipment requiring regular or frequent maintenance, where there is no direct pedestal crane access, or where runway beams are impractical.

3.7.6 Safety Features and Emergency Systems

A range of safety features and emergency systems have been integrated into the design and operation of the Offshore Facility to manage safety risk. Based on Woodside's Health and Safety Design Premises for Hydrocarbon Facilities, risk management measures have been grouped into the categories of:

- prevention
- detection
- control
- mitigation.

The safety features and emergency measures in place on the facility are listed in Table 3-6. Specific details of these and other safety systems can be found in the Pluto A Operations Safety Case.

Table 3-6: The Pluto facility safety features and emergency systems

Category	Description
Prevention	Inherently safe design (leak minimisation, layout) Dropped object/impact protection (including vessel collision avoidance) Structural design Material selection and corrosion control
Detection	Fire, gas and smoke detection (including manual alarm callpoints)
Control	Process control system Ignition control Depressurisation systems Passive fire protection Heating, ventilation and air conditioning
Mitigation	Escape and evacuation routes Temporary refuge Emergency power and UPS Emergency and escape lighting Critical communications systems Evacuation and rescue facilities and equipment

3.8 Support Vessel Operations

3.8.1 Platform Support Vessels

Platform support vessels are used to transport material and equipment to and from the riser platform when crewed. The specifications of the Mermaid Strait are presented in Table 3-7 as an example, and represent typical specifications of a platform support vessel. Vessels supporting the facility may vary depending on vessel schedules and availability.

While in the field, the vessel also backloads materials and segregated waste for transportation back to the King Bay Supply Facility in Karratha. If the vessel has Fast Rescue Craft (FRC) capability it can be utilised to carry out standby duties including during helicopter operations and working over the side activities while in the field. PLA also utilises the Standby Vessel (SBV) located at the nearby Wheatstone Platform which can be called upon to render assistance in the event of a platform emergency and rescue response for helicopter operations.

Figure 3-7: Indicative facility support vessel (Mermaid Strait)

Table 3-7: Indicative platform support vessel specifications (Mermaid Strait)

Particulars	
Type	Diesel Electric, Azimuth, AHT, OSV, DP1
Length overall (LOA)	52.35 metres
Breadth	14.6 metres
Draft	4.9 metres
Dead weight tonnage (DWT)	930 tonnes
Accommodation	Berthing for 24 personnel
Dynamic positioning system	Kongsberg Simrad DP1 with Poscon joystick control
Capacities	
Fuel	592 m3
Pollution Control	
Spray booms	Nil
Dispersant pump	Nil
Dispersant storage	Woodside issued dispersant kit: tank volume 350 gallons.

3.8.2 Subsea Support Vessels

Subsea support vessels, including uncrewed surface vessels (USVs), are also used for field work such as subsea IMMR activities. Vessels supporting offshore activities may vary depending on operational requirements, vessel schedules, capability and availability.

Subsea activities are typically undertaken from a subsea support vessel or USV and may use an ROV with transponders. For some activities, ROVs may also be deployed from the Pluto riser platform. Typical subsea support vessels use a DP system to allow manoeuvrability and avoid anchoring when undertaking works, due to the close proximity of subsea infrastructure. However, vessels are equipped with anchors which may be deployed in an emergency.

The DP system requires the temporary deployment of up to six transponders on the seabed. Transponders are also used for monitoring the location of infrastructure/equipment during a repair. The transponders are attached to small recoverable moorings (metal clump weight or tripod) that are lowered to the seabed and placed in position by ROV. The transponders have a small footprint; less than 0.5 m2. The transponders and moorings are recovered using ROVs at the end of the activity.

ROV operations often require tool baskets which are temporarily placed on the seabed. These baskets typically have a mesh base with a seabed footprint of approximately 15 m2. The baskets are recovered to the vessel at the end of the activity.

3.8.3 Accommodation Support Vessel

An Accommodation Support Vessel (ASV) may be required for short periods to support planned maintenance campaigns, shutdown maintenance or major projects. Typically, these campaigns would last up to 90 days with possible extensions due to unforeseen factors like weather. During the life of this EP, an ASV could be required at any time of the year and would be located next to the facility, inside the PSZ.

ASV vessel specifications may vary depending on operational requirements, vessel schedules, capability and availability. Typical ASVs use a DP system so as to allow manoeuvrability and avoid anchoring when in close proximity of the platform. However, vessels are equipped with anchors which may be deployed in an emergency. Indicative ASV specifications are provided in Table 3-8.

Table 3-8: Indicative accommodation supply vessel specifications (Floatel Triumph ASV)

Particulars	
Type	Semi-submersible Accommodation Support Vessel
Length overall (LOA)	125 m
Breadth	80 m
Dead weight tonnage (DWT)	27,111 t
Accommodation	500 persons approx.
Dynamic Positioning System	DP 3
Capacities	
Fuel	Largest tank 297 m3 Total capacity 1,800 m3

3.8.4 Remotely Operated Vehicles

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

- anchor holding testing
- connection of mooring systems
- pre-drill seabed and hazard survey
- blowout preventer (BOP) land-out and recovery
- BOP well control contingency
- visual observations at seabed during riserless drilling operation
- pre and post installation survey
- subsea xmas tree control systems hook-up and contingency control

- removal of sediments on or around subsea infrastructure
- installation, testing, pre-commissioning, commissioning and start-up of subsea infrastructure.

An ROV can be fitted with various tools and camera systems that can be used to capture permanent records (both still images and video) of the operations and immediate surrounding environment. Specifically, during installation, the ROV is fitted with hydraulically driven tools to facilitate flowline tie-in. An ROV may also be used in the event of an incident to deploy the Subsea First Response Toolkit.

3.8.5 Helicopter Operations

Helicopters are the primary means of transporting passengers and/or urgent freight to/from the Pluto facility and vessels. They are also the preferred means of evacuating personnel in an emergency. Helicopter operations within the PAA are limited to helicopter take-off and landing on the helideck. Helicopters may be refuelled on the helideck of the MODU. Helicopter support is principally supplied from Karratha Airport, and transports workers from Karratha for planned maintenance.

3.9 Hydrocarbon and Chemical Inventories and Selection

3.9.1 Hydrocarbons

The main hydrocarbon inventories associated with major topside process and non-process equipment is summarised in Table 3-8. In addition to the chemicals listed, the riser platform may also maintain small volumes of various facility maintenance chemicals as previously described.

Table 3-9: Hydrocarbon Inventories of process and non-process equipment

Material	Storage Means	Capacity/Storage Volume
Hydrocarbons		
Condensate	Knock-out drum	Usual volume 5 to 10 m^3, with capacity 90 m^3
Diesel	Crane pedestal diesel storage tank	80 m
	Generator set day tanks	3 x 1.8 m^3
Oily water and chemical waste	Hazardous Drain Collection Tank	14 m^3 (working volume 11.6 m3)
	Non-Hazardous Drain Collection Tank	2.3 m^3
	Waste Oil Storage Tank (transportable ISO container)	4 m^3
Water Handling Module– indicative potential hydrocarbon inventories		
Production separator	Vertical gas/liquid separator	~30 m^3 (normally also incl. PW)
Liquid-liquid separator	Produced water/condensate separator	~40 m^3 (normally also incl. PW)
Degasser	Produced water vessel	40 m^3
Induced gas floatation vessel	Produced water vessel	30 m^3
Oily water separation tank	Oily water storage tank	4 m^3

3.9.2 Chemical Usage

Chemicals are utilised for a variety of purposes and can be divided into two broad categories (operational and maintenance), as described below.

3.9.3 Operational Chemicals

3.9.3.1 Operational Process Chemicals

An operational process chemical is the active chemical added to a process or static system, which provides functionality when injected in produced fluid, utility system streams or for pipeline treatment. These chemicals may be present in routine or non-routine discharge streams from the facility.

Installation of the WHM, has introduced operational process chemicals corrosion inhibitors (up to 100 ppm dependent on water flow rate due to wet flowline operation) and water clarifiers (up to 50 ppm), some of which will be present in the routine discharge of produced water.

3.9.3.2 Operational Non-Process Chemicals

Operational non-process chemicals include chemicals which do not fall into the category described above but which may be required for operational reasons and, by virtue of their use, may be intermittently discharged or have the potential to be discharged (e.g., required as a result of maintenance or intervention activities). Examples include subsea control fluids, dyes and well intervention/workover chemicals.

Operational non-process chemicals such as hydraulic fluids required for operation of the water handling module HPU, have been introduced and included in this EP.

3.9.4 Maintenance Chemicals

Maintenance chemicals include chemicals which are required for general maintenance or 'housekeeping' activities and are critical for overall maintenance of the riser platform and its equipment. These may include paints, degreasers, greases, lubricants and domestic cleaning products. They may also include chemicals required for specialty tasks, such as laboratory testing and analysis. Maintenance chemicals generally present negligible risk to the environment, as they are not discharged as a result of their use (e.g., paint) or are used intermittently and discharged in low volumes (e.g. domestic cleaning products).

3.9.5 Indicative Chemical Inventories

An indicative list of bulk chemicals commonly used (or planned to be used on the facility) and estimated storage quantities, is summarised in Table 3-10. Other chemicals may be used in the future if chemical requirements change, for example, during start-up of new wells, there may be also be temporary well clean-up skid which may include water clarifiers. In addition to the chemicals listed, the riser platform may also maintain other small volumes of various operational chemicals and facility maintenance chemicals as previously described.

Table 3-10: Indicative bulk inventories of chemicals

Material	Storage Means	Storage Capacity
MEG	Hydrate inhibitor storage vessel[1] Transportable ISO container	12 m^3 (working volume 10 m^3)
Methanol (if required)	Hydrate inhibitor storage vessel [1] Transportable ISO container	Typically 4-6 m3 ISO containers
Subsea control fluid	Hydraulic power unit storage tank	4 m^3
Water Handling Module – indicative inventories		
Water clarifier (if required)	Water clarifier storage tank	4 m^3
Demulsifier	Demulsifier storage tank	4 m^3
Corrosion inhibitor	Corrosion inhibitor storage tank (stainless steel)	28 m^3 4 m^3

Material	Storage Means	Storage Capacity
	Lifted from vessels in IBC's and gravity drained into storage tank.	
Subsea control fluid	Hydraulic power unit storage tank for water handling module	3 m^3

[1] *Only a single hydrate inhibitor storage vessel is provided on the platform; however, the utility fluid may vary between methanol and MEG depending on operations requirements.*

3.9.6 Environmental Consideration during Selection, Assessment and Approval of Chemicals

As part of Woodside's chemical approval process, operational chemicals required by the Petroleum Activities Program are selected and approved in accordance with the Woodside Chemical Selection and Assessment Environment Guideline. This guideline is used to demonstrate that the potential impacts of the chemicals selected are acceptable and ALARP, and meet Woodside's corporate requirements (as outlined in Woodside's Environmental Performance Procedure, which requires chemicals to be selected with the lowest practicable environmental impacts and risks subject to technical constraints.

A summary of the environmental requirements of the guideline is outlined below.

3.9.7 Environmental Selection Criteria

The Woodside Chemical Selection and Assessment Environment Guideline follows the principles outlined in the OCNS which manages chemical use and discharge in the United Kingdom (UK) and the Netherlands (background on the OCNS scheme provided is below).

Operational chemicals will be selected/assessed in compliance with the Woodside Chemical Selection and Assessment Environment Guideline, specifically:

- Where operational chemicals with an OCNS rating of Gold/Silver/E/D and no OCNS substitution or product warning are selected, or a substance is considered to pose little or no risk to the environment (PLONOR), no further control is required. (Such chemicals do not represent a significant impact on the environment under standard use scenarios and therefore, are considered ALARP and acceptable).
- If other OCNS rated or non-OCNS rated operational chemicals are selected, the chemical will be assessed as follows:
  - If there is no planned discharge of the operational chemical to the marine environment, written technical verification of the 'no discharge' fate must be provided, and no further assessment is required.
  - If there is planned discharge of the operational chemical to the marine environment, a further assessment/ALARP justification will be conducted.

The ALARP assessment will include consideration of chemical toxicity, biodegradation and bioaccumulation potential, using industry standard classification criteria (CEFAS scheme criteria).

If a product has no specific ecotoxicity, biodegradation or bioaccumulation data available, the following options are considered:

- Environmental data for analogous products can be referred to where chemical ingredients and composition are largely identical.
- Alternatively, environmental data may be referenced for each separate chemical ingredient (if known) within the product.

If no environmental data is available for a chemical or if the environmental data does not meet the acceptability criteria outlined above, potential alternatives for the chemical will be investigated, with

preference for options with a Hazard Quotient (HQ) band of Gold or Silver, or are OCNS Group E or D with no substitution or product warnings.

If no more environmentally suitable alternatives are available, further risk reduction measures (e.g. controls related to use and discharge) will be considered for the specific context and implemented where relevant so that the risk is ALARP and acceptable.

Once the further assessment/ALARP justification has been completed, concurrence from the relevant manager that the environmental risk as results of chemical use is ALARP and acceptable is obtained.

3.9.8 Background Overview of the OCNS Scheme

The OCNS Scheme applies the requirements of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention). The OSPAR Convention is widely accepted as best practice for chemical management.

All chemical substances listed on the OCNS ranked list of registered products have an assigned ranking based on toxicity and other relevant parameters such as biodegradation, and bioaccumulation, in accordance one of two schemes (as shown in Figure 3-8):

Hazard Quotient 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). Applied to inorganic substances, hydraulic fluids and pipeline chemicals only.

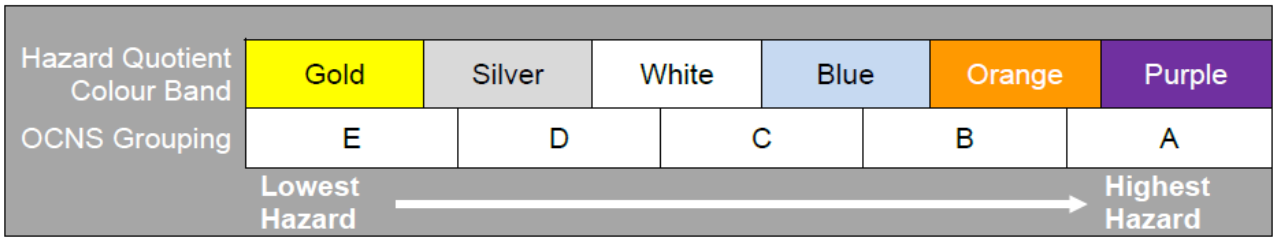

Figure 3-8: OCNS ranking scheme

3.10 Subsea Inspection, Maintenance, Monitoring and Repair (IMMR) Activities

3.10.1 Overview

Subsea infrastructure, including the platform substructure, is designed not to require significant intervention. Inspection and maintenance are undertaken to ensure the integrity of the infrastructure and identify problems before they present a risk of loss of containment. Maintaining infrastructure integrity also supports decommissioning planning. Intervention may be required to repair identified problems.

To manage subsea threats (risks) the IMMR process requires an appropriate response to be selected to manage specific equipment risks. This is typically one of: Inspection, Maintenance, Monitoring and Repair (IMMR).

The IMMR process for subsea infrastructure maintains equipment in good condition and repair, for production and to enable future removal.

Subsea activities are typically undertaken from a subsea support vessel or Uncrewed Surface Vessel (USV) and may use an ROV to inspect equipment. For some activities, ROVs may also be deployed from the PLA platform.

Maintenance and repair activities may require the deployment of frames/baskets which are temporarily placed on the seabed. These typically have a perforated base with a seabed footprint of

about 15 m^2. This temporary equipment is removed from field via recovery to project vessels at the completion of IMR activities.

3.10.2 Typical IMR activities are described below.

3.10.2.1 Inspection

Inspection of subsea infrastructure is the process of physical verification and assessment of components in order to detect changes to the as-installed location and condition by comparison to initial state following installation and previous inspections. Details of typical subsea infrastructure inspections/surveys and indicative frequencies are provided in Table 3-11. Scope and frequency of subsea equipment (operational and redundant) and pipeline inspections are determined using a Risk Based Inspection (RBI) methodology and associated plans.

RBI is commonly used within the industry as a method for determining inspection frequencies (Energy Institute, 2009; DNV, 2019).

Table 3-11: Typical subsea infrastructure inspections and surveys, their purpose and approximate frequencies.

Type of inspection/ survey	Subsea infrastructure	Purpose	Approximate frequency
General visual inspection	All subsea infrastructure	Check general infrastructure integrity.	Varied – every 1 to 8 years
Close visual inspections	All subsea infrastructure	Investigate certain subsea infrastructure components.	Varied – every 2 to 6 years
Cathodic protection	All subsea infrastructure	Check for corrosion and renew sacrificial anodes, if required.	Varied – every 2 to 6 years
Wall thickness surveys	Production and crossover manifolds, flowlines and pipelines	Monitor the condition of subsea infrastructure. (i.e., ultrasonic testing). Typically only performed if a specific threat is identified through other means.	Typical: Once every 25 years Worst case: Once every 5 years
Acoustic survey (e.g., multibeam echo sounder (MBES), sidescan sonar (SSS)	Pipelines	Identify buckling, movement, scour and seabed features. Low frequency/ intensity signals undertaken on the flowlines.	Varied – every 1 to 6 years
Non-destructive testing (NDT)	Pipeline and manifolds (if required)	Evaluates the properties of material/items using electromagnetic, radio graphic, acoustic resonance technology, ultrasonic, or magnetic equipment.	Typical: Once every 25 years Worst Case: Once every 25 years per well
Seabed sampling surveys including minor grabs/cores	NA	Identify benthic fauna, sediment characteristics, determine level of penetration/compaction, etc. Grabs/cores typically disturb 0.1 m^2 of seabed per sample.	Typical: Once every 25 years Worst Case: Once every 5 years

Anode inspections and/or replacement	Production and crossover manifolds, trees, flowlines and pipelines	Samples taken of anode materials for testing.	Typical: Once every 25 years
Marine growth sampling	All subsea infrastructure	Samples taken of marine growth for testing.	Typical: Once every 25 years Worst Case: Once every 5 years
Sub bottom profiling	Around subsea components	Low frequency echo sounder undertaken to identify returns of metals under the seabed.	Varied – every 1 to 6 years
Laser surveys	Dimensional check on spools	Used to conduct dimensional checks on spools, etc, and measure proximity.	Varied – every 1 to 6 years
Pigging	Export pipeline, flowline	Inspection, maintenance, repair or to facilitate modifications.	Typical – Once every 4 years Worst case – every 4 months
Type of inspection/ survey	Subsea infrastructure	Purpose	Approximate frequency
General visual inspection	Structure, wellheads, spools, flowlines, risers and pipelines	Check general infrastructure integrity.	Varied – every 1 to 8 years
Close visual inspections	All subsea infrastructure	Investigate certain subsea infrastructure components.	Varied – every 2 to 6 years
Cathodic protection	All subsea infrastructure	Check for corrosion and renew sacrificial anodes, if required.	Varied – every 2 to 6 years
Wall thickness surveys	Production and crossover manifolds, flowlines and pipelines	Monitor the condition of subsea infrastructure. (i.e., ultrasonic testing).	Typical: Once every 25 years Worst case: Once every 5 years
Acoustic survey (e.g., multibeam echo sounder (MBES), sidescan sonar (SSS), sub bottom profiling (SBP))	Pipelines	Identify buckling, movement, scour and seabed features. Low frequency/ intensity signals undertaken on the flowlines.	Varied – every 1 to 6 years
Non-destructive testing (NDT)	Pipeline and manifolds (if required)	Evaluates the properties of material/items using electromagnetic, radio graphic, acoustic resonance technology, ultrasonic, or magnetic equipment.	Typical: Once every 25 years Worst Case: Once every 25 years per well
Seabed sampling surveys including minor grabs/cores	NA	Identify benthic fauna, sediment characteristics, determine level of penetration/compaction, etc. Grabs/cores typically disturb 0.1 m^2 of seabed per sample.	Typical: Once every 25 years Worst Case: Once every 5 years
Anode inspections and/or replacement	Production and crossover manifolds, trees, flowlines and pipelines	Samples taken of anode materials for testing.	Typical: Once every 25 years Worst Case: Once every 25 years

Marine growth sampling	All subsea infrastructure	Samples taken of marine growth for testing.	Typical: Once every 25 years Worst Case: Once every 5 years
Sub bottom profiling	Around subsea components	Low frequency echo sounder undertaken to identify returns of metals under the seabed.	Varied – every 1 to 6 years
Laser surveys	Dimensional check on spools	Used to conduct dimensional checks on spools, etc, and measure proximity.	Varied – every 1 to 6 years
Pigging	Export pipeline, flowline	Inspection, maintenance, repair or to facilitate modifications.	Typical – Once every 12 years Worst case – every 5 years
Cycling of valves via control system	Well	Test functionality of technical integrity valves	Every 6 months
Marine growth removal	Production and cross over manifolds and retrieval components (e.g., chokes)	Reduce weight or gain visual access	Based on outcomes from visual inspections and marine growth trends on regional infrastructure
Flushing of chemical hydraulic fluid lines	Hydraulic fluid lines	For repair scenarios	When required for repair
Leak and pressure testing	All subsea infrastructure	Test integrity of subsea infrastructure	Following installation of subsea infrastructure components after a repair or intervention, prior to return to service

3.10.2.2 Monitoring

Monitoring of subsea infrastructure refers to the process of surveillance of the physical and chemical environment that a subsea system or component is exposed to, in order to determine if and when damage may occur, and (where relevant) predict the rate or extent of that damage. Monitoring activities may include process composition testing, corrosion probes, corrosion mitigation checks, metocean and seismic monitoring, and cathodic protection testing. Other monitoring activities include process monitoring (temperature, pressure, etc.), cyclone weather monitoring, and hydraulic fluid usage.

3.10.2.3 Maintenance

Maintenance activities on subsea infrastructure are those required at regular or planned intervals to prevent deterioration or integrity failure of infrastructure. Typical maintenance activities are described in Table 3-12.

Table 3-12: Typical maintenance activities, their purpose and approximate frequencies

Type of maintenance	Subsea infrastructure	Purpose	Approximate Frequency
Cycling of valves via control system	Wells and manifolds	Test functionality of technical integrity valves	Every 6 months for well barriers during operations
Marine growth removal	Production and cross over manifolds and retrieval components (e.g. chokes) and jacket cleaning	Reduce weight or gain visual access	Based on outcomes from visual inspections (Table 3-11) and marine growth trends on regional infrastructure

Flushing of chemical hydraulic fluid lines	Hydraulic fluid lines	For repair scenarios	When required for repair
Leak and pressure testing	All subsea infrastructure	Test integrity of subsea infrastructure	Following installation of subsea infrastructure components after a repair or intervention, prior to return to service
Pigging	Export pipeline	Cleaning of trunkline or liquids management	Typically every year for cleaning and liquids management pigging not required at current export rates but would be performed on as needs basis

3.10.2.4 Repair

Repair activities are those required when a subsea system or component is degraded, damaged or has deteriorated to a level outside of acceptance limits as defined by design codes. Damage sustained may not necessarily pose an immediate threat to continued system integrity, but may present an elevated level of risk to environment or production reliability. Due to the design of subsea infrastructure and materials used, repairs are undertaken on an as needs basis. The requirements and frequency of these repairs are dictated by the outcome of the inspection and maintenance regimes described in Table 3-11 and Table 3-12. Typical subsea repair activities included but not limited to, are described below.

- subsea choke and/or battery module replacement
- chemical injection throttling valve (CITV) replacement
- subsea control module (SCM) or electrical distribution unit (EDU) replacement
- power and communications router, tree and downhole replacement
- multi-phase flow meter (MPFM) or wet gas flow meter (WGM) replacement
- acoustic sand detector (ASD) replacement
- hydraulic control router (HCR) replacement
- hydraulic flying lead (HFL) replacement
- electrical flying lead (EFL) replacement
- pipeline or spool support with grout bag, mattress, anchors or rock dumping
- spool disconnection and/or replacement
- umbilical jumper replacement and/or relocation
- flowline/pipeline replacement
- scour prevention installation
- cathodic protection system replenishment/repair.

When equipment is replaced, the redundant equipment, may remain in-situ or be removed from the field. The location of redundant subsea infrastructure items is recorded as part of the ROV as left survey and included in a database for Pluto subsea inventory.

3.10.2.5 Subsea Chemical Usage

Planned chemical discharges may occur during a range of subsea system operation and IMMR activities. The chemicals and volumes released will be specific to each activity. Releases are discussed and provided in the specific activity sections below and, where practical, typical and approximate worst-case volumes provided. Typical volumes are the expected releases associated with the activity following depressurisation and flushing activities.

Operational chemicals to be used within Pluto subsea infrastructure are selected and assessed using Woodside's chemical selection and assessment procedures as detailed in Section 3.9.

Typical chemicals which are used in subsea infrastructure and may be released during IMMR activities include those described below.

- Subsea Control Fluid – The subsea control fluid presently used in the facility subsea systems is HW443. HW443 is a water-based product.
- Hydrate Control – MEG is used for hydrate control.
- Corrosion Inhibitor – Corrosion inhibitor is generally used to manage and prevent corrosion in pipes and tanks.
- Biocide – Biocides are generally used to prevent the bacterial growth in pipelines that may cause corrosion.
- Dye – Chemical dyes are used to identify the source of a leak.
- Acid – Where removal of calcium deposits is required, Woodside typically uses sulphamic (or equivalent) acid. Alternatives such as citric acid may be used.
- Oxygen Scavenger – Oxygen scavenger is used to de-oxygenate the flowlines and prevent corrosion and aerobic bacterial growth.
- Grout – The material used in grout, mattresses and rock is typically concrete-based.
- Staurolite Products – Staurolite products are used for abrasive/sand blasting to clean and remove marine growth. The main component is staurolite, which is a naturally forming mineral.

3.10.2.6 Marine Growth Removal

Due to the relatively high rate of marine growth on the NWS, it is often necessary to remove excess growth prior to undertaking many subsea IMMR activities. Marine growth removal is undertaken with a ROV or a diver. The different techniques are described in Table 3-13..

Table 3-13: Marine growth removal techniques

Activity/Equipment	Description
Water jetting	Uses high pressure water to remove marine growth.
Brush systems	Uses brushes attached to a ROV to remove marine growth.
Acid (typically sulphamic acid)	Dissolving of calcium deposits between interfaces on subsea infrastructure.
Sand/abrasive blasting	Additional cleaning to allow close visual inspections.

3.10.2.7 Intervention Isolations

The Woodside Engineering Operating Standard – Subsea Isolation defines a proven isolation to be a valved isolation where the effectiveness of the isolation has been confirmed via vent, bleed, or instrumentation points. An activity specific philosophy/procedure must be developed in line with this standard for each isolation. Isolation testing will result in a planned release of hydrocarbons to the environment.

3.10.2.8 Pipeline Pigging Operations

Pipeline cleaning pigging occurs approximately once every 20 weeks to manage liquid hold-up and solids generation, and as part of the planned inspection programme. Pipeline maintenance and monitoring requirements may increase pipeline pigging frequency with time, to monitor pipeline integrity more closely as the facilities age and/or in response to findings from intelligent pigging campaigns.

3.10.2.9 Sediment Relocation

If sediment builds up around a pipeline or other subsea infrastructure, a ROV-mounted suction pump/dredging unit may be used to relocate the sediment to allow inspection/works to be undertaken. This activity is limited to the relocation of small amounts of sediment material in the immediate vicinity of the subsea infrastructure (i.e. within the existing footprint). Sediment relocation typically results in minor seabed disturbance and some localised turbidity.

3.10.2.10 Corrosion Protection

The aim of corrosion protection is to preventor limit the chemical reactions that cause corrosion and to manipulate them in such a way that corrosion is avoided or mitigated. Corrosion prevention techniques used are:

- corrosion protection layers to provide a barrier of corrosion-resistant material between the subsea environment and the structural material.
- anode skids where an anode is attached to the subsea asset to act as ‘sacrificial metal’ which is more easily corroded.

Measurements may be undertaken using probes (e.g., electrical resistance probes) to assess the effectiveness of these techniques. If a measurement identifies the corrosion protection layer requires repairs, appropriate remediation options will be investigated.

If additional anode skids are required, they will be placed on the seabed using a support vessel crane. A typical anode skid will have a seabed footprint of approximately 8 m2. It is necessary to remove marine growth around the point where the anode skid is to be connected in order to establish good continuity through clamping and/or welding.

Activities may result in some minor disturbance due to placement of skids, removal of marine growth from equipment, sediment relocation, the placement of ROV tool baskets and DP transponders on the seabed.

3.10.2.11 Span Rectification, Pipeline Protection and Stabilisation

Due to tidal currents or other scouring processes, sections of pipelines, spool flowlines and umbilicals may become unsupported by the seabed (span) and/or become unstable on the seabed. Spanning or instability may expose the component to risk of stress beyond design parameters, increasing risk of failure.

A number of techniques may be used for span rectification or component stabilisation and protection, including grout bags, mattresses, anchors, piling or rock placement. All techniques require the use of a support vessel crane to deploy the material and a ROV so that it is accurately placed on the seabed. In addition, a subsea component may require protection from additional activities (e.g., supply vessel lifts onto the facility and pipeline crossings).

3.10.2.11.1 Grout Bags

Span rectification typically involves placement of a grout bag with anti-scouring skirts under the spanned component. Grout is pumped into the grout bag from a support vessel via a downline. Once

the bag is inflated it acts as a pillow with the pipe resting on top (Figure 3-10). Typical grout volumes will depend on the size of the span and may vary from 200 kg to greater than 2000 kg.

Figure 3-9: Grout bags in position

3.10.2.11.2 Mattresses

Mattresses are typically made of concrete and may be used for span rectification or pipeline protection and stabilisation. An example of a mattress over a pipeline is provided in Figure 3-11. Mattresses are typically 3 m by 6 m in size, and therefore may disturb 18 m2 of the seabed.

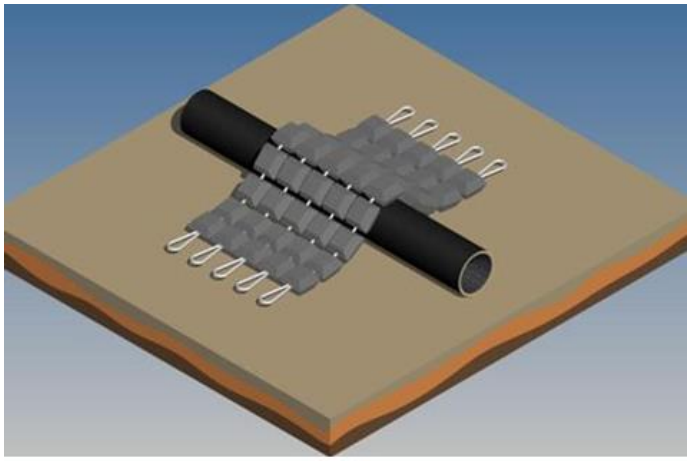

Figure 3-10: Concrete mattress for span rectification or pipeline protection or stabilisation

3.10.2.11.3 Rock Placement

Rock placement for span rectification is typically small scale and involves the use of one tonne bulker bags filled with rock, with the number of bags varying to suit the application. This activity will cause seabed disturbance due to placement of material on the seabed; however, the area of seabed affected will be small and localised and is unlikely to extend beyond the area originally impacted during the laying of the pipeline.

In addition, the activity may result in some minor disturbance from removal of marine growth, sediment relocation, the placement of ROV tool baskets and DP transponders on the seabed.

3.10.2.12 Suspension and Preservation of Redundant Equipment

In the event equipment is degraded, damaged or has deteriorated to a level outside of acceptance limits, equipment may be repaired, replaced, or preserved and suspended until decommissioning. A risk assessment will be undertaken considering level of risk to safety, health, and environment or production reliability and will determine if the infrastructure will be repaired, replaced or suspended and preserved.

A typical program to suspend and preserve redundant equipment is as follows:

- Complete an as-found ROV survey of the umbilical/jumper and adjacent infrastructure.
- Remove marine growth, if required.
- Relocate any sediment build-up in the area surrounding infrastructure, if required.
- Flush prior to disconnection.
- Isolate equipment.
- Install caps/flanges.
- Relocate infrastructure to a safe location (if required).

3.10.2.13 Well Management and Maintenance Activities

The facility subsea well interventions, workovers and well kills require a suitable vessel or MODU to accommodate and support intervention packages. Therefore, these activities do not form part of the scope of this EP. Unloading and clean-up from subsea wells via the facility may be required infrequently. Unloading and clean-up discharges are routed via the process facilities to be cleaned of any remaining chemicals and fluids in the wellbore or reservoir.

3.10.2.13.1 Well Unloading and Clean-up

Following subsea interventions, workovers and well kills, the well may be unloaded and flowed via the process facilities to be cleaned of any remaining chemicals and fluids in the wellbore or reservoir. During this phase, the products may be processed, as follows:

- Gas: will be routed into the production process where possible, or flared if unsuitable.
- Fluids: will be routed to the HP flare knock-out drum which discharges liquids to the closed drain system.
- Wastes (may include fluids and sand/solids): will be managed as appropriate based on composition. Solids will be separated for onshore disposal as required following Woodside's Waste Management Plan for Offshore Facilities. An additional strainer may be placed in the flowlines prior to the main separators to remove any large debris that may be in the wellbore.

3.11 Xena-03 Drilling and Tie-back Activities

3.11.1 Drilling Activities

This EP includes drilling activities for the Xena-03 well in the Xena-03 Operational Area and tie-back to the Pluto facility, in the PAA. Well construction activities are conducted in a number of stages, as described below. Well design will be optimised for ultimate recovery.

Detailed well designs will be submitted to NOPSEMA as part of the Approval to Drill and the accepted Well Operation Management Plan (WOMP), as required under the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011.

For clarity, all activities specific to the Xena-03 Drilling and Tie-back campaign (Section 3.11) will herein be referred to as the Xena-03 Tie-back activities.

3.11.1.1 Cement Unit Test

Upon arrival on location at the Xena-03 Operational Area, the MODU may need to perform a cement unit test, or 'dummy cement job', to test the functionality of the cement unit and the MODU's bulk cement delivery system before performing an actual cement job. This operation is usually performed after a MODU has been out of operation for an amount of time (warm-stack), if maintenance on the

cement unit has been performed, or if it is the first time a MODU is being used in-country and commissioning of the cement unit system is required.

A 'dummy cement job' involves mixing a sacrificial cement slurry at surface, and once functionality of the cement unit and delivery system has been confirmed, the slurry is discharged through the usual cement unit discharge line (which may be up to 10 m above the sea level) or through drill pipe below sea level as a cement slurry. The slurry is usually a mix of cement and water; however, may sometimes contain stabilisers or additives. The indicative volume of cement that may be discharged to sea during a cement unit test is approximately 100 bbl.

3.11.1.2 Top Hole Section Drilling

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

- The MODU arrives and establishes position over the well site.
- Top-hole sections are drilled riserless using seawater with pre-hydrated bentonite sweeps/XC Polymer sweeps or drilling fluids to circulate drilled cuttings from the wellbore. As a contingency, Water Based Mud (WBM) may be used in the presence of a shallow gas anomaly.

Once the top hole sections of the well have been drilled, steel tubulars (called conductor or casing) are inserted into the wellbore to form the surface/intermediate casing and secured in place by pumping cement into the annular space above the casing shoe or to surface (seabed), which will involve discharging excess cement at the seabed.

3.11.1.3 Blowout Preventer and Marine Riser Installation

After setting the surface or intermediate casing, a BOP is installed on the wellhead, and the marine riser above it, to provide a physical connection between the well and MODU. This enables a closed circulation system to be maintained, where weighted drilling fluids and cuttings can be circulated from the wellbore back to the MODU, via the riser.

In addition, the BOP provides a means for sealing, controlling and monitoring the well during drilling operations. The BOP components operate using open hydraulic systems, using water-based BOP control fluids.

Each time a BOP pressure and function test schedule is undertaken approximately 3620 L of water-based fluid is released to the marine environment, of this approximately 4% is control fluid additive. BOP operation includes function and pressure testing approximately every 21 days, and a function test (approximately 2665 L) approximately every seven days, excluding the week a pressure test is conducted.

3.11.1.4 Bottom Hole Section Drilling

A closed system (riser in place) is used for drilling bottom hole sections to the planned wellbore Total Depth (TD). The bottom hole sections will be drilled using water-based mud (WBM) drilling fluids, although contingency non-water-based muds (NWBM) may be used if WBM cannot meet technical requirements (Section 3.11.5).

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

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

Cementing operations can be performed to:

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

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

3.11.1.5 Formation Evaluation

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

3.11.1.6 Wellbore Clean Out

As required throughout activities with the riser connected, wells will be displaced from one drilling fluid system to another, or from the drilling fluid system to completion brine. A chemical clean out pill or fluids train will be circulated between the two fluids. Brine is typically a filtered brine with < 70 NTU or < 0.05% total suspended solids (TSS). This results in a brine and seawater discharge after this operation.

Clean out fluids and completion brine will be captured and stored on the MODU and discharged if oil concentration is < 1% by volume or returned to shore if discharge requirements cannot be met.

3.11.1.7 Xmas Tree Installation

Before the upper completion is installed into the well, the horizontal xmas tree will be installed from either an installation vessel or directly from the MODU. Due to the subsea well layout, if installation was to occur from an installation vessel, the MODU will be required to reposition away from the drill centre to allow the installation vessel to install the xmas tree. Once the xmas tree has been installed, the tree-to-wellhead interface will be pressure tested to confirm integrity. The MODU BOP will then be reconnected to continue with drilling and completions activities.

The xmas tree will be installed with a preservation mixture in the production and annulus bore.

3.11.1.8 Completions Activities

Once the well has been drilled, well completion activities will be performed which may include the installation of the lower completion, intermediate completion, production tubing and subsea tree. The well is then pressure tested for integrity before well suspension.

The well will be completed with a conventional upper completion. The well will be suspended with two crown plugs installed in the tubing hanger. Crown plugs will be individually pressure tested to verify suspension barriers before removing the BOP.

3.11.1.9 Well Unload

3.11.1.9.1 General Description

During well unloading activities, all completion and reservoir fluids will be directed through the Pluto facility to the onshore LNG plant.

In the event that fluids from well unloading cannot be directed to the Pluto facility, they may be flared or discharged to the environment via the well test package onboard the MODU. The base oil column, completion fluid, hydrocarbons and produced/condensed water will be measured, handled, separated, treated for overboard discharge (non-hydrocarbon) and flared/burned (hydrocarbon) through the temporary production system on the MODU. Note that the opportunity to unload to the Pluto facility is Woodside's preferred option, which could eliminate or reduce well unloading to the MODU.

3.11.1.9.2 Produced/Reservoir Water Disposal

If fluids from well unloading are directed to the MODU, the well test water treatment package will be used to treat produced/reservoir water before discharge. Prior to discharging, the fluids are cycled through an onboard filtration system and gauge tank. Water filtration is standard practice for well unloading operations. Fluids that cannot be treated or flared will be sent onshore in tanks for disposal.

3.11.1.9.3 Emissions

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

3.11.2 Drilling Fluid System

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

3.11.2.1 Water-based Mud System

A water-based drilling fluid system is the preferred option for the Petroleum Activities Program.

In addition to the base fluid, drilling muds contain a variety of chemicals, incorporated into the selected drilling fluid system to meet specific technical requirements (e.g., mud weight required to manage pressure, or for borehole stability). The WBM drilling fluid will either be mixed on the MODU or received pre-mixed, then stored and maintained aboard the MODU. The top hole sections are drilled riserless with seawater containing pre-hydrated gel sweeps. The bottom hole sections may be drilled using WBM in a closed circulation system which enables reuse of the WBM drilling fluids.

WBM drilling fluids that cannot be reused (e.g., due to bacterial deterioration or if they do not meet required drilling fluid properties) or are mixed in excess of required volumes, may be operationally discharged to the ocean under the MODU's Permit to Work (PTW) system.

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

3.11.2.2 Mud Pits

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

3.11.2.3 Drill Cuttings

Drill cuttings generated from the well are expected to range from very fine to very coarse (<1 cm) particle/sediment sizes. Cuttings generated during drilling of the top hole sections are discharged at the seabed. Estimated volumes of drill cuttings that may be discharged during the Petroleum Activities Program are presented in Section 6.7.8.

The bottom hole sections are drilled with a marine riser that enables cuttings and drilling fluid to be circulated back to the MODU, where the cuttings are separated from the drilling fluids by the SCE. The SCE comprises, but is not limited to shale shakers, cuttings dryers and centrifuges. The SCE uses shale shakers to remove coarse cuttings from the drilling mud. After being processed by the shale shakers, the recovered mud from the cuttings may be directed to centrifuges, which are used to remove fine solids (4.5 to 6 µm). The cuttings are usually discharged below the water line and the mud is recirculated into the fluid system.

If contingency NWBM is needed to drill a well section, the cuttings which are separated from the NWBM via the shakers will also pass through a cuttings dryer and associated SCE to reduce the average oil on cuttings for the entire well (only sections using NWBM) to 6.9% wt or less on wet cuttings prior to discharge. Woodside is not planning to use NWBM and their use is retained as a contingency only. The approval process within Woodside to permit the use of NWBM is described in Section 3.11.5.4.

3.11.2.4 Cement, Barite and Bentonite Discharge

Excess cement, barite and bentonite (dry bulk) after well operations are completed, will either be held onboard and used for subsequent wells, provided to the next operator at the end of the program, or if these options are not feasible, discharged to the marine environment. Toward the end of the campaign, if re-use, transfer or on-sale of the dry bulk stocks becomes not feasible, Woodside will implement stock reduction measures to reduce the volume dry bulk stock requirement, to that necessary for well control, as defined in relevant well control procedures.

Excess cement, barite and bentonite that does not meet technical requirements during the Petroleum Activities Program may also be bulk discharged to the environment. Bulk discharges of cement, barite and bentonite may occur as a slurry through the usual cement discharge line or blown as dry bulk and discharged. Woodside requires that mercury and cadmium concentration in stock barite be below 1 mg/kg and 3 mg/kg, respectively. Documentation of heavy metal analysis is planned to be undertaken for all individual batches of barite and used to verify compliance with these concentrations.

3.11.3 Subsea Installation and Pre-commissioning Activities

The subsea installation scope of work will include installing and pre-commissioning the infrastructure summarised in Table 3-14. The Petroleum Activities Program includes directly installing infrastructure from the installation vessels in the relevant location. During hook-up and pre-commissioning of the new and existing facilities there is potential for discharges associated with the testing and connection activities of the subsea systems. The pre-commissioning associated with subsea infrastructure generally includes leak testing of the flexibles, subsea control systems verification and function-testing of valves to verify that the electric and hydraulic flying leads are ready for entry into the commissioning phase.

Table 3-14: Subsea installation component summary

Description	Detail	Dimensions (approximate)
Well (Xena-03)	1x wellhead and xmas tree system	6.0 m (L) x 4.0 m (W) x 6.0 m (H) (typical)
Subsea flowline	10” ID flexible flowline	3000 m
Subsea control	1 x electrohydraulic umbilical (EHU)	2500 m
	Umbilical termination assembly x 2	4 m x 3m
Stabilisation	Concrete mattresses x ~10	6 m x 3 m

3.11.3.1 Underwater Acoustic Positioning

Long base line (LBL) transponders and/or Ultra Short Baseline transponders (USBL) are commonly used acoustic positioning methods and may be installed on the seabed as required by the installation activities. The USBL subsea transponder transmits an acoustic pulse back to the vessel receiver, hence providing an accurate positioning of the subsea transponder location. The LBL array provides accurate positioning by measuring ranges to three or more transponders deployed at known locations on the seabed and structures.

These transponders are utilised for the correct positioning of the subsea infrastructure. Transmissions are not continuous but consist of short ‘chirps’ with a duration that ranges from three to 40 milliseconds. If used, the LBL transponders are installed in stands on the seabed. Both the transponders and stands are recovered after installation. The USBL transponders are mounted on the subsea infrastructure and removed post installation.

Transponders may also be installed in stands on the seabed for vessel positioning. Both transponders and stands shall be removed post installation.

3.11.3.2 Installation of Structures

Subsea structures (i.e., subsea distribution unit, mudmats) are lowered to the seabed using the main crane positioned on an installation vessel to a pre-determined depth before engaging an ROV to guide it to the correct position.

As described above, the structures may be positioned using LBL array or USBL. Additional pre-deployed clump weights or sandbags can potentially be used to provide further assurance that the structures are positioned in the correct location and orientation.

3.11.3.3 Flexible Flowline Initiation/Initiation Anchor Deployment

Commencement of the flowline installation may require using an initiation anchor to pull against in order to provide the required tension to the flexible flowline as it transitions from the installation vessel to the seabed. The initiation anchor, which will be recovered after use, may consist of a clump weight.

Installation aids such as sandbag markers or concrete mattresses may be used for positioning aids or wet storage as required.

3.11.3.4 General Flexible Flowline and flying leads Installation

The installation contractor will mobilise an installation vessel to the field to install the flexible flowline and flying leads to the seabed. The installation vessel will operate in DP during installation activities.

The optimum flowline route is selected by considering seabed bathymetry, pre-installation surveys and installation risk management, including dropped object risks.

The indicative installation methodology and principle applied when installing the flowline is as follows:

- The flexible flowline is reeled onto either horizontal or vertical reels.
- VLS are installed on the vessel to lay the flexible flowline.
- During installation, a hydraulically driven centre reel drive is engaged to the reel to rotate the reel in synchronised speed with the VLS.
- Installation sequence for flexible flowline is as follows:
- Prepare universal connection system and VLS onboard the vessel.
- Fit applicable subsea components (anodes, bend restrictors) to flexible flowline, perform tests and pre-deployment checks.
- Deploy flexible flowline, ROV guide tail end to initiation point and land out
- Continue flexible flowline lay as per lay route while monitoring touchdown with ROV.
- Land out second end to final location and disconnect.

The flexible flowline may also be installed using a lighter installation spread on the installation vessel, via a deck-mounted powered reel system in combination with a deployment chute mounted on the side of the installation vessel and temporary installation aids placed on the seabed.

The flying leads are configured into deployment basket(s) and landed on the seabed using a crane. ROVs will complete the final subsea tie-in. Small volumes of MEG and HW443 will be released to subsea environment during HFL removal and installation.

3.11.3.5 Span/Scouring Rectification and Stabilisation

Spans are undulations in the seabed that do not provide sufficient support to the flowline. Spans are generally mitigated by installing structures, such as concrete mattresses, before installing the flowline. Engineering validation will determine if concrete mattresses need to be installed to mitigate spans. The dimensions for each concrete mattress are typically 6 m by 3 m by 0.3 m.

Post-lay span rectification may also be required after flexible flowline installation. This process typically involves placing grout bags under the span section. The empty bag is moved into position using ROV, then filled with grout supplied from a mixing and pumping spread on the vessel via a downline. Typical grout volumes depend on the size of the span and may vary from about 200 kg to 2000 kg per span.

If grout bags are used, the downline recovery time risks exceeding the grout curing time. If grout cures within the downline and pump, the equipment is likely to be rendered unserviceable, as well as the downline not being safely recoverable in the normal way. Therefore, after grouting activities at each span site, the downline and pump will need to be purged using seawater. This results in an amount of grout, approximately equivalent to the downline volume (5 m^3), being discharged to the ocean. This flushing is required once per grout site. The actual number is not known until the line is laid and need for span rectification determined, if any.

Scouring is the movement of seabed sediment (e.g., silt, sand and gravel) from around the base of a subsea structure to further afield due to prevailing hydrodynamic conditions, potentially compromising the integrity of a structure. Scouring is generally mitigated by installing mattresses along the perimeter of the installed structure. Concrete mattresses may be installed pending engineering verification.

Stabilisation is a post-lay activity to ensure that items, such as the flying leads remain at their installed positions, i.e. not being shifted due to strong seabed current. Stabilisation of flying leads is generally mitigated by installing sandbags on top of flying leads at a predetermined distance apart. Sandbags generally come in a standard size with 20 kg to 25 kg weight. Concrete mattresses may be used to stabilise the flexible flowline. Sandbags or concrete mattresses may also be used to provide temporary stability of wet stored items if wet storage proves necessary.

Sandbags or concrete mattresses may be installed for crossings over existing umbilicals or jumpers/flowlines.

3.11.3.6 Pre-commissioning of the Flexible Flowline

Leak testing is performed to test the integrity of subsea infrastructure, test isolations and identify any leaks. Pressure may be applied via a downline from the installation vessel or via ROV. Failure of testing equipment or integrity of the tested infrastructure may lead to a loss of leak test fluids to the marine environment. After the leak testing is completed, the system pressurisation volume may be released to the environment to mitigate the risk of hydrocarbons returning to the installation vessel.

During tie-in and pre-commissioning activities, any subsea connection break-outs will be preserved with chemical sticks. A small amount of chemically treated MEG/ water may be discharged to the environment from the structure and tie-in flexible prior to final makeup of the connection. All chemicals used in pre-commissioning activities will be subject to the chemical selection assessment process described in Section 3.9.

3.11.3.6.1 Flooding

The flexible flowline will be installed filled with chemically treated ~50 wt% MEG/water. MEG is used to prevent formation of hydrates during start-up. Topping up of the flowline will occur when the pulling head is removed to install diverless connectors.

3.11.3.6.2 Leak Testing

Leak test/system pressure tests are performed to confirm the integrity of subsea connections and flowline. During leak testing there may be small volumes of test fluids discharged to environment during connection and disconnection of hot stabs.

3.11.3.7 Tie-in of Flowlines at Pluto Manifold

Prior to tie-in of the Xena-03 flowline to the Pluto manifold, verification testing of any leakage from the manifold isolation valves may be undertaken. This testing will verify that suitable isolations for safe tie-in are available, thereby preventing a major hydrocarbon release during tie-in. This verification may result in the release of hydrocarbons to the environment. The hydrocarbons are predominately gas with a small quantity of condensate. Additionally, when the flowline tie-ins take place, a quantity of hydrocarbons may be released. A conservative estimate of hydrocarbons that may be released during the flowline tie-in at the manifold is up to 400 L of condensate and residual gas over a 48 hour period. Water jetting and/ or acid injection may be used to clean the connections on the infrastructure prior to tie-in.

3.11.3.8 Cold Commissioning of Subsea Infrastructure

The commissioning associated with subsea infrastructure prior to the introduction of hydrocarbons (referred to as cold commissioning) generally includes subsea control systems verification and function testing of valves to verify that the Hydraulic Flying Leads (HFLs) and Electric Flying Leads (EFLs) are ready for entry into the start-up phase.

During cold commissioning, an ROV is deployed from the installation vessel (or similar support vessel) to provide visual confirmation of xmas tree valve actuation. This activity is typically less than 12 hours in duration.

3.11.3.9 Wet Storage of Equipment

Wet storage of infrastructure may be required intermittently throughout the duration of subsea installation activities as part of the Petroleum Activities Program. There are two categories of equipment that may require wet storage as part of the Petroleum Activities Program, as summarised

in Table 3-15. At completion of Xena-03 Tie-back activities there will be no wet stored infrastructure remaining on the seabed.

Table 3-15: Wet storage that may be required as part of Xena-03 Tie-back activities.

Wet Storage Category	Reason for wet storage	Typical equipment	Retrieval method
Installation Aids	To facilitate safe installation of infrastructure.	Predominately installation aids (subsea/ROV baskets, clump weights, etc)	Retrieval will be undertaken using project vessels (Section 3.12) and associated equipment such as cranes, ROV, etc.
Subsea installation	Prior to connection of infrastructure, wet storage may be necessary to optimise project schedule and support SIMOPs	Items may include flexible flowline, flying leads and wet parking/deployment frames etc	Retrieval is not required, as infrastructure will be used for production operations and once connected is no longer considered wet stored.

3.11.3.10 Maintenance of Subsea Infrastructure

All subsea structures installed during the Petroleum Activities Program have been designed for full removal. et stored items will be removed during the subsea installation activities. Due to the design of equipment, the materials selected and short duration of subsea installation activities, all wet stored equipment will be in a condition that allows for removal.

The as-built survey will confirm that structures installed for production operations are in good condition and repair.

3.11.3.11 Site Surveys

Site surveys will be undertaken at various stages throughout the installation of subsea infrastructure. An initial pre-lay survey will be undertaken by the flexible flowline installation contractor before starting installation activities. The pre-lay survey may be performed by a dedicated pre-lay survey vessel which is typically similar in size to support vessels, or potentially by the installation vessel.

The pre-lay survey is a debris and hazard identification survey and not a full geophysical survey along the pre-determined route or proposed design route. While it is not anticipated that any significant debris may need to be removed before flexible flowline installation, if required, these activities will fall under this EP and will be performed by an installation vessel, a support vessel or similar.

Additional surveys, with an ROV, will be undertaken throughout the installation activities. These surveys will identify the location of all items placed on the seabed (including wet stored items and installed infrastructure). The survey data will be input into a computer program to track all subsea equipment and displayed on the ‘survey screen’ (comprising an auto-cad file). This file will be progressively updated throughout the activities as items are placed and removed from the seabed (and in the title).

An as-built survey will be conducted by ROV at the completion of the installation campaign so that installation of equipment is in the designed location. This data will be used to update the ‘survey screen’ to develop the as-built report, which is considered the inventory of items remaining on the seabed (and in the title). In addition, any material items dropped to the marine environment and not recovered (See Section 6.9.8) will be added to the inventory for the title.

3.11.4 Xena-03 Commissioning (initial start-up) Activities

The commissioning (initial start-up) activities of the Xena-03 well and associated subsea infrastructure are planned to commence in 2025. All activities may be subject to rescheduling,

including delay, based on operational requirements of the Pluto platform or other production scheduling reasons as well as project schedule changes. Topsides modifications on the Pluto facility are limited to controls updates.

Once hydrocarbons have been introduced into the system, preservation fluids are displaced to the Pluto platform, where they are processed and wells are cleaned-up to maximum rates. Performance testing may be undertaken such as Multi-Rate Testing, simulated ESD of Xena-03 well only, then Pressure Build-up testing. MEG of up to 100%, or a combination of MEG/ treated water initially in the Xena-03 flowline arrives at the separator and is discharged via the produced water (PW) discharge route, along with residual completions fluids and fines from the well as part of well clean-up.

3.11.5 Contingent Activities for the Xena-03 Tie-back

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

3.11.5.1 Respud

A respud may be required for a number of reasons, such as if the conductor or well head slumps or fails installation criteria (typically during top hole drilling). Re-spudding involves moving the MODU to a suitably close location (e.g., ~50 m from the original location) to recommence drilling. A respud activity would result in repeating top hole drilling (Section 3.11.1).

The environmental aspects of re-spudding are the same as those for drilling and are considered to be adequately addressed by this EP (Section 6.7), with no significant changes to existing environmental risks or any additional environmental risks likely. The net environmental effect will be limited to an increase in the volume of cuttings generated (Section 6.7.8) and increased volumes discharged.

3.11.5.2 Sidetrack

The option of a sidetrack instead of a respud may be required if operational issues are encountered. The environmental aspects of a sidetrack well are the same as those for routine drilling activities, which are considered to be adequately addressed by this EP (Section 6.7), with no significant changes to existing environmental risks or any additional environmental risks likely. The net environmental effect will be limited to an increase in the volume of cuttings generated (Section 6.7.8), potential increase in the use of drilling fluids and the additional emissions (atmospheric and waste) associated with an extended drilling program.

3.11.5.3 Workover

A workover may be performed on the Xena-03 well. A workover or intervention may be required to restore production or integrity due to a failed completion or component in the well. The environmental aspects of a workover operation are the same as those for well completion activities and are considered to be adequately addressed by this EP, with no significant changes to existing environmental risks or any additional environmental risks likely.

3.11.5.4 Non-water Based Mud System

The Xena-03 well is planned to be drilled entirely using WBM, however NWBM may be required for bottom hole sections as a contingency. The decision to use NWBM drilling fluids for the bottom hole sections of a well is based on a variety of technical factors relevant to wellbore conditions, such as well temperature, well shape and depth, reactivity of the formation to water and well friction. The

technical justification to use NWBM includes environment, health, safety and waste management considerations.

The use of NWBM drilling fluids is subject to a formal written commercial and/or technical justification approved in accordance with the Best Practice – Overburden Drilling Fluids Environmental Requirements. The main ingredient of NWBM is base oil, and similar to a WBM system, a range of standard solid and liquid additives may be added in the pits to alter specific mud properties for each section of the well, dependent on the conditions encountered while drilling.

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

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

The NWBM drilling fluids that cannot be re-used (i.e., do not meet required drilling fluid properties or are mixed in excess of required volumes) are recovered from the mud pits and returned to the shore base for onshore processing, recycling and/or disposal. The mud pits and associated equipment/infrastructure are cleaned when NWBM is no longer required, with wash water treated onboard through SCE before discharge with mud pit washings, or returned to shore for disposal if discharge criteria cannot be achieved (refer to Section 3.5).

3.11.5.5 Well Suspension

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

3.11.5.6 Wireline Logging

Wireline contingencies that may be in place for development drilling include gamma ray and casing collar locator for depth correlation, ultrasonic imaging tool and cement bond log to measure cement integrity, formation pressures (XPT), density, neutron and resistivity and punch perforators/tubing cutters suitable for all tubing sizes. Wireline contingency work will be performed with appropriate isolation barriers in place, i.e., an overbalanced fluid column. If wireline work is required to occur in a live well, or where there is a risk of barrier failure, the operation will be performed with full pressure control equipment at the surface.

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

3.11.5.7 Well Intervention

An intervention may be performed on the Xena-03 well. Interventions may be performed due to down-hole equipment failure or to address underperformance of a well. Key well intervention methods include wire-line and coiled tubing. Potential environmental impacts from intervention activities have been included in this EP, including discharge of suspension fluids and brines and small volume gas releases subsea due to removal of a tree cap which may be in place if the well was previously suspended.

3.11.5.8 Well Abandonment

The Petroleum Activities Program covers the drilling and intervention of the Xena-03 well, which is not envisaged to be abandoned until the end of the production field life. For technical reasons, the lower section of a well may need to be abandoned, before sidetracking, or if a respud is required.

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

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

After abandonment activity, the marine riser and BOP will be removed and every reasonable attempt made to retrieve the wellhead. Conventional wellheads are removed by deploying a cutting device on drill pipe which then cuts through the casing and conductor, allowing the wellhead to be retrieved to the surface. Backup cutting equipment is sent offshore as a contingency should the primary set of equipment fail. The conductor cutting equipment is very reliable with a high success rate of cutting wellheads.

If these recognised removal techniques are ineffective, the wellhead may be left in-situ. The integrity of the wellbore is not affected by the wellhead assembly remaining in-situ.

3.11.5.9 Wellhead Assembly Left In-situ

If a well is abandoned due to the requirement to respud, the wellhead assembly may be left in-situ if recognised removal techniques are ineffective. Well abandonment activities would be performed as outlined in Section 3.11.5.8 but the well assembly would remain. The integrity of the wellbore is not affected by the wellhead assembly remaining in-situ. The environmental aspects of the wellhead assembly remaining in-situ as a contingent activity are considered to be adequately addressed by this EP (Section 6.7.2) with no significant changes to existing environmental risks or any additional environmental risks likely.

Final decommissioning of the development wellhead assembly and other subsea infrastructure at the end of field life will be subject to a separate EP. Woodside's Decommissioning Framework is discussed further in Section 7.5.

3.11.5.10 Sediment Mobilisation and Relocation

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

3.11.5.11 Venting

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

3.11.5.12 Emergency Disconnect Sequence

An emergency disconnect sequence (EDS) may be implemented if the MODU is required to rapidly disengage from the well. The EDS closes the BOP (i.e., shutting in the well) and disconnects the riser to break the conduit between the wellhead/BOP and MODU. Common examples of when this

system may be initiated include the movement of the MODU outside of its operating circle (e.g., due to a failure of the DP system) or the movement of the MODU to avoid a vessel collision (e.g., third-party vessel on collision course with the MODU). EDS aims to leave the wellhead and BOP in a secure condition but will result in loss of the drilling fluids/cuttings in the riser after disconnection.

3.12 Vessel-based Activities for the Xena-03 Tie-back

During the Xena-03 Tie-back activities, vessel-based activities will involve the MODU, subsea installation vessels and support vessels such as Anchor Handling Vessels (AHVs).

All project vessels are 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 includes 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, as required for safe operations. Lighting levels will be determined primarily by operational safety and navigational requirements under relevant legislation, specifically the Navigation Act 2012. The MODU and support vessels will be lit to maintain operational safety on a 24-hour basis.

3.12.1 MODU

The Xena-03 well will be drilled by a moored, or hybrid MODU. Contingent well intervention activities may also be performed by a moored or hybrid MODU. Typical specifications for a moored and hybrid MODU are provided in Table 3-16 and Table 3-17, respectively. Moored and hybrid MODU types are collectively referred to as MODU for the remainder of the document unless specific risks for different MODU types have been identified. Due to variabilities such as contractual and operational matters, the MODU used may be subject to change.

Table 3-16: Typical moored MODU specifications for Ocean Apex

Component	Specification Range
Rig Type/Design/Class	Semi-submersible MODU
Accommodation	120 to 200 personnel
Station Keeping	Eight-point or twelve-point mooring system
Bulk Mud and Cement Storage Capacity	283 to 770 m³
Liquid Mud Storage Capacity	576 to 2500 m³
Fuel Oil Storage Capacity	966 to 1400 m³
Drill Water Storage Capacity	3500 m³

Table 3-17: Typical hybrid MODU specifications for Transocean Endurance

Component	Specification
Rig Type/Design/Class	Semi-submersible MODU
Accommodation	130 persons (maximum persons on board)
Station Keeping	Eight-point or twelve-point mooring system with thrusters for Dynamic Positioning (DP3)
Bulk Mud and Cement Storage Capacity	340 m³
Liquid Mud Storage Capacity	1445 m³
Fuel Oil Storage Capacity	2600 m³

Component	Specification
Drill Water Storage Capacity	1508 m³

3.12.2 Installation Vessels

The Petroleum Activities Program subsea installation scopes of work may require various installation vessels, with sufficient capacity to accommodate hardware and equipment such as flowlines, flexible flowlines, umbilicals and the cold commissioning/dewatering spreads.

A typical installation vessel for subsea and flowline installation would be a DP vessel (usually DP2 Class) equipped with a primary differential global surface positioning system (DGPS) and an independent secondary DGPS backup. The specification of a typical subsea installation vessel is provided in Table 3-18.

Installation vessels are typically equipped with various material handling equipment, which includes cranes, winches, remotely operated vehicles (ROVs) and ROV launch and recovery systems, vertical lay system (VLS) with either vertical reel drive or horizontal reel drive (carousel) and cold commissioning spread.

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

Table 3-18: Typical DP2 Class subsea installation vessel for Deep Orient

Component	Specification Range
Vessel Type	DP2 Class as a minimum
Crane Capacity	250 T active heave compensation crane as minimum
ROVs	Two Work Class ROVs
Deck Space	Approximately 1900 m²
Deck Strength	Approximately 15 T/m²
Accommodation	Approximately 120 people
Fuel Oil	Approximately 2200 m³
Potable Water	Approximately 800 m³

3.12.3 Support and Other Vessels

During the Petroleum Activities Program, the MODU and installation vessel will be supported by other vessels, such as general support vessel(s) and AHVs.

Support vessels are used to transport equipment and materials between the MODU/installation vessel and port (e.g., Dampier, Onslow, Exmouth). When required, a support vessel will perform standby duties at the MODU. At any given time, support vessels will make regular trips between the Operational Area to port for routine, non-routine and emergency operations.

Support vessels will be using their DP system within the Operational Area.

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

3.12.4 Subsea Support Vessel for LWI Activities

During the Petroleum Activities Program, a subsea support vessel for light well intervention (LWI) operations may be used as an option for contingent well intervention, subsea installation and other activities. An example of this vessel type is the Sapura Constructor, which is a 117 m long subsea

support vessel equipped with a saturation dive system, two Work Class ROVs, well intervention equipment, a helideck, moon pool and accommodation for 120 persons. The final vessel selection, if required, will be subject to commercial and/or operational considerations.

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

Mooring uses a system of chains/ropes and anchors, which may be pre-laid before the MODU arrives at the location, to maintain position when drilling. Mooring analysis will be undertaken to determine the appropriate mooring system for the Petroleum Activities Program. The mooring analysis will identify whether the mooring systems are pre-laid or set by the rig, proof tension values, and if synthetic fibre mooring ropes are required. Pre-laid systems are often selected and designed to withstand higher sea states than the rig's mooring system or to provide additional clearance/protection of subsea infrastructure when deemed necessary in the mooring analysis.

Installation and proof tensioning of anchors involves some disturbance to the seabed. Anchor Handling Vessels (AHVs) are used in the deployment and recovery of the mooring system.

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

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

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

3.12.6 Holding Station: Rig Anchor Release MODU

The hybrid MODU scenario is such that the MODU is DP capable though predominantly holds station via a pre-laid mooring system. If a hybrid MODU is used to conduct drilling, it will likely have a rig anchor release (RAR) system integrated as a contingency case for cyclone season. A traditional arrangement with no RAR (for lines passing over subsea assets) and rig- or prelay-lines (for lines clear of subsea assets) will likely be used as the base case in non-cyclone seasons. The moorings are typically pre-laid in an eight-point arrangement, with a RAR device connecting the MODU mooring components with the anchor mooring components. The RAR is an acoustic release connecting link that can be installed in a mooring line to enable a rapid disconnection of a MODU from the mooring system. Each mooring leg would have one RAR installed in the mooring line. The acoustic release process is instigated from a command unit on the MODU that, when activated, transmits a low frequency signal (9 – 11 kHz) that is received by the RAR transducer in the mooring line and activates the primary hydraulic actuator. The hydraulic actuator then releases the locking mechanism of the RAR and the mooring line is disconnected. The MODU then recovers the MODU wire/chain ready for transit (on DP) and the subsea mooring leg remains on the seabed. Anchor lines crossing subsea infrastructure, will be buoyed to maintain clearance from the subsea assets after a disconnection (either on the surface or suspended in the water column).

To reconnect the MODU with the mooring system after a disconnection, the AHV will recover the MODU mooring line (including RAR and the trigger sleeve) from the MODU before connecting to the pre-laid line, which is recovered from the seabed or water column by the AHV utilising a ROV.

3.12.7 MODU and Support Vessel Activities

A variety of materials are routinely bulk transferred from support vessels to the MODU including drilling fluids (e.g., muds), base fluids, cements and drill water. A range of dedicated bulk transfer stations and equipment are in place to accommodate the bulk transfer of each type of material. There is also a capacity to bulk transfer waste oil from the MODU to the support vessel, for back loading and disposal on shore.

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

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

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

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

The MODU and support vessels may also take on or discharge ballast water in order to maintain vessel stability. All ballast water exchanges will be undertaken in accordance with relevant requirements, such as the Australian Ballast Water Management Requirements.

3.12.8 Subsea Installation and Support Vessel Activities

An installation vessel may be used for various subsea installation activities such as pre- and post-installation survey, installation of subsea structures, installation of the flowline, installation of interconnecting HFL, EFL and MEG jumper, tie-in to existing infrastructure, and cold commissioning activities.

Other support vessels may also be used to transport equipment, hardware and MEG from shore to the installation vessel.

3.12.9 Refuelling

The MODU will be refuelled via support vessels approximately once a month, or as required. Refuelling will occur within the Xena-03 Operational Area and has been included in the risk assessment for this EP. Other fuel transfers that may occur on board the MODU may include refuelling of cranes, helicopters or other equipment as required.

As the base case, refuelling of installation vessels is planned to occur outside of the Operational Area during interim mobilisation/demobilisation.

3.12.10 Vessel Mobilisation

Vessels may mobilise from the nearest Australian port or directly from international waters to the PAA, in accordance with biosecurity and marine assurance requirements. Vessel activities whilst in transit to the PAA are not included in the scope of this EP.

4. DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 Overview

In accordance with Regulations 21(2) and 21(3) of the Environment Regulations, this section describes the existing environment that may be affected (EMBA) by the activity (planned and unplanned, as described in Section 2.10), including details of the particular relevant values and sensitivities of the environment, which were used for the risk assessment.

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 worst-case credible spill scenarios for this EP are a loss of well integrity and potential marine diesel loss of containment release in the offshore area, and a nearshore subsea loss of containment scenario. 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. These visible hydrocarbons are not expected to cause ecological impacts. In respect of this, an additional socio-cultural EMBA is defined, as the potential spatial extent within which social-cultural impacts may occur from changes to the visual amenity of the marine environment. Receptors relevant to the socio-cultural EMBA include Commonwealth and State marine protected areas (MPAs), National and Commonwealth Heritage Listed places, areas of tourism and recreation, and commercial and traditional fisheries. The EMBA and socio-economic EMBA are described in Table 4-1.

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

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

Hydrocarbon Type	EMBA1	Socio-cultural EMBA[1]	Planning Area for Scientific Monitoring
Surface	10 g/m2 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/m2 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 Environment bulletin: A652993, April 2019).	
Dissolved	50 ppb This represents potential toxic effects, particularly sublethal effects to highly sensitive species (NOPSEMA Environment bulletin: 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 Environment bulletin: A652993, April 2019). This area is described in Figure 4-1. In the event of a spill, DNP will be notified of AMPs which may be contacted by hydrocarbons at this threshold.
Entrained	100 ppb This represents potential toxic effects, particularly sublethal effects to highly sensitive species (NOPSEMA Environment bulletin: A652993, April 2019). As entrained hydrocarbons are within the water column and not visible, impacts to socio-cultural receptors are		

Hydrocarbon Type	EMBA1	Socio-cultural EMBA[1]	Planning Area for Scientific Monitoring
	associated with ecological impacts. Therefore, entrained hydrocarbons at this threshold also represent the level at which socio-cultural impacts may occur.		
Shoreline	100 g/m2 This represents the threshold that could impact the survival and reproductive capacity of benthic epifaunal invertebrates living in intertidal habitat.	10 g/m2 This represents the volume where hydrocarbons may be visible on the shoreline but is below concentrations at which ecological impacts are expected to occur.	N/A

[1] *Further details including the source of the thresholds used to define the EMBA in this table are provided in Section 6.8.3*

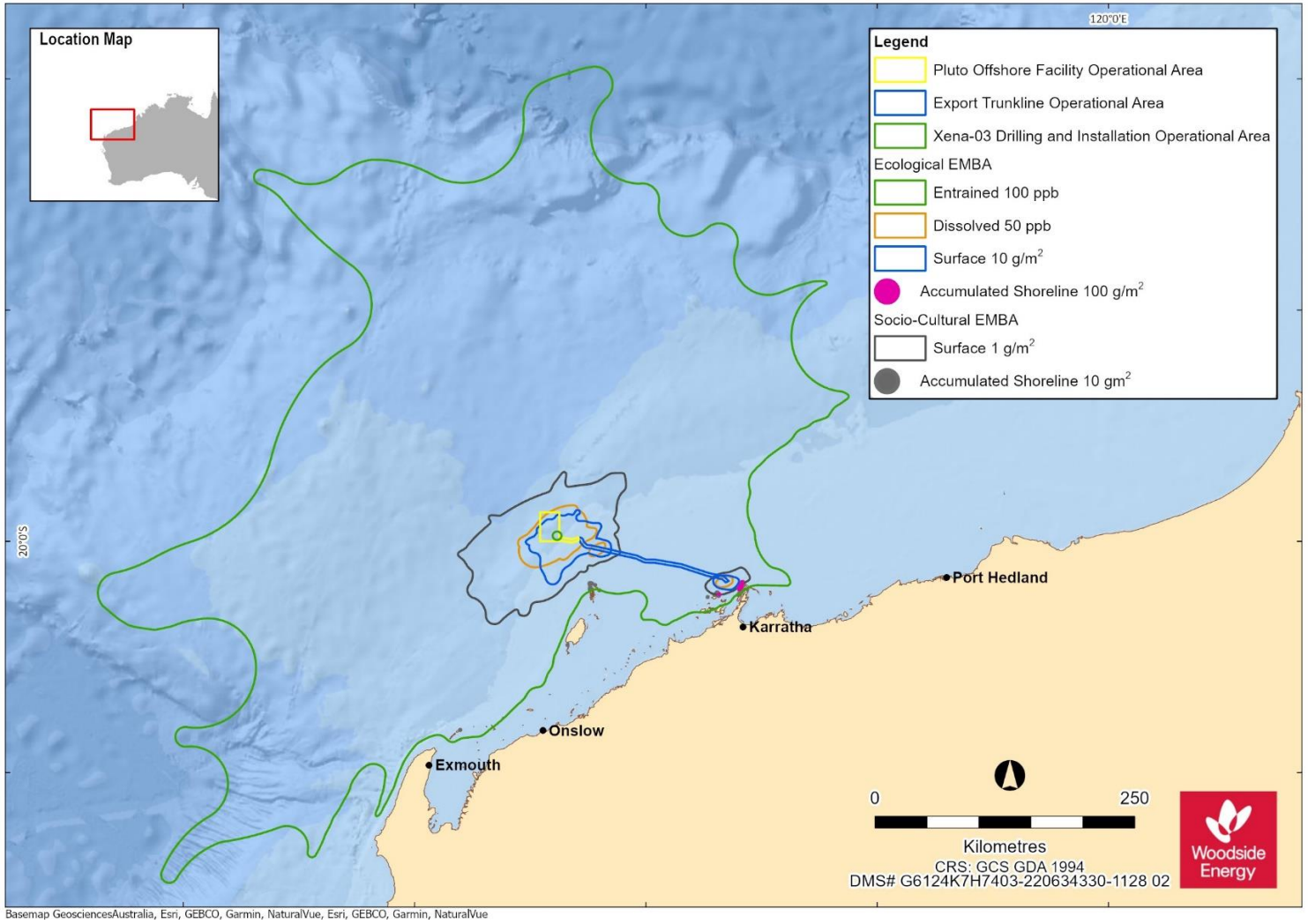

Figure 4-1:Environment that may be affected (EMBA) by the Petroleum Activities Program

4.2 Regional Context

The Petroleum Activities Area (PAA) 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). Within the NWMR, the export pipeline lies within the North West Shelf Province, while the facility lies across the boundary of the North West Shelf Province and the Northwest Province. Section 1 of Woodside's Master Existing Environment (Woodside, 2022) summarises the characteristics for the relevant marine bio-regions.

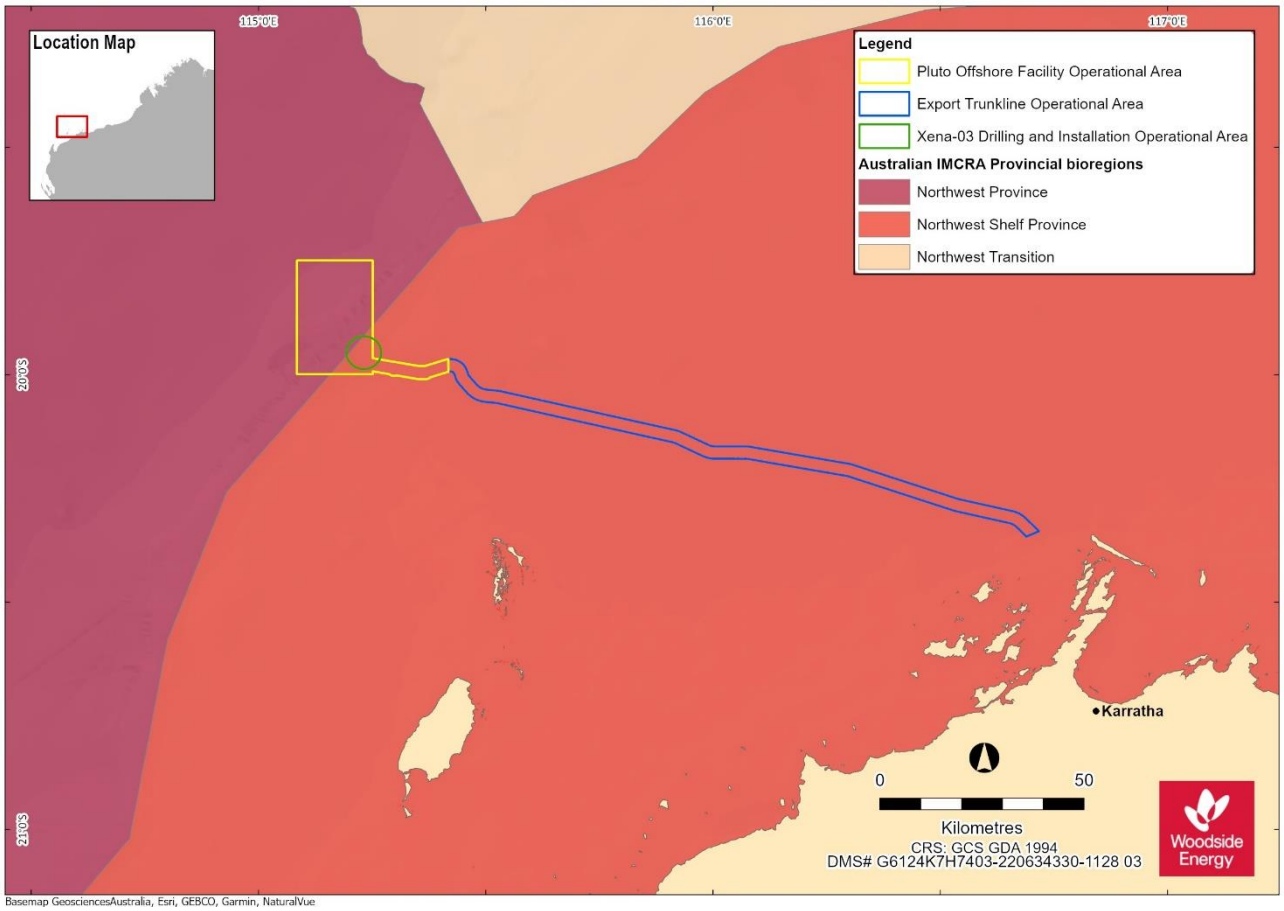

Figure 4-2: Location of the PAA and relevant marine bio-regions

4.3 Matters of National Environmental Significance (EPBC Act)

Table 4-2 and Table 4-3 summarise the MNES overlapping the PAA and EMBA, respectively, according to Protected Matters Search Tool (PMST). 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 is provided in subsequent sections of this chapter and described in detail in the Master Existing Environment (Woodside, 2022).

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

MNES	Number	Relevant Section
World Heritage Properties	0	Section 4.9.8
National Heritage Places	0	Section 4.9.8
Wetlands of International Importance (Ramsar)	0	Master Existing Environment (Woodside, 2022)
Commonwealth Marine Area	0	Master Existing Environment (Woodside, 2022)
Listed Threatened Ecological Communities	0	Master Existing Environment (Woodside, 2022)
Listed Threatened Species	24	Section 4.6
Listed Migratory Species	41	Section 4.6

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

MNES	Number	Relevant Section
World Heritage Properties	1	Section 4.9.8
National Heritage Places	2	Section 4.9.8
Wetlands of International Importance (Ramsar)	0	Master Existing Environment (Woodside, 2022)
Commonwealth Marine Area	3	Master Existing Environment (Woodside, 2022)
Listed Threatened Ecological Communities	0	Master Existing Environment (Woodside, 2022)
Listed Threatened Species	53	Section 4.6
Listed Migratory Species	62	Section 4.6

4.4 Physical Environment

The PAA is characterised by both the continental shelf and the continental slope of the NWMR. The export pipeline lies entirely in continental shelf waters from the State waters boundary to the facility. Water depth along the export pipeline is between 40 and 85 m. Water depth at the Pluto Offshore Facility (at the riser platform) is 85 m and the subsea gathering system extends downslope to depths of 962 m.

The bathymetry within the continental shelf section of the PAA is generally flat, which is consistent with the broader NWS Province (Baker et al., 2008). Bathymetry around the riser platform is relatively flat and featureless (Woodside, 2006). Across the shelf, the seabed has a gentle (approximately 0.05°) seaward gradient to where it transitions to a steep distal slope approximately 200 to 300 km offshore, in water depths of around 200 m (Dix et al., 2005). The continental slope descends relatively rapidly from the shelf edge to depths greater up to 5,000 m within the Northwest Province (James et al., 2004; Woodside, 2006).

Within the broader Northwest Province, the continental slope comprises seven major geomorphic features, including plateaus, deeps/holes/valleys, terraces, trenches/troughs and canyons (Baker et al., 2008). Key features overlapping the subsea hydrocarbon gathering system section of the facility include:

- a number of canyon systems which trend east-west across the continental slope and have an increased seafloor gradient of up to 80°
- approximately 20 m high cliff-like structures at 1000 m depth where the continental slope meets the abyssal plain

- mudstone outcrops at 900 to 1000 m
- a field of rock pinnacles (2 to 3 m tall and 1 m wide and in an area covering approximately 4 x 1 km) of biogenic origin located at a depth of 300 to 500 m on the continental slope within WA-34-L.

The Master Existing Environment (Woodside, 2022) provides a summary of the physical characteristics of the environment within the EMBA and broader NWMR (Appendix K).

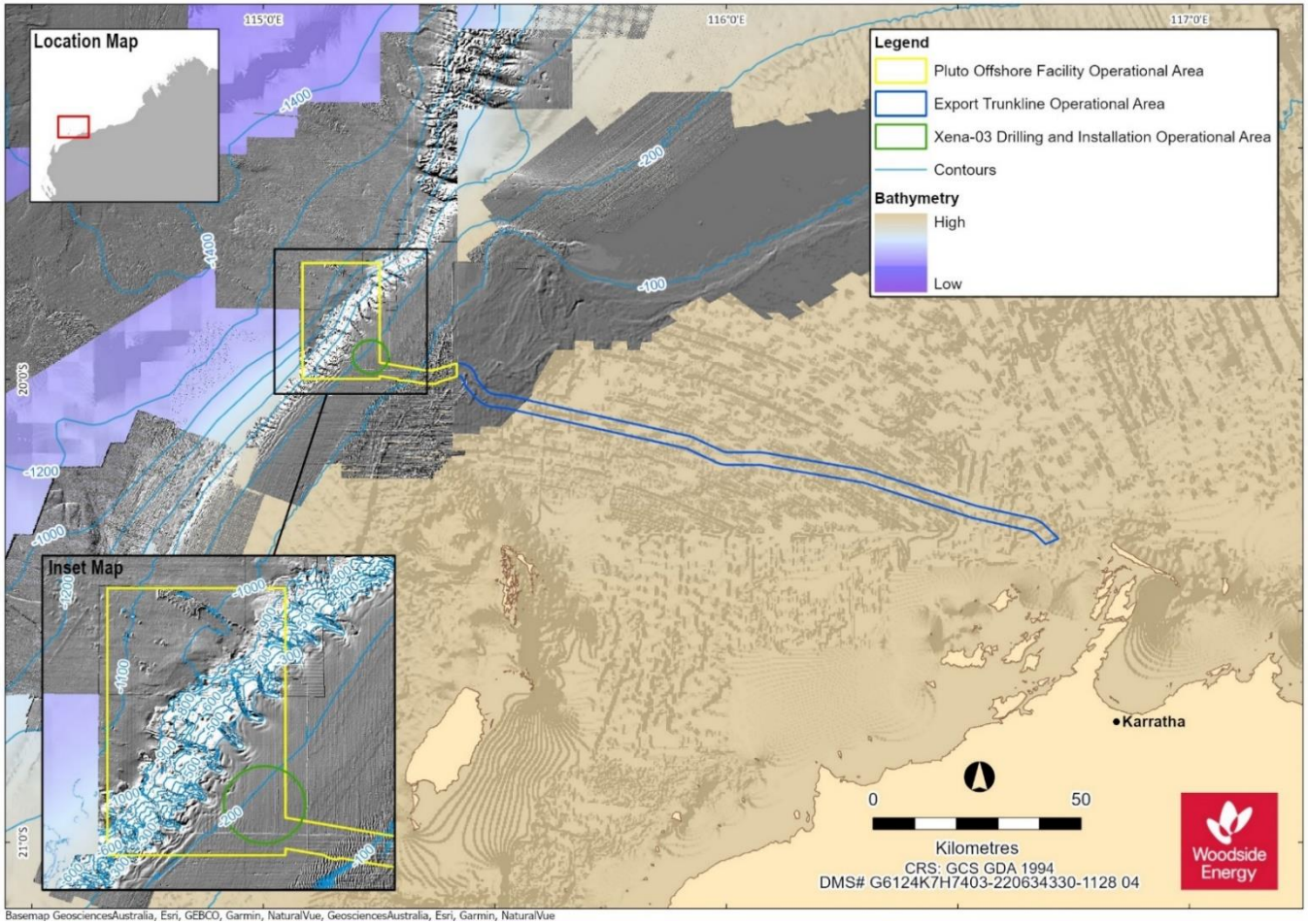

Figure 4-3: Location and bathymetry for the PAA

4.5 Habitats and Biological Communities

Sediments in the outer NWMR are relatively homogenous and are typically dominated by sands and a small portion of gravel (Baker et al., 2008). Fine sediment size classes (e.g. muds) increase with proximity to the shoreline and the shelf break, but are less prominent in the intervening continental shelf (Baker et al., 2008). Carbonate sediments typically account for the bulk of sediment composition, with both biogenic and precipitated sediments present on the outer shelf (Dix et al., 2005). Beyond the shelf break within the NWMR (200 m depth contour), the proportion of fine sediments increases along the continental slope towards the abyssal plain (Baker et al., 2008).

Prior to commissioning of the facility, seabed surveys of the Facility Operational Area were completed. The survey revealed that the seabed around the riser platform comprised soft sediments, with surface layer of sand between 1–4 m thick overlying cemented sands, typical of the region (SKM, 2007; Woodside, 2006). Seabed surveys along the export pipeline route found sediments were predominantly fine sand with variable proportions of coarser sand fractions, silt, shells and shell fragments, coral cemented materials (including calcarenite gravel and cobbles) (SKM, 2006; Woodside, 2006).

Within WA-34-L on the continental slope, sediments ranged from fine sands to silts, with sediments generally becoming finer with increasing water depth down to 600 m for both slope and canyon transects. Below 600 m, sediment became slightly coarser, but still relatively fine compared to continental shelf sediments (between 150–200 m) (SKM, 2007). This is expected to be characteristic of the sediment across the subsea hydrocarbon gathering system section of the facility.

While the PAA comprises of mainly soft sediments, two Key Ecological Features (KEFs) overlap the Facility Operational Area, including the Ancient Coastline at 125 m Depth Contour KEF and the Continental Slope Demersal Fish Communities KEF (Figure 4-10). The Xena-03 Operational Area also overlaps the Continental Slope Demersal Fish Communities KEF. Areas of hard substrate may be associated with these KEFs, which are considered to support more diverse benthic communities that are characteristic of the wider region. Refer to Section 4.7 and the Master Existing Environment (Woodside, 2022) for information on the environmental values of KEFs overlapping the PAA and EMBA.

Key habitats and ecological communities within the EMBA are identified in Table 4-4 and described in the Master Existing Environment (Woodside, 2022).

Table 4-4: Key Sensitive Habitats and Communities within the EMBA (distance calculated from PAA)

Habitat/Community	Key locations within the EMBA
Seabed characteristics	
Ancient Coastline at 125 m Depth Contour	Several steps and terraces as a result of Holocene sea level changes occur in the region with the most prominent of these features occurring as an escarpment along the NWMR and Sahul Shelf at a water depth of 125 m, which forms the Ancient Coastline at 125 m depth contour KEF (the Ancient Coastline). The Ancient Coastline KEF overlaps the Facility Operational Area, extending along a line approximated by the 125 m isobath Section 4.7. The Ancient Coastline is not continuous throughout the NWMR and coincides with a well-documented eustatic stillstand at approximately 130 m worldwide (Falkner et al., 2009). Where the Ancient Coastline provides areas of hard substrate, it may contribute to higher diversity and enhanced species richness relative to soft sediment habitat (Falkner et al., 2009). Parts of the Ancient Coastline, represented as rocky escarpment, are considered to provide biologically important habitat in an area predominantly made up of soft sediment. The escarpment type features may also potentially facilitate mixing within the water column due to upwelling, providing a nutrient rich environment. Although the Ancient Coastline adds additional habitat types to a representative system, the habitat types are not unique to the coastline as they are widespread on the upper shelf (Falkner et al., 2009). Detail regarding these features are provided in Section 4.7 and the Master Existing Environment (Woodside, 2022).
Continental Slope Demersal Fish Communities	The continental slope demersal fish communities in the region have been identified as a KEF of the NWMR (DSEWPaC, 2012), and overlaps the Facility Operational Area and Xena-03 Operational Area. The continental slope between North West Cape and the Montebello Trough has been identified as one of the most diverse slope assemblages in Australian waters, with over 508 fish species and the highest number of endemic species (76) of any Australian slope habitat (DEWHA, 2008). Detail regarding these features is provided in Section 4.7 and the Master Existing Environment (Woodside, 2022).
Marine primary producers (distances from the PAA)	
Coral	Rankin Bank (29 km north-east) Montebello Islands State Marine Park (25 km south) Barrow Island State Nature Reserve (43 km south) Dampier Archipelago Island Reserves – Rosemary Island (13 km south) Lowendal Islands (61 km south-west) Muiron Islands (195 km south-west) Ningaloo Coast World Heritage Area (WHA) (incl. Muiron Islands) (195 km south-west).
Seagrass beds and macroalgae	Montebello Islands (25 km south-west) Barrow Island (67 km south-west) Muiron Islands (195 km south-west) Ningaloo Coast (195 km south-west) Exmouth Gulf (225 km south-west)
Mangroves	Montebello Islands (32 km south) Ningaloo Coast (195 km south-west) Exmouth Gulf (225 km south-west)

Habitat/Community	Key locations within the EMBA
Other communities and habitats	
Plankton	Plankton within the PAA and EMBA are expected to be representative of the wider NWMR, as detailed in the Master Existing Environment (Woodside, 2022). Primary productivity of the NWMR appears to be largely driven by offshore influences (as reported by Brewer et al., 2007), with periodic upwelling events and cyclonic influences driving coastal productivity with nutrient recycling and advection. There is a tendency for offshore phytoplankton communities in the NWMR to be characterised by smaller taxa (e.g. bacteria), whereas, shelf waters are dominated by larger taxa such as diatoms (Hanson et al., 2007). Within the wider EMBA, peak primary productivity occurs in late summer/early autumn, along the shelf edge of the Ningaloo Reef. It also links to a larger biologically productive period in the area that includes mass coral spawning events, peaks in zooplankton and fish larvae abundance (Department of Conservation and Land Management, 2005) with periodic upwelling throughout the year.
Pelagic and demersal fish populations	Pelagic and demersal fish populations within the PAA and EMBA are expected to be representative of the NWMR (described in the Master Existing Environment (Woodside, 2022)). The presence of subsea infrastructure with the facility and export pipeline has likely resulted in the development of demersal fish communities that would otherwise not occur within the PAA (McLean et al. 2017). Given continental shelf waters overlap the majority of the Operational Area, pelagic species will also be present. The Continental Slope Demersal Fish Communities KEF and Ancient Coastline at 125 m Depth Contour KEF overlap the Facility Operational Area. These KEFs include areas of hard substrate that are known or likely to support a higher diversity of demersal fish assemblages. Rankin Bank (29 km north-east of the PAA) has also been identified as supporting high demersal fish richness and abundance (Australian Institute of Marine Science, 2014). Further information KEFs is provided in Section 4.7. Fish species in the NWMR (including the PAA and the EMBA) comprise small and large pelagic and demersal species. Small pelagic fish inhabit a range of marine habitats, including inshore and continental shelf waters. They feed on pelagic phytoplankton and zooplankton and represent a food source for a wide variety of predators including large pelagic fish, sharks, seabirds and marine mammals (Mackie et al., 2007). Large pelagic fish in the NWMR include commercially targeted species such as mackerel, wahoo, tuna, swordfish and marlin. Large pelagic fish are typically widespread, found mainly in offshore waters (occasionally on the shelf) and often travel extensively. Detail regarding these features is provided in the Master Existing Environment (Woodside, 2022).
Epifauna and infauna	Filter feeders such as sponges, ascidians, soft corals, and gorgonians are animals that feed by actively filtering suspended matter and food particles from water by passing the water over specialised filtration structures (DEWHA 2008). Filter feeders within the EMBA are expected to be representative of the NWMR, with notable areas of high sponge diversity occurring in the Commonwealth Waters of Ningaloo Marine Park and at shoals within the EMBA. Filter feeders generally live in areas that have strong currents and hard substratum and are closely associated with substrate type, with areas of hard substrate typically supporting more diverse

Habitat/Community	Key locations within the EMBA
	epibenthic communities (Heyward et al., 2001a). Conversely, higher diversity infauna is mainly associated with soft unconsolidated sediment and infauna communities are considered widespread and well represented along the continental shelf and upper slopes of the NWMR (Brewer et al., 2007a; Rainer, 1991; SKM, 2007b; Woodside Energy Limited, 2004). A number of targeted surveys investigating epibenthos and infauna within offshore NWSP shelf and slope environments have been carried out by Woodside. Woodside has collected survey data from numerous sampling locations within and surrounding the Operational Area using ROV/video investigations of benthic habitats and infauna and epifauna sampling using sediment grabs and epibenthic sled (SKM, 2007). Elsewhere on the NWSP, surveys have included grab samples of seabed sediments from around North Rankin Complex, Goodwyn A, Angel facilities and their export pipeline routes (SKM, 2007), as well as additional sampling throughout the broader region (SKM, 2007b). Benthic grab sampling in the vicinity of the continental slope region of the Operational Area revealed a sparse abundance, high variability and high diversity of infauna dominated by polychaetes with other fauna including nemerteans and sipunculids and crustaceans (mainly amphipods) (SKM, 2007). Higher, albeit low, infauna density was reported at the shelf break (200 m) compared to deeper areas on the continental slope. Epifaunal sled samples to 800 m depth including from inside and outside the canyon systems on the continental slope found deepwater solitary cnidarians were the most common fauna in samples, followed by crustaceans (mostly decapods), bony fish and sponges, with urchins, sea stars and brittle stars also recorded (SKM, 2007). Epifauna, cnidarians and demersal fish were also more common in samples taken at 200 m compared to deeper depths and it was noted other epifauna groups showed some variation in abundance with depth (SKM, 2007). These survey findings at the facility were typical of other surveys in the region which revealed deep water habitats consist primarily of bare unconsolidated carbonate sediments supporting a sparse assemblage of deposit and filter feeding organisms, including glass sponges, urchins, sea cucumbers, sea stars and crustaceans (Mobil, 2011; Heyward et al., 2001; URS, 2010). Only limited areas of deepwater hard substrate have been observed over the continental slope, namely rock pinnacles on the upper continental slope and exposed cliff-like features and relatively soft expanses of mudstone outcrops on the mid continental slope. Benthic fauna is closely associated with substrate type, with areas of hard substrate typically supporting more diverse epibenthic communities (Heyward et al., 2001a). Rock pinnacles possibly formed by the deep-water coral Lophelia spp. (few live specimens were observed with low cover) were found in a small portion of the Pluto reservoir (4 x 1 km area) at a depth of 300–500 m and observed to provide habitat for fish, shrimp, hydroids and anemones (SKM, 2007). Exposed cliff-like features of banded sedimentary rock (approximately 20 m in height) were observed at around 1000 m deep. ROV survey findings showed no epifauna on exposed rock, possibly due to their vertical orientation and water flow which may impede settlement (SKM, 2007). However, anemones and fish were observed in areas on more sloping areas among the cliff-like features where sediment had accumulated. At approximately 900–1000 m, mudstone outcrops were also observed dominated by glass sponges. Discrete areas of hard substrate hosting sessile filter feeding communities may also be associated within the Ancient Coastline at the 125 m Depth Contour KEF, which overlaps the PAA. However, Falkner et al. (2009) concluded the Ancient Coastline

Habitat/Community	Key locations within the EMBA
	may not represent different habitat type compared to the surrounding areas and suggested that associated faunal communities may be similar. Refer to Section 4.7 for additional information on KEFs overlapping the Operational Area and wider EMBA. Filter feeder communities within the PAA are present on the subsea infrastructure and Pluto platform, which provides hard substrate for attachment (Jacobs, 2014). Within the wider EMBA, the NWMR has been identified as a sponge diversity hotspot with a variety of areas of potentially high and unique sponge biodiversity, particularly in the Commonwealth waters of Ningaloo Marine Park (CALM, 2005b; Rees et al., 2004). Detail regarding these features is provided in the Master Existing Environment (Woodside, 2022).

4.6 Protected Species

A total of 100 EPBC Act listed species considered to be MNES were identified as potentially occurring within the EMBA, of which a subset of 47 species were identified as potentially occurring within the PAA. The full list of marine species identified from the PMST reports is provided in Appendix C, including several MNES that are not considered to be credibly impacted (e.g., terrestrial species within the EMBA). Criteria for determining species to be considered for impact assessment is outlined in the Master Existing Environment (Woodside, 2022).

Species identified as potentially occurring within the PAA and EMBA, and relevant Biologically Important Areas (BIAs) and Habitat Critical to their Survival (Habitat Critical) are listed in Table 4-4 to Table 4-12. A description of these species is included in the Master Existing Environment (Woodside, 2022), which also shows the spatial overlap with relevant BIAs and Habitat Critical areas and the PAA and EMBA.

4.6.1 Fish, Sharks and Rays

A total of eight EPBC-listed Threatened and an additional seven Migratory fish species have been identified to potentially occur within the EMBA, of which 14 occur in the PAA (Table 4-5). For additional detail, the PAA is presented here in two parts; the Export Pipeline Operational Area and the combined Facility and Xena-03 Drilling Operational Areas. Two threatened species, identified in the PMST were identified to occur within the EMBA, however are not considered to inhabit shorelines, or rely on the marine environment for their diet, and therefore are not included. There are also 35 EPBC- listed Marine species in the EMBA, which do not have a Threatened or Migratory status and include a variety of pipefish and sea dragons. These species are described in the Master Existing Environment (Woodside, 2022).

The PAA overlaps the foraging BIA for the whale shark as outlined in Figure 4-4. The BIAs are detailed further in the Master Existing Environment (Woodside, 2022).

Table 4-5: Threatened and Migratory Fish, Shark and Ray Species predicted to occur within the Export Pipeline Operational Area, Facility and Xena-03 Operational Areas and the EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction		
				Export Pipeline OA	***Facility and Xena-03 OA***	***EMBA***
Carcharadon carcharias	White shark	Vulnerable	Migratory	Species or species habitat may occur within area.	Species or species habitat may occur within area.	Species or species habitat known to occur within area
Pristis clavata	Dwarf sawfish	Vulnerable	Migratory	Species or species habitat known to occur within area	Species or species habitat known to occur within area	Species or species habitat known to occur within area
Pristis zijsron	Green sawfish	Vulnerable	Migratory	Species or species habitat known to occur within area.	Species or species habitat known to occur within area.	Species or species habitat known to occur within area
Pristis pristis	Freshwater sawfish	Vulnerable	Migratory	Species or species habitat may occur within area	Species or species habitat may occur within area	Species or species habitat likely to occur within area
Rhincodon typus	Whale shark	Vulnerable	Migratory	Foraging, feeding or related behaviour known to occur within area.	Foraging, feeding or related behaviour known to occur within area.	Foraging, feeding or related behaviour known to occur within area
Carcharias taurus	Grey nurse shark	Vulnerable	N/A	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area
Sphyrna lewini	Scalloped hammerhead	Conservation Dependant	N/A	Species or species habitat known to occur within area	Species or species habitat known to occur within area	Species or species habitat known to occur within area
Thunnus maccoyii	Southern bluefin tuna	Conservation Dependent	N/A	Breeding known to occur within area	Breeding known to occur within area	Breeding known to occur within area
Anoxypristis cuspidata	Narrow sawfish	N/A	Migratory	Species or species habitat likely to occur within area.	Species or species habitat may occur within area.	Species or species habitat known to occur within area
Carcharhinus longimanus	Oceanic whitetip shark	N/A	Migratory	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction		
				Export Pipeline OA	*Facility and Xena-03 OA*	*EMBA*
Isurus oxyrinchus	Shortfin mako	N/A	Migratory	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area
Isurus paucus	Longfin mako	N/A	Migratory	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area
Manta alfredi	Reef manta ray	N/A	Migratory	Species or species habitat known to occur within area.	Species or species habitat likely to occur within area.	Species or species habitat known to occur within area
Manta birostris	Giant manta ray	N/A	Migratory	Species or species habitat likely to occur within area.	Species or species habitat likely to occur within area.	Species or species habitat known to occur within area
Lamna nasus	Porbeagle shark	N/A	Migratory	N/A	N/A	Species or species habitat may occur within area

Table 4-6: Fish, Shark and Ray BIAs within the PAA and EMBA

Species	BIA type	Approximate Distance (closest) and Direction of BIA from PAA (km)
Whale shark	Foraging (northward from Ningaloo along 200 m isobath)	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
	Foraging (high density prey) (Ningaloo Marine Park and adjacent Commonwealth waters)	228 km south-west (Facility and Xena-03 Operational Area)

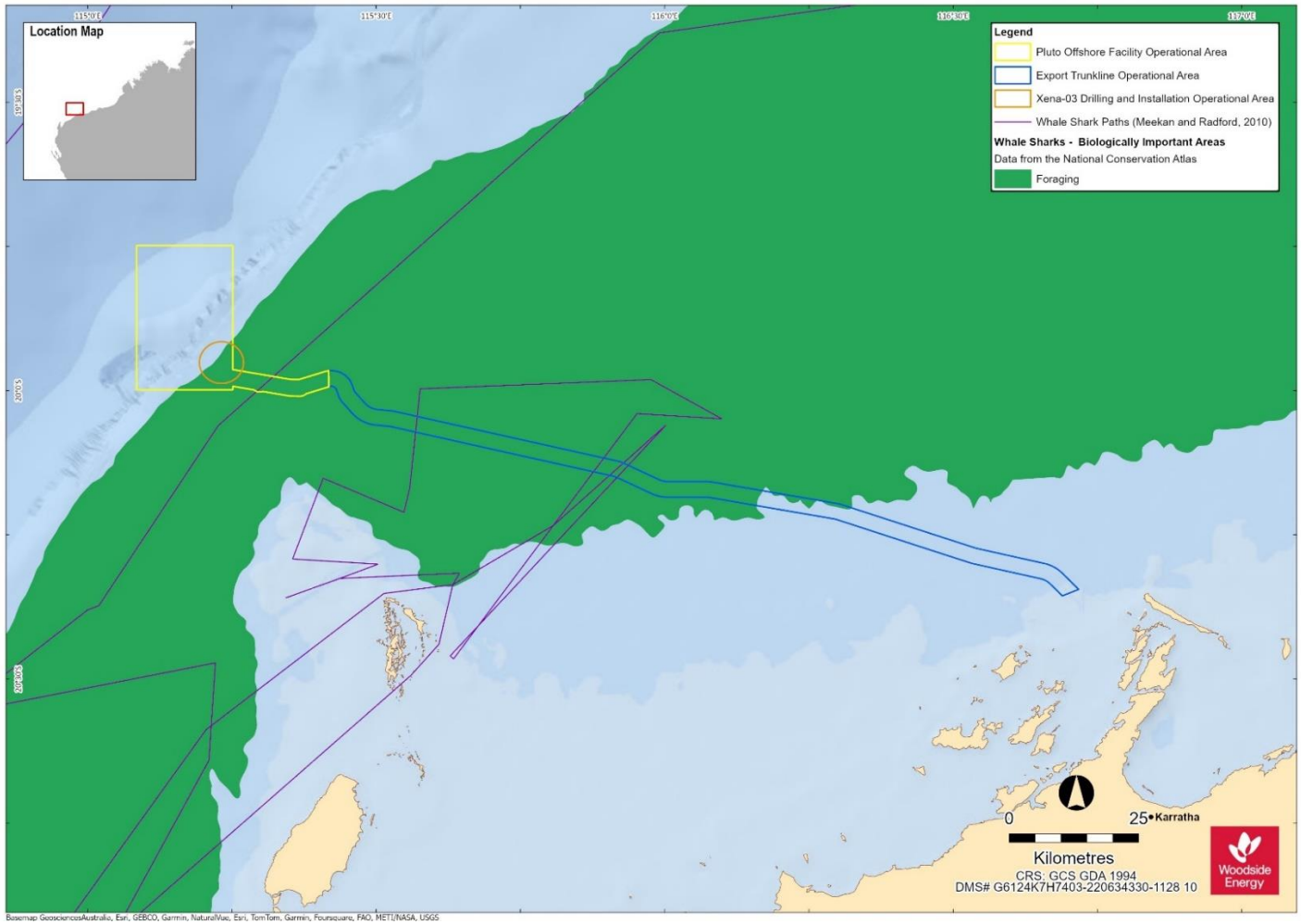

Figure 4-4: Whale Shark BIAs overlapping the PAA and satellite tracks of whale sharks tagged between 2005 and 2008 (Double et al. 2012, 2014)

4.6.2 Marine Reptiles

All seven EPBC listed marine reptiles are and five of these are also listed Migratory species (Table 4-7). For additional detail, the PAA is presented here in two parts; the Export Pipeline Operational Area and the combined Facility and Xena-03 Drilling Operational Areas. Two threatened species, identified in the PMST were identified to occur within in the EMBA, however are not considered to inhabit shorelines, or rely on the marine environment for their diet, and therefore are not included in Table 4-6.

BIAs for the green turtle, hawksbill turtle, and flatback turtle overlap the PAA and the loggerhead turtle only overlaps the Export Pipeline Operational Area as described in Table 4-7 and shown in Figure 4-5.

Habitat critical to the survival of the green turtle, hawksbill turtle, and loggerhead turtle is overlapped by, or adjacent to the PAA as shown in Figure 4-5. An additional 16 EPBC-listed Marine reptiles species occur in the EMBA, which do not have Threatened or Migratory status. The majority of these are sea snake species. These listed Marine species are described in the Master Existing Environment (Woodside, 2022).

Table 4-7: Threatened and Migratory Marine Reptile Species predicted to occur within the Export Pipeline Operational Area, Facility and Xena-03 Operational Areas and the EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction		
				Export Pipeline OA	Facility and Xena-03 OA	EMBA
Caretta caretta	Loggerhead turtle	Endangered	Migratory	Congregation or aggregation known to occur within the area	Species or species habitat known to occur within the area	Breeding known to occur within area
Dermochelys coriacea	Leatherback turtle	Endangered	Migratory	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within the area	Species or species habitat known to occur within area
Chelonia mydas	Green turtle	Vulnerable	Migratory	Congregation or aggregation known to occur with the area	Species or species habitat known to occur within the area	Breeding known to occur within area
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	Migratory	Congregation or aggregation known to occur with the area	Species or species habitat known to occur within the area	Breeding known to occur within area
Natator depressus	Flatback turtle	Vulnerable	Migratory	Congregation or aggregation known to occur with the area	Congregation or aggregation known to occur with the area	Breeding known to occur within area
Aipysurus apraefrontalis	Short-nosed seasnake	Critically Endangered	N/A	Species or species habitat likely to occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area
Aipysurus foliosquama	Leaf-scaled seasnake	Critically Endangered	N/A	Species or species habitat known to occur within the area	N/A	Species or species habitat known to occur within area

Table 4-8: Marine Turtle BIAs within the EMBA

Species	BIA type (closest location)	Approximate Distance and Direction of BIA from PAA (km)
Flatback turtle	Internesting Buffer (Montebello Island, Hermite Island, NW Island, Trimouille Island; Dampier Archipelago (islands to the west of the Burrup Peninsula); Intercourse Island; Legendre Island, Huay Island; Delambre Island; Dixon Island; West of Cape Lambert; Thevernard Island – South coast)	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
	Mating (Dampier Archipelago (islands to the west of the Burrup Peninsula); Montebello Island, Hermite Island, NW Island, Trimouille Island; coral reef habitat west of the Montebello group (extends the entire length of Montebello's); Barrow Island; Coral reef habitat west of the Montebello group (extends the entire length of the Montebellos)	10 km south-east (Export Pipeline Operational Area)
	Nesting (Dampier Archipelago (islands to the west of the Burrup Peninsula); Legendre Island, Huay Island; Delambre Island; Montebello Island, Hermite Island, NW Island, Trimouille Island)	10 km south-east (Export Pipeline Operational Area)
	Foraging (Dampier Archipelago (islands to the west of the Burrup Peninsula); Legendre Island, Huay Island; Montebello Island, Hermite Island, NW Island, Trimouille Island; coral reef habitat west of the Montebello)	10 km south-east (Export Pipeline Operational Area)
	Aggregation (Coral reef habitat west of the Montebello group. Extends the entire length of Montebello's)	40 km south-west (Export Pipeline Operational Area)
	Internesting (Dampier Archipelago (islands to the west of the Burrup Peninsula); coral reef habitat west of the Montebello group (extends the entire length of Montebello's))	10 km south-east (Export Pipeline Operational Area)
	Migration corridor (Dampier Archipelago (islands to the west of the Burrup Peninsula)	10 km south-east (Export Pipeline Operational Area)
Green turtle	Internesting Buffer (Dampier Archipelago (islands to the west of the Burrup Peninsula); Legendre Island, Huay Island; Montebello Island, Hermite Island, NW Island, Trimouille Island; Delambre Island; north and south Muiron Island; north-west Cape)	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
	Mating (Dampier Archipelago (islands to the west of the Burrup Peninsula); Montebello Islands; Hermite Island, NW Island, Trimouille Island; coral reef habitat west of the Montebello group (extends the entire length of Montebello's))	10 km south-east (Export Pipeline Operational Area)
	Nesting (Dampier Archipelago (islands to the west of the Burrup Peninsula); Legendre Island, Huay Island; Montebello Islands; Hermite Island, NW Island, Trimouille Island; north and south Muiron Island)	10 km south-east (Export Pipeline Operational Area)
	Internesting (Dampier Archipelago (islands to the west of the Burrup Peninsula); Montebello Islands; coral reef habitat west of the Montebello group (extends the entire length of Montebello's))	10 km south-east (Export Pipeline Operational Area)

Species	BIA type (closest location)	Approximate Distance and Direction of BIA from PAA (km)
	Foraging (Dampier Archipelago (islands to the west of the Burrup Peninsula); Legendre Island, Huay Island; Delambre Island; Montebello Island, Hermite Island, NW Island, Trimouille Island; coral reef habitat west of the Montebello group (extends the entire length of Montebellos))	10 km south-east (Export Pipeline Operational Area)
	Aggregation (Coral reef habitat west of the Montebello group (extends the entire length of Montebello's))	40 km south-west (Export Pipeline Operational Area)
	Migration corridor (Dampier Archipelago (islands to the west of the Burrup Peninsula)	10 km south-east (Export Pipeline Operational Area)
Hawksbill turtle	Internesting Buffer (Rosemary Island; Dampier Archipelago (islands to the west of the Burrup Peninsula); Delambre Island; Montebello Island; Hermite Island, NW Island, Trimouille Island; Ah chong and South East Island; Lowendal Island; Thevenard Island; Ningaloo coast and Jurabi coast)	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
	Foraging (Dampier Archipelago (islands to the west of the Burrup Peninsula); Montebello Island, Hermite Island, NW Island, Trimouille Island	10 km south-east (Export Pipeline Operational Area)
	Mating (Dampier Archipelago (islands to the west of the Burrup Peninsula); Montebello Island; Hermite Island; NW Island; Trimouille Island)	10 km south-east (Export Pipeline Operational Area)
	Nesting (Delambre Island (and other Dampier Archipelago Islands); Dampier Archipelago (islands to the west of the Burrup Peninsula); Rosemary Island; Montebello Island; Hermite Island; NW Island; Trimouille Island; Ah chong and South East Island)	9 km south-east (Export Pipeline Operational Area)
	Internesting (Dampier Archipelago (islands to the west of the Burrup Peninsula))	10 km south-east (Export Pipeline Operational Area)
	Migration corridor (Dampier Archipelago (islands to the west of the Burrup Peninsula))	10 km south-east (Export Pipeline Operational Area)
Loggerhead turtle	Internesting buffer (Rosemary Island; Montebello Islands; Muiron Island; Ningaloo coast and Jurabi coast)	Overlaps Export Pipeline Operational Area only
	Nesting (Cohen Island; Rosemary Island; Montebello Islands; Muiron Island)	10 km south-east (Export Pipeline Operational Area)
Leatherback turtle	No BIAs within the EMBA or PAA	

Table 4-9: Habitat Critical to the Survival of Marine Turtle Species occurring within the EMBA

Species	Genetic Stock	Nesting Locations	Approximate Distance and Direction from PAA (km)	Inter-nesting buffer	Nesting period	Hatching period
Flatback turtle	Northwest Shelf	Dampier Archipelago (including Delambre Island and Huay Island), Barrow Island, Montebello Islands, coastal islands from Cape Preston to Locker Island, Cemetery Beach, Port Headland, Mundabullangana Beach	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area	60 km	All year (peak: Au– - Sep)	All year
Green turtle	Northwest Shelf	Dampier Archipelago (including Delambre Island and Rosemary Island, Barrow Island, Montebello Islands, Serrier Island and Thevenard Island, Cape Preston to mourh of Exmouth Gulf (including Moneteblo Islands and Lowendal Islands)	Overlaps Export Pipeline Operational Area only	20 km	Nov–Mar (peak: Dec–Jan)	Jan–May (peak: Feb–Mar)
Hawksbill turtle	Northwest Shelf	Dampier Archipelago (including Rosemary Island and Delambre Island), Cape Preston to north of Exmouth Gulf (including Monteeblo Islands and Lowendal Islands),	Overlaps Export Pipeline Operational Area only	20 km	All year (peak: No– - May)	All year (peak: Dec–Feb)
Loggerhead turtle	Northwest Shelf	Exmouth Gulf and Ningaloo coast, Gnaraloo Bay and beaches.	200 km south-west (Facility and Xena-03 Operational Areas)	20 km	Nov–Mar (peak: Jan)	Jan–May
Leatherback turtle	No overlap – nesting located within the EMBA and PAA					

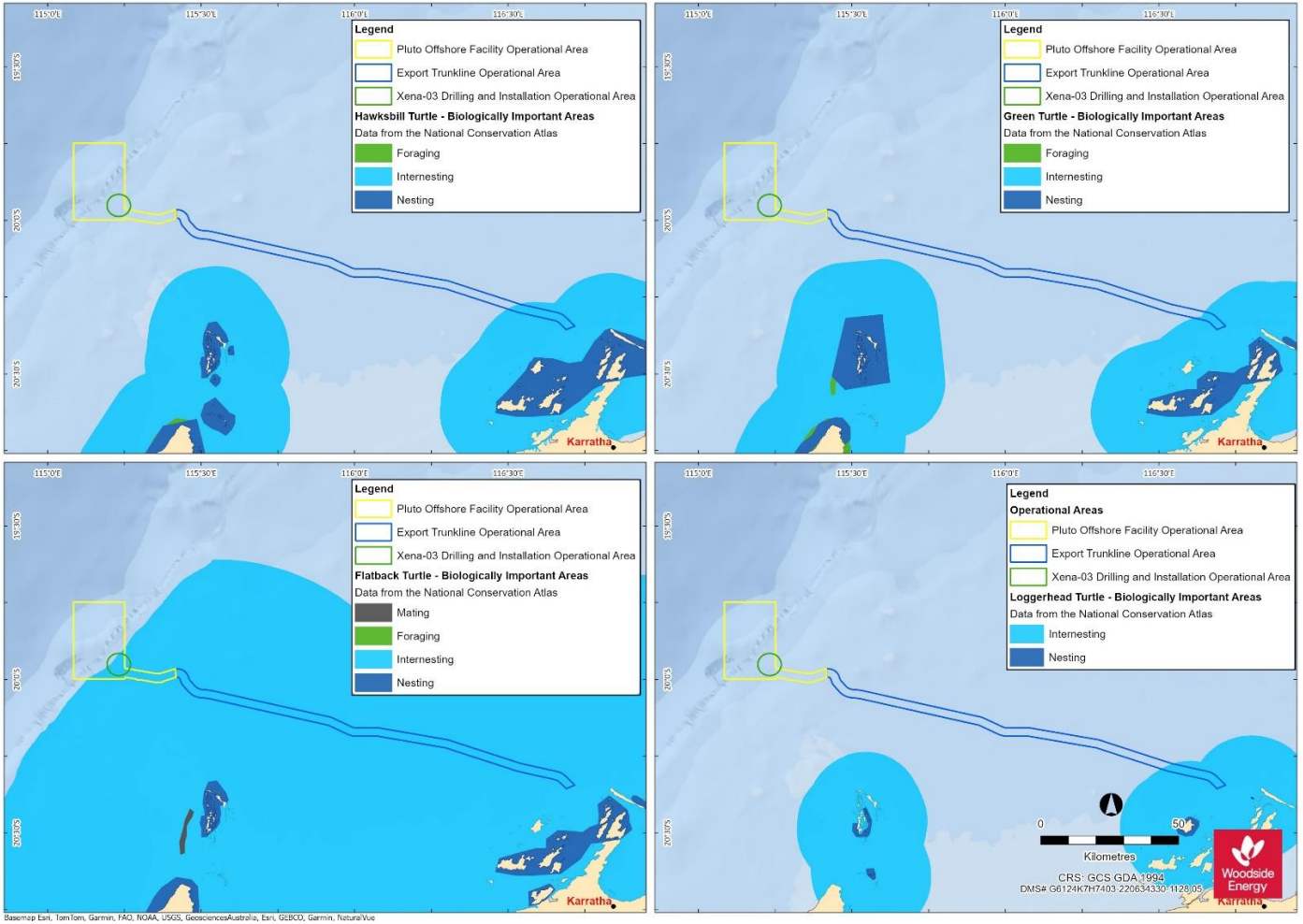

Figure 4-5: Marine Reptile BIAs overlapping the PAA

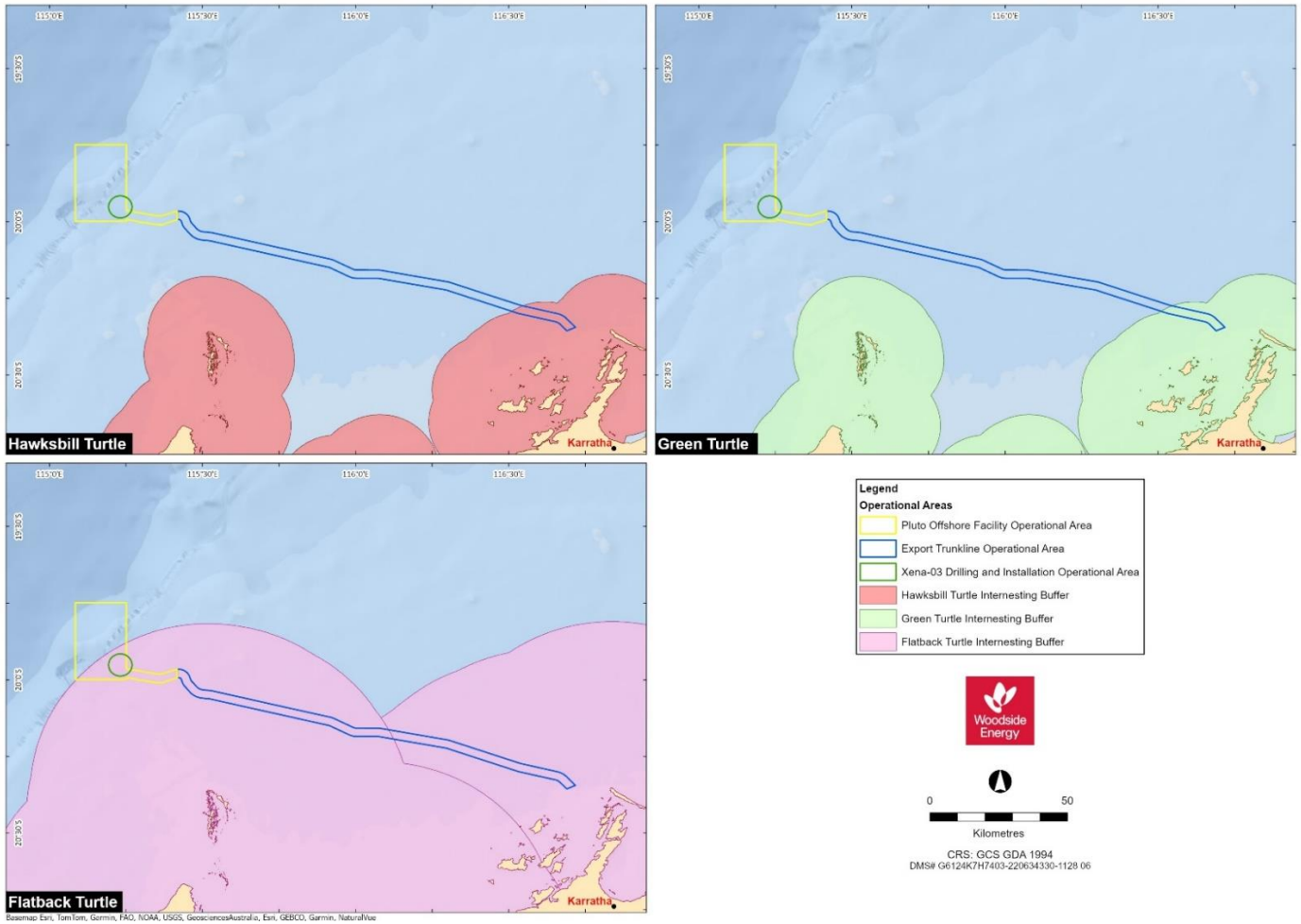

Figure 4-6: Habitat Critical to the Survival of Marine Turtles overlapping the PAA

4.6.3 Marine Mammals

A total of four EPBC Listed Threatened and an additional nine Migratory marine mammal species have been identified to potentially occur within the EMBA, of which 11 occur in the PAA (Table 4-10). For additional detail, the PAA is presented here in two parts; the Export Pipeline Operational Area and the combined Facility and Xena-03 Drilling Operational Areas. Nine threatened species, identified in the PMST were identified to occur within in the EMBA, however are not considered to inhabit shorelines, or rely on the marine environment for their diet, and therefore are not included.

The PAA overlaps with the distribution and migration BIAs for the pygmy blue whale and migration (north and south) BIA for the humpback whale. Two other species of marine mammal species have BIAs within the EMBA and are described in Table 4-10.

Table 4-10: Threatened and Migratory Marine Mammal Species predicted to occur within the Export Pipeline Operational Area, Facility and Xena-03 Operational Areas and the EMBA

Species name	Common name	Threatened status	Migratory Status	Potential for interaction		
				Export Pipeline OA	Facility and Xena-03 OA	EMBA
Balaenoptera musculus	Blue whale	Endangered	Migratory	Migration route known to occur within the area	Migration route known to occur within the area	Migration route known to occur within area
Balaenoptera physalus	Fin whale	Vulnerable	Migratory	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within the area	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera borealis	Sei whale	Vulnerable	Migratory	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within the area	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni	Bryde's whale	N/A	Migratory	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within area
Dugong dugon	Dugong	N/A	Migratory	Species or species habitat known to occur within the area	N/A	Breeding known to occur within area
Megaptera novaeangliae	Humpback whale	N/A	Migratory	Breeding known to occur with in the area	Breeding known to occur with in the area	Breeding known to occur within area
Orcaella heinsohni	Australian snubfin dolphin	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area
Orcinus orca	Killer whale	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat may occur within area

Species name	Common name	Threatened status	Migratory Status	Potential for interaction		
				Export Pipeline OA	Facility and Xena-03 OA	EMBA
Physeter macrocephalus	Sperm whale	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat may occur within area
Sousa chinensis	Australian humpback dolphin	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted bottlenose dolphin	N/A	Migratory	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within the area	Species or species habitat known to occur within area
Eubalaena australis	Southern right whale	Endangered	Migratory	N/A	N/A	Species or species habitat likely to occur within area
Balaenoptera bonaerensis	Antarctic minke whale	N/A	Migratory	N/A	N/A	Species or species habitat likely to occur within area

Table 4-11: Marine Mammal BIAs within the EMBA

Species	BIA type	Approximate Distance and Direction from PAA (km)
Dugong	Calving (Exmouth Gulf)	207 km south-west (Facility and Xena-03 Operational Areas)
	Nursing (Exmouth Gulf)	207 km south-west (Facility and Drilling Operational Area)
	Breeding (Exmouth Gulf)	207 km south-west (Facility and Xena-03 Operational Areas)
	Foraging (high density seagrass beds) (Exmouth Gulf)	207 km south-west (Facility and Xena-03 Operational Areas)
Pygmy Blue Whale	Migration (Augusta to Derby. Tend to pass along the shelf edge at depths of 500m to 1000m; appear close to coast in the Exmouth-Montebello Islands area on southern migration.)	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
	Distribution	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
	Foraging (Ningaloo)	232 km south-west (Facility and Xena-03 Operational Areas)
Humpback whale	Migration (north and south) (The migration corridor extends from the coast to out to approximately 100km 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 the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
Southern Right Whale	Reproduction (Exmouth Gulf and Ningaloo)	Abuts the EMBA

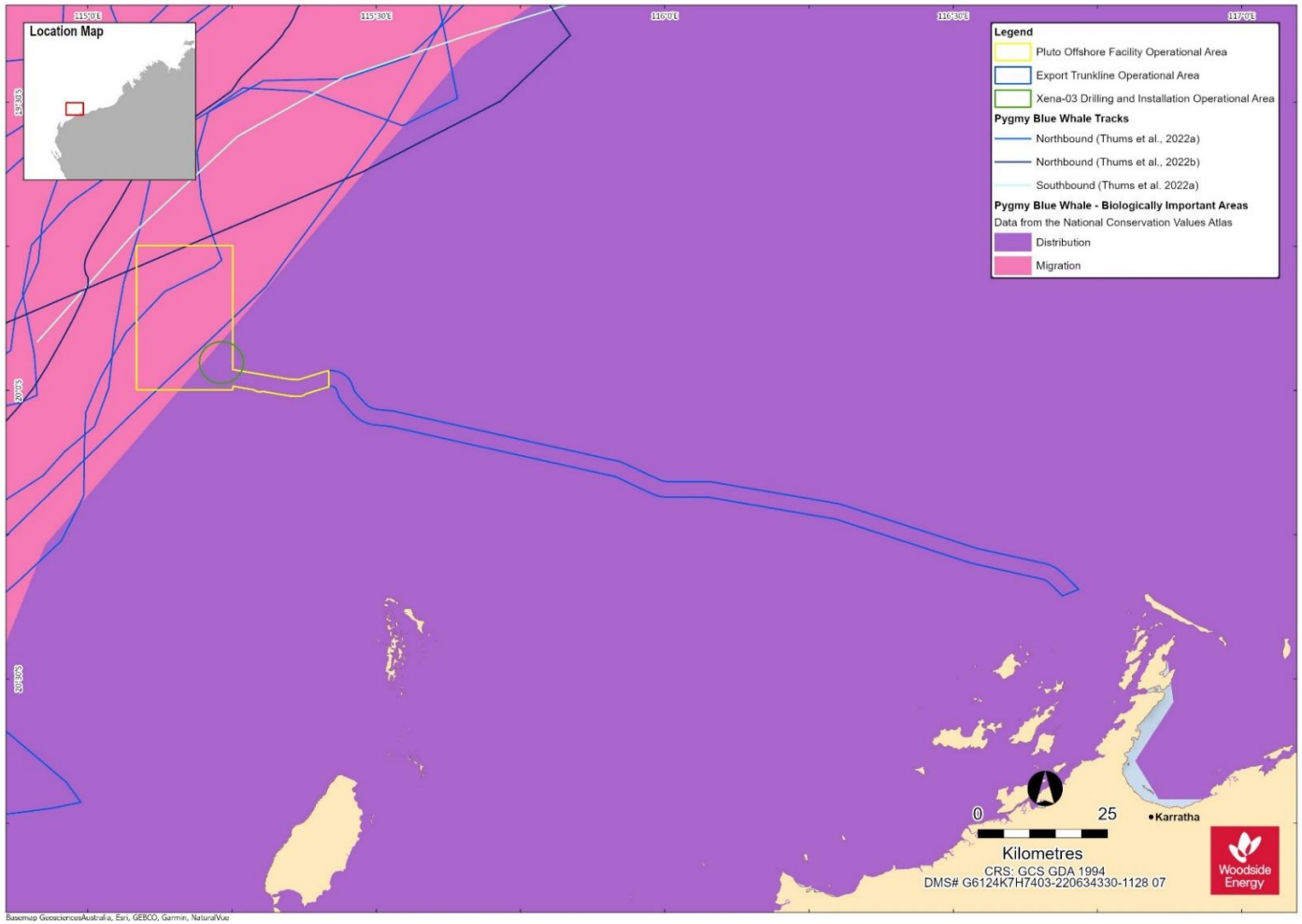

Figure 4-7:Pygmy blue whale BIAs overlapping the PAA and satellite tracks of tagged whales (Double et al., 2012, 2014)

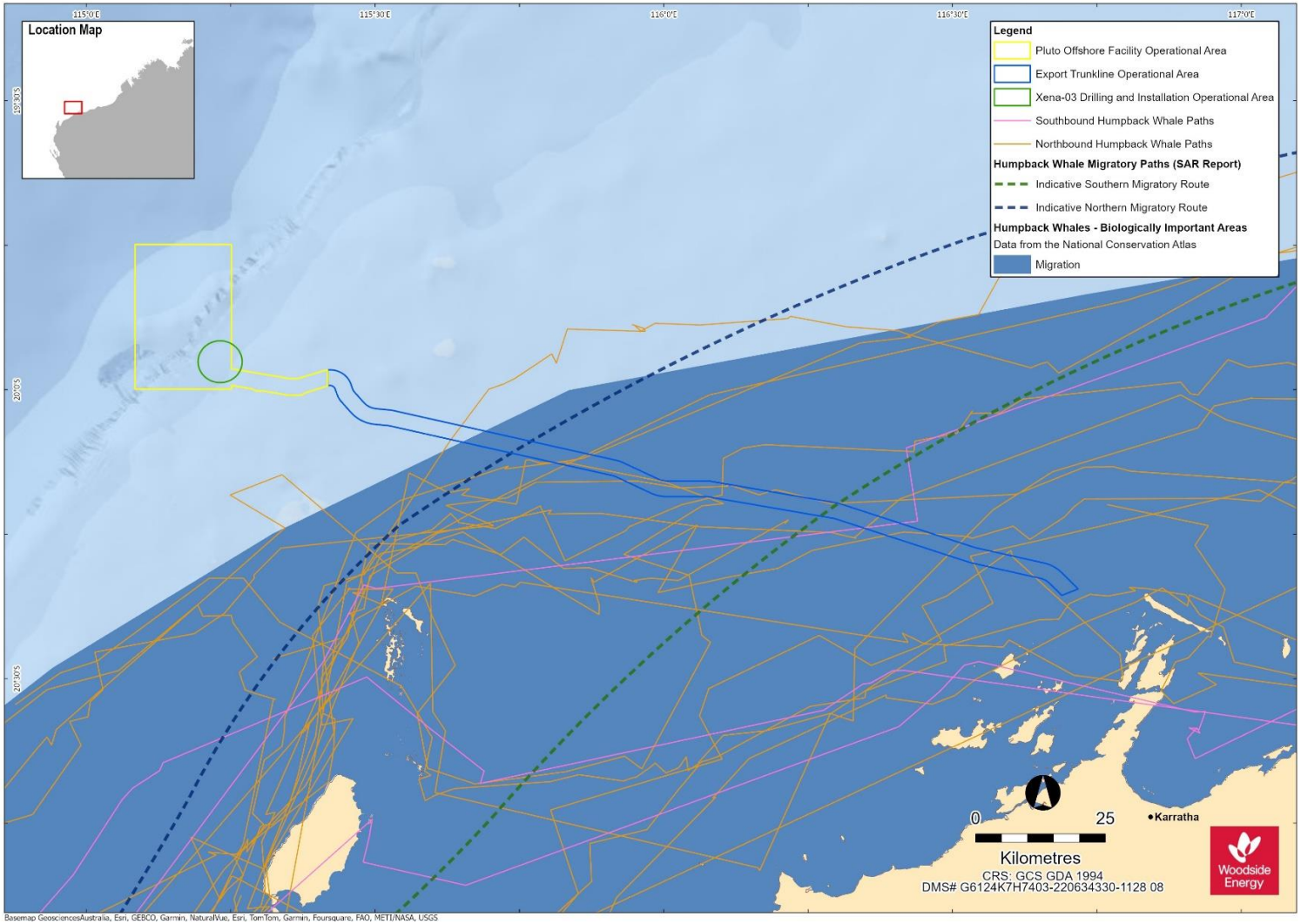

Figure 4-8: Humpback whale BIAs overlapping the PAA and satellite tracks of tagged whales (Double et al., 2012, 2010)

4.6.4 Seabirds and Migratory Shorebirds

A total of 17 EPBC-listed Threatened and additional 21 Migratory seabird and shorebird species have been identified to potentially occur within the EMBA, of which 15 occur in the PAA (Table 4-12). For additional detail, the PAA is presented here in two parts; the Export Pipeline Operational Area and the combined Facility and Xena-03 Drilling Operational Areas. There are 2 migratory bird species (fork-tailed swift and roseate turn) occurring within the Export Pipeline Operational Area that are not present within the Facility and Xena-03 Drilling Operational Areas. An additional 6 EPBC-listed Marine bird species are identified to occur within the EMBA, none of which are listed as Threatened or Migratory.

The PAA overlaps the BIA (Breeding) for the wedge-tailed shearwater. The roseate tern, and fairy tern only overlap the Export Pipeline Operational Area, as shown in Figure 4-9. The lesser crested tern breeding BIA is overlapped by the EMBA. Seabird and Migratory shorebirds which BIAs within the PAA and EMBA are outlined in Table 4-13.

Table 4-12: Threatened and Migratory Seabird and Migratory Shorebird Species predicted to occur within the Export Pipeline Operational Area, Facility and Xena-03 Operational Area and the EMBA

Species name	Common name	Threatened status	Migratory status	Potential for interaction		
				Export Pipeline OA	Facility and Xena-03 OA	EMBA
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area
Numenius madagascariensis	Eastern curlew	Critically Endangered	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area
Macronectes giganteus	Southern-giant petrel	Endangered	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat may occur within area
Calidris acuminata	Sharp-tailed sandpiper	Vulnerable	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area
Calidris canutus	Red knot	Vulnerable	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area
Phaethon lepturus fulvus	Christmas Island white-tailed tropicbird	Endangered	N/A	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat may occur within area
Phaethon rubricauda	Red-tailed tropicbird	Endangered	N/A	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area	Species or species habitat known to occur within area
Sternula nereis nereis	Australian fairy tern	Vulnerable	N/A	Breeding known to occur within the area	Foraging, feeding or related behaviour likely to occur within the area	Breeding known to occur within area
Actitis hypoleucos	Common sandpiper	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction		
				Export Pipeline OA	Facility and Xena-03 OA	EMBA
Anous stolidus	Common noddy	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat likely to occur within area
Apus pacificus	Fork-tailed Swift	N/A	Migratory	Species or species habitat likely to occur within the area	N/A	Species or species habitat likely to occur within area
Ardenna pacifica	Wedge-tailed shearwater[7]	N/A	Migratory	Breeding known to occur within the area	Breeding known to occur within the area	Breeding known to occur within area
Calidris melanotos	Pectoral sandpiper	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat may occur within area
Calonectris leucomelas	Streaked shearwater	N/A	Migratory	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within area
Fregata ariel	Lesser frigatebird	N/A	Migratory	Species or species habitat likely to occur within the area	Species or species habitat likely to occur within the area	Species or species habitat known to occur within area
Fregata minor	Great frigatebird	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat may occur within area
Phaethon lepturus	White-tailed tropic bird	N/A	Migratory	Species or species habitat may occur within the area	Species or species habitat may occur within the area	Species or species habitat known to occur within area

[7] The wedge-tailed shearwater was not captured in the PMST but will interact with the PAA.

Species name	Common name	Threatened status	Migratory status	Potential for interaction		
				Export Pipeline OA	Facility and Xena-03 OA	EMBA
Sterna dougallii	Roseate tern	N/A	Migratory	Breeding likely to occur within the area	N/A	Breeding known to occur within area
Tringa nebularia	Common Greenshank	Endangered	Migratory	N/A	N/A	Species or species habitat likely to occur within area
Limnodromus semipalmatus	Asian Dowitcher	Vulnerable	Migratory	N/A	N/A	Species or species habitat may occur within area
Thalassarche impavida	Campbell albatross	Vulnerable	Migratory	N/A	N/A	Species or species habitat may occur within area
Thalassarche carteri	Indian yellow-nosed albatross	Vulnerable	Migratory	N/A	N/A	Species or species habitat may occur within area
Charadrius leschenaultii	Greater sand plover	Vulnerable	Migratory	N/A	N/A	Species or species habitat known to occur within area
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Endangered	N/A	N/A	N/A	Species or species habitat known to occur within area
Rostratula australis	Australian painted snipe	Endangered	N/A	N/A	N/A	Species or species habitat likely to occur within area
Papasula abbotti	Abbott's booby	Endangered	N/A	N/A	N/A	Species or species habitat may occur within area
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	N/A	N/A	N/A	Foraging, feeding or related behaviour likely to occur within area

Species name	Common name	Threatened status	Migratory status	Potential for interaction		
				Export Pipeline OA	Facility and Xena-03 OA	EMBA
Ardenna carneipes	Flesh-footed shearwater	N/A	Migratory	N/A	N/A	Species or species habitat likely to occur within area
Charadrius veredus	Oriental Plover	N/A	Migratory	N/A	N/A	Species or species habitat may occur within area
Glareola maldivarum	Oriental Pratincole	N/A	Migratory	N/A	N/A	Species or species habitat may occur within area
Hirundo rustica	Barn Swallow	N/A	Migratory	N/A	N/A	Species or species habitat may occur within area
Hydroprogne caspia	Caspian tern	N/A	Migratory	N/A	N/A	Breeding known to occur within area
Limosa lapponica	Bar-tailed godwit	N/A	Migratory	N/A	N/A	Species or species habitat known to occur within area
Motacilla flava	Yellow wagtail	N/A	Migratory	N/A	N/A	Species or species habitat may occur within area
Onychoprion anaethetus	Bridled tern	N/A	Migratory	N/A	N/A	Breeding known to occur within area
Pandion haliaetus	Osprey	N/A	Migratory	N/A	N/A	Breeding known to occur within area
Sternula albifron	Little tern	N/A	Migratory	N/A	N/A	Species or species habitat may occur within area
Thalasseus bergii	Greater crested tern	N/A	Migratory	N/A	N/A	Breeding known to occur within area

Table 4-13: Seabird and Shorebird BIAs within the PAA and EMBA

Species	BIA type	Approximate Distance (closest) and Direction of BIA from PAA (km)
Wedge-tailed shearwater	Breeding (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	Overlaps the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area
Roseate tern	Breeding (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	Overlaps Export Pipeline Operational Area only
Fairy tern	Breeding (Pilbara and Gascoyne coasts and islands)	Overlaps Export Pipeline Operational Area only
Lesser crested tern	Breeding (Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef)	30 km south (Export Pipeline Operational Area)

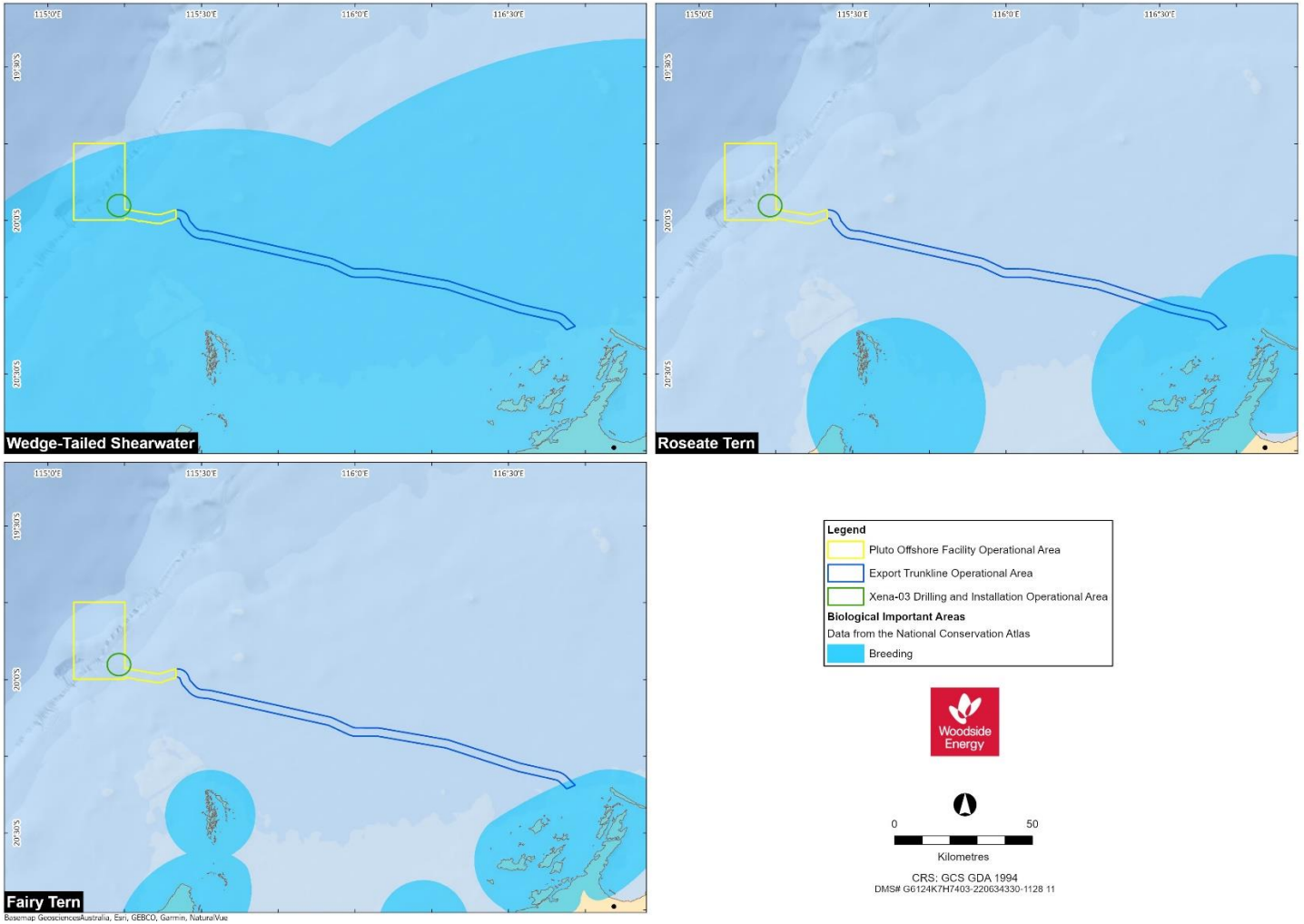

Figure 4-9: Seabird BIAs overlapping the PAA

4.6.5 Seasonal Sensitivities for Protected Species

Seasonal sensitivities for protected migratory species identified as potentially occurring within the PAA are identified in Table 4-14. Movement patterns of all protected species identified in Section 4.6 are described in the Master Existing Environment (Woodside, 2022).

Table 4-14: Key seasonal sensitivities for protected migratory species identified as occurring within the PAA and EMBA

Species	January	February	March	April	May	June	July	August	September	October	November	December
Fish, sharks and rays												
Whale shark – northern and southern migration (NWMR)[8]												
Whale shark – foraging/ aggregation (Ningaloo Coast)[8]												
Great white shark – northern migration (to Northwest Cape) [9]												
Marine reptiles[10]												
Flatback turtle, Pilbara Coast genetic stock – nesting												
Flatback turtle, Pilbara Coast genetic stock – hatching												
Green turtle, Northwest Shelf genetic stock – nesting												
Green turtle, Northwest Shelf genetic stock– - hatching												
Hawksbill turtle Western Australia genetic stock – nesting												
Hawksbill turtle Western Australia genetic stock – hatching												
Leatherback turtle – nesting												
Leatherback turtle – hatching												
Loggerhead turtle – nesting												
Loggerhead turtle–hatchling												
Mammals												
Dugon– - foraging												
Fin whale												

[8] TSSC, 2015d
[9] DSEWPaC, 2013a
[10] Information regarding seasonal occurrence of marine turtles has been taken from the Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth of Australia, 2017).

Species	January	February	March	April	May	June	July	August	September	October	November	December
Humpback whale– - northern migration [11] [12]												
Humpback whale – southern migration [11]												
Sei whale – migration (DEH, 2005)												
East Indian Ocean (EIO) pygmy blue whale – northern migration[13]												
East Indian Ocean (EIO) pygmy blue whale – southern migration [13]												
Seabirds and shorebirds												
Curlew sandpiper – non breeding (NWMR) [14]												
Eastern curlew – non-breeding (NWMR) [15]												
Red knot – non-breeding season (NWMR) [16]												
Wedge-tailed shearwater – various breeding sites [17] [18]												
	Species may be present in the PAA											
	Peak period. Presence of animals is reliable and predictable each year											

[11] TSSC, 2015a
[12] Double et al, 2010
[13] Double et al., 2012; 2014
[14] DCCEEW, 2023c
[15] DoE, 2015b
[16] TSSC, 2016a
[17] DSEWPaC 2012
[18] Environment Australia 2002

4.7 Key Ecological Features

Two KEFs overlap the PAA (Figure 4-10). KEFs within the PAA and EMBA are identified in Table 4-15 and described in the Master Existing Environment (Woodside, 2022).

Table 4-15: KEFs within the PAA and EMBA

Key Ecological Feature	Distance (closest) and Direction from PAA to KEF (km)
Ancient Coastline at the 125 m depth contour	Overlaps (Export Pipeline Operational Area)
Continental Slope Demersal Fish Communities	Overlaps (Facility and Xena-03 Operational Areas)
Glomar Shoal KEF	56 km north-east (Export Pipeline Operational Area)
Exmouth Plateau	74 km west (Facility and Xena-03 Operational Areas)
Canyons Linking the Cuvier Abyssal Plain and the Cape Range Peninsula	164 km south-west (Facility and Xena-03 Operational Areas)
Commonwealth Waters Adjacent to Ningaloo Reef	207 km south-west (Facility and Xena-03 Operational Areas)

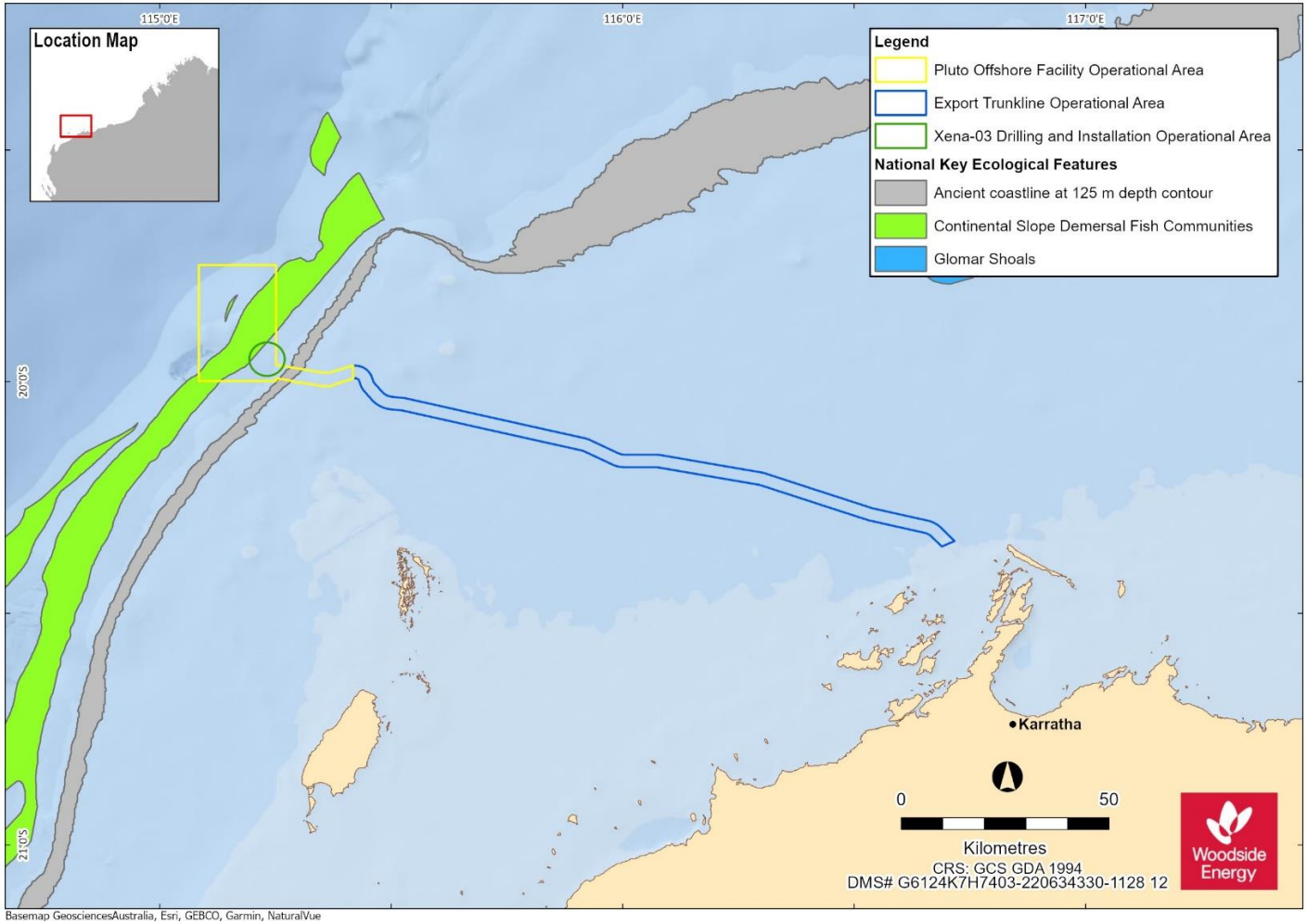

Figure 4-10: Key Ecological Features overlapping and near the PAA

4.8 Protected Places

The Montebello Marine Park Overlaps the PAA. Protected places within the EMBA are identified in Table 4-16 and presented in Figure 4-11 and Figure 4-12. The Master Existing Environment (Woodside, 2022) outlines 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 places and other sensitive areas	Distance (closest) and Direction from PAA to protected place or sensitive area (km)	Park zone and IUCN category* overlapping PAA and/or EMBA
AMPs		
NWMR		
Montebello	Overlaps Facility and Xena-03 Operational Areas and Export Pipeline Operational Area	Multiple Use Zone – VI
Dampier	13 km east (Export Pipeline Operational Area)	Habitat Protection Zone – IV National Park Zone – II Multiple Use Zone – IV
Argo-Rowley Terrace	254 km north-east (Facility and Xena-03 Operational Areas)	Multiple Use Zone – VI
Gascoyne	160 km south-west (Facility and Xena-03 Operational Areas)	Multiple Use Zone – VI Habitat Protection Zone – IV
Ningaloo	206 km south-west (Facility and Xena-03 Operational Areas)	Recreational Use Zone – IV
State Marine Parks and Nature Reserves		
Marine Parks		
Barrow Island	43 km south-west (Export Pipeline Operational Area)	Sanctuary –Zone– - Ia
Montebello Islands	25 km south (Export Pipeline Operational Area)	Sanctuary Zone – Ia General Use Zone – II Special Purpose Zone (Benthic Protection) – IV Special Purpose Zone (Pearling) Recreational –Zone– - II
Ningaloo	207 km south-west (Facility and Xena-03 Operational Areas)	General Use –Zone– - II Special Purpose Zone (Benthic Protection) – IV Sanctuary Zone – Ia Recreational Area -II
Conservation Park		
Montebello Islands	32 km south-west (Export Pipeline Operational Area)	N/A
Marine Management Areas		
Barrow Island	42 km south-west (Export Pipeline Operational Area)	N/A
Muiron Islands	190 km south-west (Facility and Xena-03 Operational Areas)	N/A

Protected places and other sensitive areas	Distance (closest) and Direction from PAA to protected place or sensitive area (km)	Park zone and IUCN category* overlapping PAA and/or EMBA
Nature Reserves		
Muiron Islands	179 km south-west (Export pipeline OA) 172 km south-west (Facility and Xena-03 Operational Areas)	Ia
Bessieres Island	172 km south-west (Facility and Xena-03 Operational Areas)	Ia
Round Island`	186 km south-west (Export Pipeline Operational Area)	Ia
Serrurier Island	182 km south-west (Facility and Xena-03 Operational Areas)	Ia
5(1)(h) Reserve		
Unnamed WA40828	36 km south-west (Export Pipeline Operational Area)	N/A
Unnamed WA40877	16 km south-west (Export Pipeline Operational Areas)	N/A
Unnamed WA36910	18 km south (Export Pipeline Operational Area	N/A
Unnamed WA36909	20 km south (Export Pipeline Operational Area)	N/A
Unnamed WA44665	173 km south-west (Facility and Xena-03 Operational Areas)	N/A
Unnamed WA41080	32 km south (Export Pipeline Operational Area)	N/A

**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.

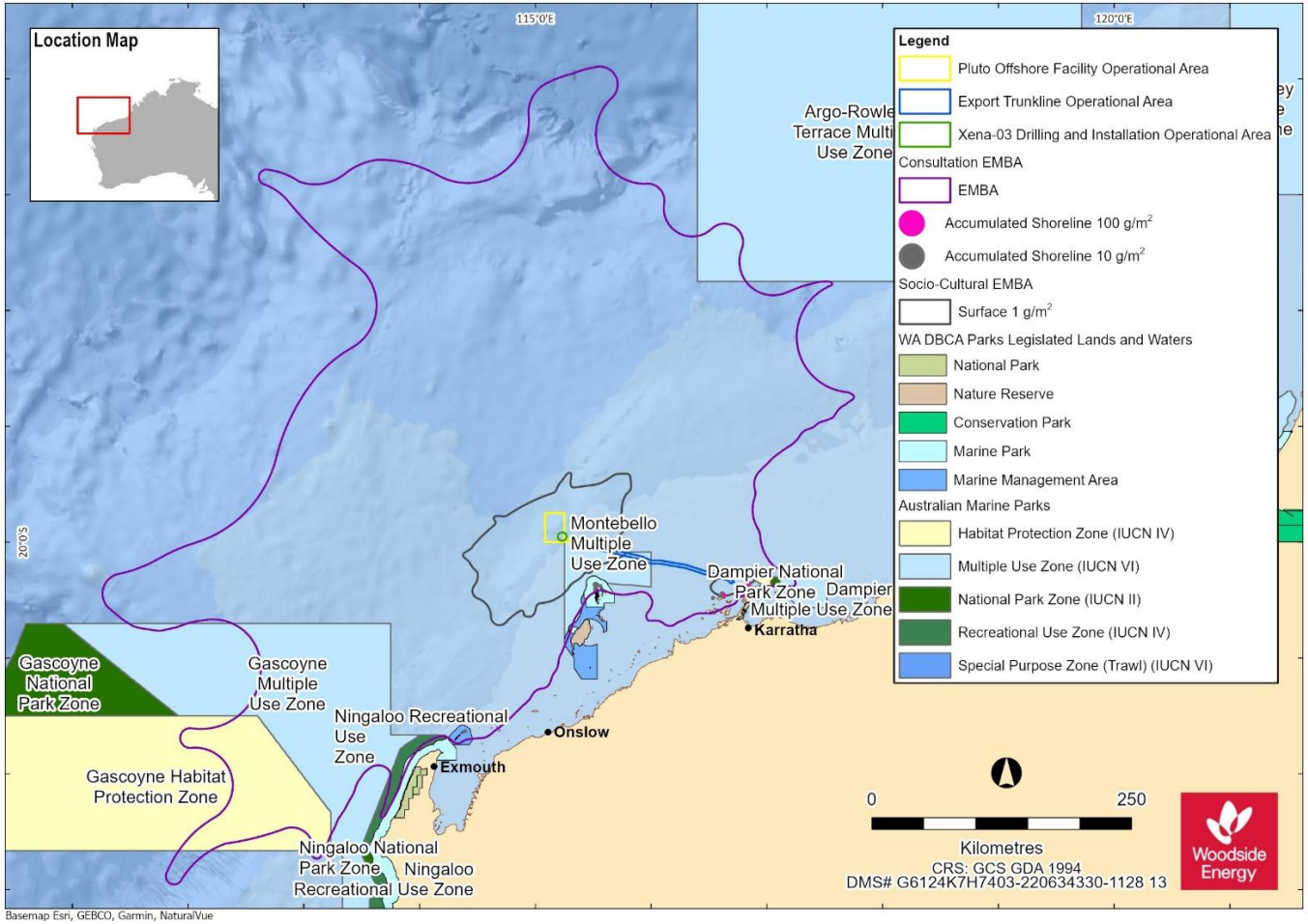

Figure 4-11: Protected Areas adjacent to the PAA and EMBA

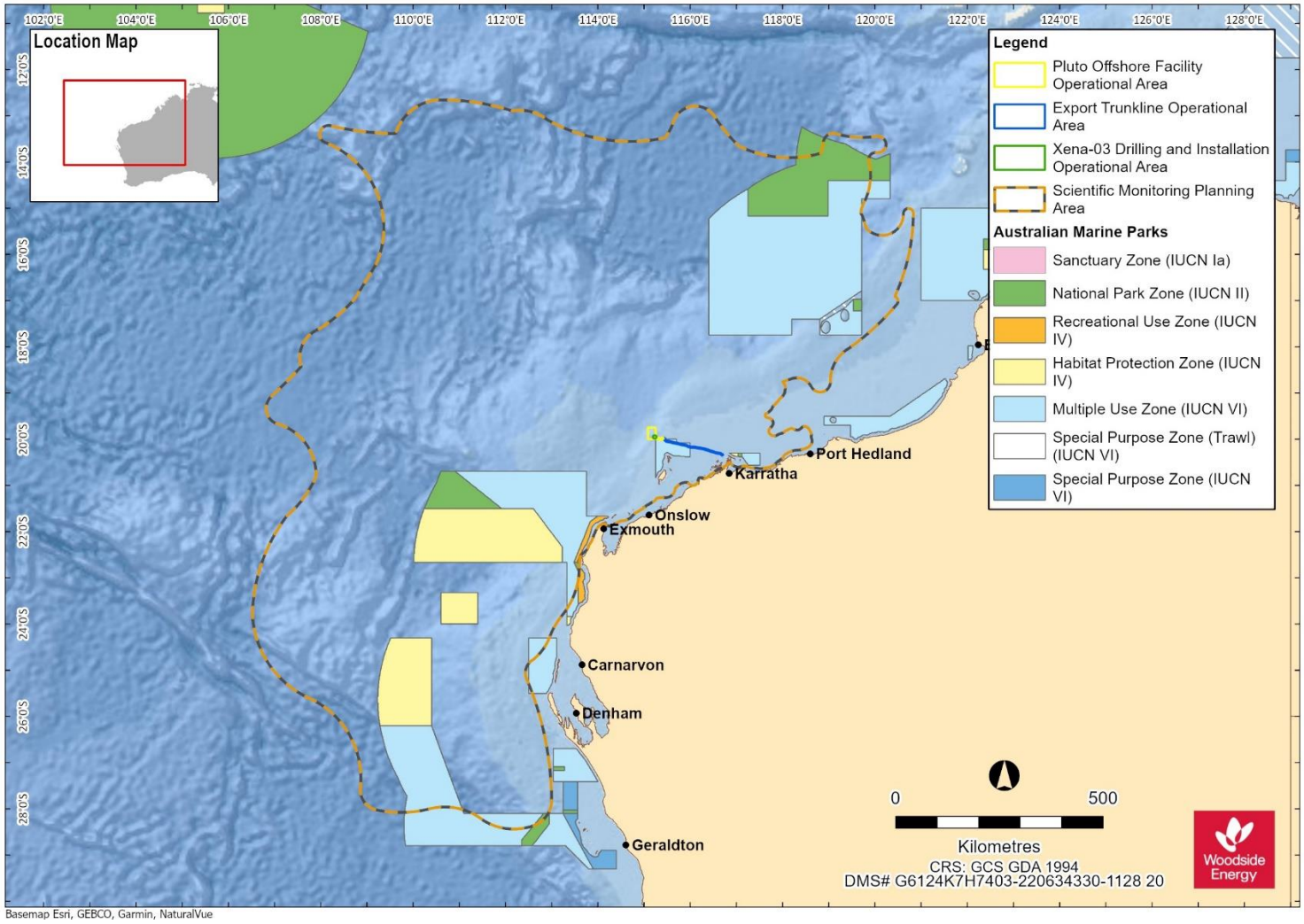

Figure 4-12: Australian Marine Parks adjacent to the PAA, Scientific Monitoring Area and EMBA

4.9 Cultural Features and Heritage Values

4.9.1 Background

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

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

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

In line with The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (Australia ICOMOS 2013) (Burra Charter) and associated practice notes, Woodside understands heritage value to refer to the cultural significance of a place to an individual or group. A cultural feature, by contrast, is understood to be comparable to the Burra Charter term “fabric” and refer to a place’s elements, fixtures, contents and objects which have cultural values. Although these features are necessarily physical, the place they inhabit or comprise may have tangible or intangible dimensions (Australia ICOMOS 2013). Woodside has undertaken heritage assessment to identify potential cultural values or features that may be impacted by the PAA. This assessment has not identified heritage places, objects or values which will be impacted by the activities planned under this EP (discussed in Section). However, Woodside recognises the deep spiritual and cultural connection to the environment[19] that First Nations peoples hold and is committed to ensuring appropriate management through on-going consultation.

4.9.2 First Nations People

Woodside uses established systems managed and maintained by government at State and/or Federal level where possible to identify First Nations groups that may have functions, interests or activities that may be affected by the PAP. Woodside identifies native title representative bodies and nominated representative entities, as well as native title claims, determinations and Indigenous Land Use Agreements (ILUAs) which the EMBA overlaps. Native title claims, determinations and ILUAs are defined under the Native Title Act 1993 (Cth). While acknowledging that cultural features and heritage values may exist outside of the native title framework, Woodside considers this to be the broadest extent over which Indigenous groups have claimed native title rights and interests.

Native title claims are applications made to the Federal Court under the Native Title Act 1993 for a determination or decision about native title in a particular area. A claim is made by a native title claim group which asserts it holds native title rights and interests in an area of land and/or water, according to its traditional laws and customs. By making a claim, the native title claim group seeks a decision that native title exists so that its native title rights and interests are recognised by the common law of Australia. This is called a native title determination. A determination is a decision by a recognised body, such as the Federal Court or High Court of Australia, that native title either does or does not exist in relation to a particular area (National Native Title Tribunal).

A requirement to establishing a positive determination of native title in court is proving that there is an organised society that occupied the land and/or waters at the time of British annexation. The requirement of an ‘organised society’ is set out by Justice Toohey in the historic judgment of Mabo

[19] Definition of ‘Environment’ in Regulation 4 of the OPGGS (Environment) Regulations are defined as:
Ecosystems and their constituent parts, including people and communities; and
Natural and physical resources; and
The qualities and characteristics of locations, places and areas; and
The heritage values of places; and includes
The social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d)

v Queensland (No 2) [1992] HCA 23; (1992) 175 CLR 1 ('Mabo'). Justice Toohey had the following to say (at 187):

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

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

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

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

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

The Native Title Act 1993 provides for a Representative Aboriginal/Torres Strait Islander Body (Native Title Representative Body) to be recognised by the Commonwealth Minister for an area. Native Title Representative Bodies have specialist functions set out in the Native Title Act 1993 within the area for which they are the Native Title Representative Body. However, the functions of a Native Title Representative Body are such that they do not hold details on the cultural features or heritage values of an area and therefore do not inform Woodside's understanding of heritage values or cultural features.

For the activity in this EP, there are no native title claims or determinations, ILUAs overlapping the PAA and therefore also no native title rights or interests and/or cultural values identified over the PAA (Figure 4-13).

There are three native title claims overlapping the EMBA and areas of potential shoreline accumulation. A further two native title claims are coastally adjacent to the EMBA. There are three ILUAs overlapping the in-water EMBA and areas of potential shoreline accumulation. A further 9 ILUAs are coastally adjacent to the EMBA (Figure 4-13).

4.9.3 Coastally adjacent First Nations groups

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

Woodside understands from engagement with relevant persons and/ or organisations, that extending a native title group's responsibility to areas which those groups have elected to not include in their claims or ILUAs can have significant cultural consequences for First Nations groups and individuals. This may also, over time, build expectations in the broader First Nations community that a group is responsible for maintaining environmental values in areas for which they do not hold traditional knowledge. Woodside also acknowledges that a First Nations group's relative proximity to any PAA or EMBA is not necessarily a meaningful indicator of the connection of First Nations groups to the

area, and providing advice over such areas can be culturally dangerous. As a result, caution must be used when conducting broader engagement.

A summary of native title claims, determinations and ILUAs overlapping or coastally adjacent to the EMBA is set out in Table 4-17. Claims and determinations have not been differentiated in this table, as it is acknowledged that either of these may indicate the existence of rights and interests.

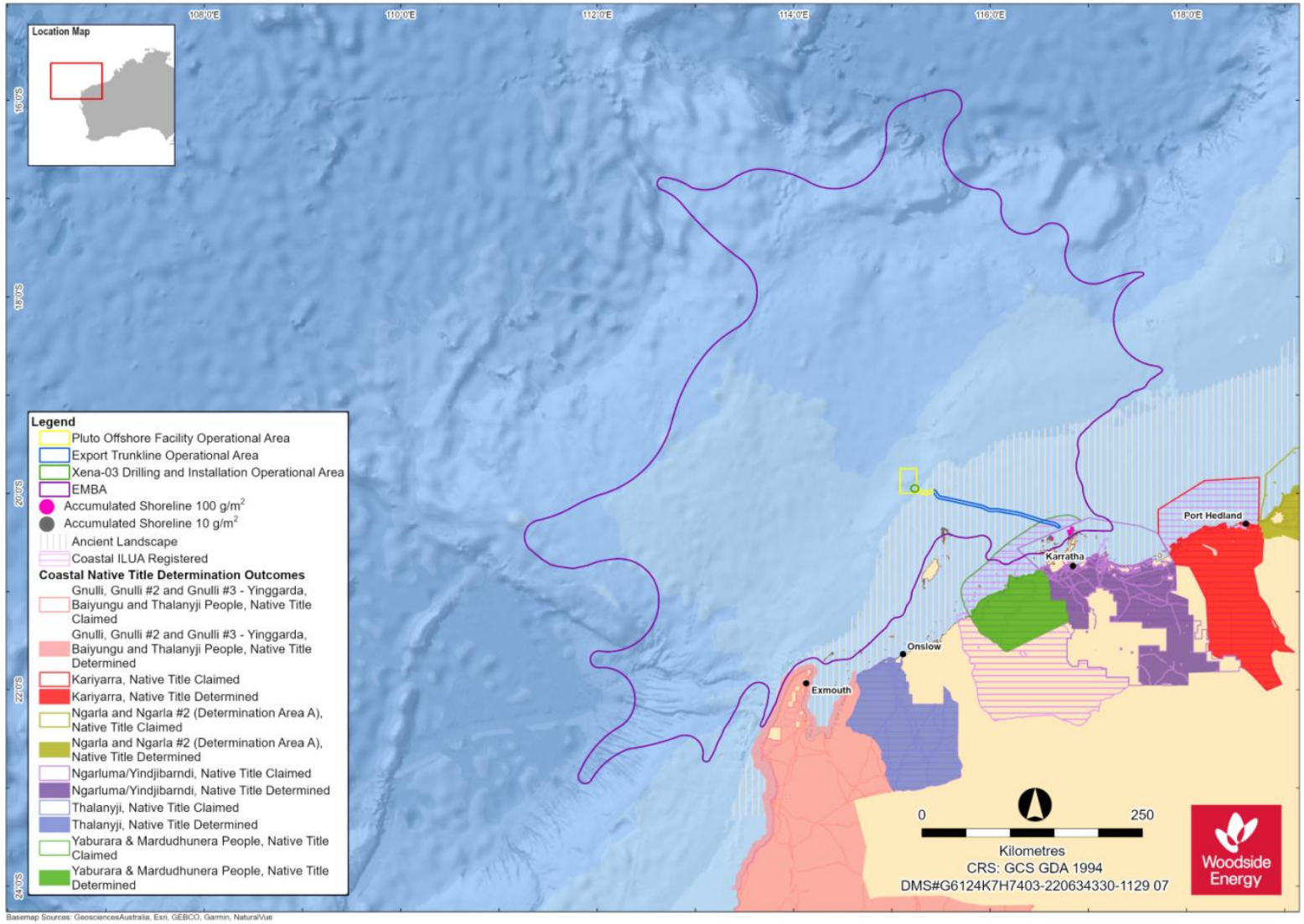

Figure 4-13: PAA and EMBA in relation to native title claims, determinations and ILUA

Table 4-17: Summary of Native Title Claims, Determinations and ILUAs that overlap or are coastally adjacent to the EMBA

Claim / Determination / ILUA	Registered Native Title Body Corporate	Overlap with EMBA	Coastally Adjacent to EMBA
Claim / Determination			
Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People	Nganhurra Thanardi Garrbu Aboriginal Corporation,Yinggarda Aboriginal Corporation	Yes	Yes
Kariyarra	Kariyarra Aboriginal Corporation	No	Yes
Ngarluma/Yindjibarndi	Yindjibarndi Aboriginal Corporation,Ngarluma Aboriginal Corporation	Yes	Yes
Thalanyji	Buurabalayji Thalanyji Aboriginal Corporation	No	Yes
Yaburara & Mardudhunera People	Wirrawandi Aboriginal Corporation	Yes	Yes
ILUA			
Alinta-Kariyarra Electricity Infrastructure ILUA	No representative body specified.	No	Yes
Anketell Port, Infrastructure Corridor and Industrial Estates Agreement	NAC	No	Yes
Cape Preston Project Deed (YM Mardie ILUA)	WAC	Yes	Yes
Cape Preston West Export Facility	WAC	No	Yes
FM - Kariyarra Land Access ILUA	No representative body specified.	No	Yes
Kariyarra and State ILUA	Kariyarra Aboriginal Corporation	No	Yes
KM & YM Indigenous Land Use Agreement 2018	WAC, Robe River Kuruma Aboriginal Corporation	Yes	Yes
Kuruma Marthudunera and Yaburara and Coastal Mardudhunera Indigenous Land Use Agreement	No representative body specified.	Yes	Yes
Macedon ILUA	BTAC	No	Yes
Ningaloo Conservation Estate ILUA	NTGAC	No	Yes
RTIO Kuruma Marthudunera People ILUA	Robe River Kuruma Aboriginal Corporation	No	Yes
RTIO Ngarluma Indigenous Land Use Agreement (Body Corporate Agreement)	NAC	No	Yes

4.9.4 Sea Country Values

Woodside recognises the potential for marine ecosystems to include cultural features as well as environmental values. This is one aspect of the broader concept of "sea country", which can be defined as the area of sea over which a First Nations group has interests, cultural value, connection and use. It has been noted that "the saltwater peoples of the north-west are associated with discrete clan estates or tribal areas, often referred to in contemporary Aboriginal English as 'saltwater country' or 'sea country'. 'Country' refers to more than just a geographical area: it is shorthand for all the values, places, resources, stories and cultural obligations associated with that geographical area." (Smyth, 2007). It necessarily follows that an impact to marine ecosystems has the potential to impact cultural values where the impact is detectable within sea country—the seascape which Traditional Custodians view, interact with or hold knowledge of. The link between environmental protection and cultural heritage protection is illustrated in the Australian Government's Indigenous Protected Areas Program. The Indigenous Protected Areas program provides for "areas of land and sea managed by Indigenous groups as protected areas for biodiversity conservation…IPAs deliver environmental benefits…Managing IPAs also helps Indigenous communities protect the cultural values of their country for future generations…" (DCCEEW, 2023).

McNiven (2004) suggests that "For those mainland groups whose exploitation of the sea was limited to littoral resources, it is likely that seascapes extended no more than c. 20–30km out to sea, out to the horizon and the limit of human visibility. ... However, in some coastal places, clouds that can be seen well over 100km out to sea are imbued with spiritual significance. For those groups with elaborate canoe technology, seascapes extend well over the horizon." While there is some evidence of traditional watercraft in Australia's North West, the recorded evidence is limited to travel across inland rivers (e.g. Barber and Jackson 2011) or travel between coastal islands (Paterson et al 2019). The process for identifying First Nations groups who may have interests and connection in Sea Country are set out in Section 4.9.4.1. The scope of advice Traditional Custodians were encouraged to provide through project consultation was not limited by reference to any particular boundaries or limits of Sea Country.

Cultural features of coastal areas may include marine species that may travel many thousands of kilometres through areas with similar cultural values to multiple First Nations groups. Some species may travel as far as 5,000 km from Antarctica to the Kimberley region of Western Australia (Double et al., 2010, 2012), passing First Nations groups along the entire west coast of Australia. For a further description of whale distribution and whale migration patterns, see Section 4.6.3. For a further description on turtles, see Section 4.6.2.

As set out above, an impact to marine ecosystems has the potential to impact cultural values where the impact is detectable within Sea Country. Woodside considers that impact to cultural values of marine species will be adequately managed in areas of traditional Sea Country, and therefore management of the environmental values will preserve the cultural values of environmental receptors, as assessed in Section 6.

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

- Desktop assessment of sea country values from publicly available sources
- Indigenous archaeological heritage assessments
- Consultation with First Nations groups and individuals

4.9.4.1 Desktop Assessment of Sea Country Values

4.9.4.1.1 Cultural Features and Heritage Values Identified in Publicly Available Literature

Publicly available sources were assessed for any records of previously identified Sea Country values or cultural features that may overlap with the EMBA or PAA. Where cultural features or Sea Country

values were identified these are summarised in Table 4-18 according to the First Nations groups (where identified or inferable) who hold these values.

All cultural features and heritage values restricted to onshore locations or inland waters have been excluded in Table 4-17, noting that the closest boundary of the PAA is approximately 13 km to islands of the Dampier Archipelago and 22 km north-west of the coastal mainland, while the boundary of the EMBA is about 6 km from closest landfall with no shoreline contact. Where the geographical extent is not specified or unclear it has been included for completeness.

Table 4-18: Cultural features and heritage values identified in publicly available literature

First Nations Group	Features and Values	Source	Potential for overlap	
			PAA	***EMBA***
Gnulli (Baiyungu, Thalanyji, Yinggarda)	Feature: resources including marine animals. Value: traditional knowledge holds that ancestors live on the land and in the water. Therefore, people have obligations to access and care for these places (e.g. keeping them clean).	Peck on behalf of the Gnulli Native Title Claim Group v State of Western Australia [2019] FCA 2090	Possible (unspecified) Possible (unspecified)	Possible (unspecified) Possible (unspecified)
	Feature: resources including mangrove crabs, gastropods, shellfish, dugong, turtle.	Morse 1993	Possible (turtle) No (other resources)	Possible (all)
	Feature: heritage sites in the Ningaloo region include shell middens, artefact scatters, skeletal material/burial sites, camps, meeting places, hunting places and water sources.	Deloitte 2020	No	Possible (Shoreline accumulation areas on offshore islands)
	Feature: resources including gajalbu (emu), bundgurdi (kangaroo), bardurra (bush turkey), majun (marine turtles), turtle eggs, bilygurumarda (osprey), fish, shellfish and plants.		Possible (turtles, fish) No (other resources)	Possible (turtles, turtle eggs, fish, shellfish) No (other resources)
	Feature: mudflats, mangroves and sand dunes provide a critical breeding ground for marine and terrestrial wildlife.		No	Possible (mangroves)
	Value: the Ningaloo region contains cultural heritage dating back at least 32,000 years, including ceremonial Thalu sites.		No	Possible (unspecified, but likely refers to onshore areas outside the EMBA)
	Value: connection to Country is important to the Traditional Owners' spirituality and religion.		Possible Unspecified	Possible (unspecified, but likely due to location of EMBA)
	Value: caring for Country– "The southern coastal reserves along the Ningaloo Coast are jointly managed by Traditional Owners and the DBCA. The Joint Management Body ensures that the Traditional Owners have an opportunity to make decisions about environmental management and land use". This document also includes information that is marked that cannot be copied, reproduced or used without consent.		No	Possible

First Nations Group	Features and Values	Source	Potential for overlap	
			PAA	***EMBA***
Kariyarra	Value: traditional knowledge recalls that a salt water serpent lives in the sea and brings fish to shore	Zaunmayr 2016	Possible (unspecified)	Possible (unspecified)
Ngarda-Ngarli (Mardudhunera, Ngarluma, Wong-Goo-Tt-Oo, Yaburara and/or Yindjibarndi)	Feature: Archaeological sites on Murujuga. Feature: Ceremonial sites. Feature: Dreaming sites.	Department of the Environment and Heritage, 2006	No No Possible (unspecified)	Possible (submerged) No Possible (unspecified)
	Value: Traditional knowledge recalls that the sea is a source of creation for flying foxes. Value: Petroglyphs are understood as permanent signs left by ancestral beings. Value: Petroglyphs depict the law. Value: Cultural obligations to look after places of special potency. Value: Petroglyphs are important in initiation and education.	DEC, 2013	Possible (unspecified) No No Possible (unspecified) – unlikely given distance offshore No	Possible (unspecified) Possible (submerged) Possible (submerged) Possible (unspecified) – unlikely given distance offshore Possible (submerged)
	Value: The sea is acknowledged as a starting point for songlines, including the flying fox songline.	MAC, 2023a	Possible (unspecified)	Possible (unspecified)
	Feature: Resources including fishes, turtles and dugong. Value: Traditional knowledge recalls a sea serpent which travelled from the coast to inland pools.	Water Corporation, 2019	Possible Possible (unspecified)	Possible Possible (unspecified)
	Value: Traditional knowledge recalls a water serpent from the ocean now lives in an inland pool. He created many sites and punishes law breakers. Value: In a separate account, a sea serpent punishing people was driven back to the sea by a freshwater serpent.	Barber and Jackson, 2011	Possible (unspecified) Possible (unspecified)	Possible (unspecified) Possible (unspecified)
	Value: Traditional knowledge recalls Manggan created the seas.	NAC n.d.	Yes	Yes
	Value: Traditional knowledge recalls Pannawonica Hill being carried from the sea near Barrow Island or Murujuga by a spirit bird.	Hook et al., 2004	Possible (unspecified)	Possible (unspecified)

First Nations Group	Features and Values	Source	Potential for overlap	
			PAA	***EMBA***
	Value: Traditional knowledge recalls Murujuga is where ancestral beings emerged from the sea and brought the Law.	Australian Heritage Council, 2012	Possible (unspecified)	Possible (unspecified)
	Feature: Submerged First Nations archaeological sites in Cape Bruguieres channel. Feature: Submerged First Nations archaeological sites in Flying Foam Passage.	Benjamin et al., 2020	No No	Possible No
	Feature: Submerged First Nations archaeological sites in Cape Bruguieres channel. Feature: Submerged First Nations archaeological sites in Flying Foam Passage.	Benjamin et al., 2023	No No	Possible No
	Value: Traditional knowledge recalls Maarga (creation ancestors) lifted the land and sky out of the ocean.	Milroy and Revell, 2013	Possible (unspecified)	Possible (unspecified)
	Value: Traditional knowledge recalls Maarga (creation ancestors) lifted the land and sky out of the ocean.	Japingka Aboriginal Art Gallery, 2023	Possible (unspecified)	Possible (unspecified)
	Feature: Submerged waterholes related to the Kangaroo songline. Value: Traditional knowledge holds that Songlines continue beyond the current coast and across the submerged landscape.	Kearney et al., 2023	Possible No	Possible Possible (unspecified)
	Value: Songlines are captured through storytelling, rock art, songs and dance, and in the landmarks themselves. Value: Murujuga is the start of many songlines, including the Seven Sisters.	Bainger, 2021	No No	Possible Possible (unspecified)
	Value: Songlines at Murujuga date back to times when the sea-level was lower.	MAC, 2023b	No	Possible (unspecified)
	Feature: Rock art. Feature: Sacred sites.	Weerianna Street Media Production, 2017	No Possible (unspecified)	Possible (submerged) Possible (unspecified)
	Feature: Resources including fish, turtles. Feature: Fish traps exist throughout the archipelago. Feature: Shell middens exist on coastal margins.	Leach, 2020	Possible No No	Possible Possible Possible

First Nations Group	Features and Values	Source	Potential for overlap	
			PAA	***EMBA***
	Feature: Submerged archaeological sites. Value: Law emerged from the sea and travelled inland.		Possible Possible (unspecified)	Possible Possible (unspecified)
	Feature: Archaeological sites on Murujuga.	McDonald, 2023	No	Possible (submerged)
	Feature: Archaeological sites on Murujuga.	McDonald, 2015	No	Possible (submerged)
	Feature: Archaeological sites on Enderby Island.	McDonald et al., 2022a	No	No
	Feature: Archaeological sites on Rosemary Island.	McDonald et al., 2022b	No	No
	Feature: Petroglyphs on Murujuga.	Mulvaney, 2015	No	Possible (submerged)
	Feature: Resources including mangrove seeds, turtles, turtle eggs). Value: It is recalled that ceremonies were conducted on islands.	Smyth, 2007	Possible (turtle) No (other resources) No (onshore)	Possible (turtle) No (other resources) No (onshore)
	Feature: Petroglyph and other archaeological sites at Murujuga.	Dortch et al., 2019	No	Possible (submerged)
Thalanyji	Feature: resources including fish, shellfish, crabs, crustaceans, sea urchins, turtle, dugong and flora and fauna associated with mangrove communities. Feature: archaeological sites on Barrow Island. Value: connection to Country.	Commonwealth of Australia 2002	Possible (turtle; fish) No (other resources) No Possible (unspecified)	Possible (all resources) No Possible (unspecified)
	Feature: resources include turtles, eggs, fish, shellfish and plants.	DBCA et al. 2002	Possible (turtle; fish) No (other resources)	Possible
	Value: traditional knowledge recalls a water snake is located in inland waters.	Hayes on behalf of the Thalanyji People v State of Western Australia [2008] FCA 1487	No (inland waters)	No (inland waters)
	Value: connection to Country. Value: transfer of knowledge.	DBCA 2022	Possible (unspecified) Possible (unspecified)	Possible (unspecified) Possible (unspecified)

First Nations Group	Features and Values	Source	Potential for overlap	
			PAA	***EMBA***
	Value: access to Country.		Possible (unspecified)	Possible (unspecified)
	Value: access to Barrow and possibly Montebello Islands.	Hook et al. 2004	No	Possible (Montebello Islands)
	Feature: artefact scatters are located in coastal sand dunes. Feature: burials are located in coastal sand dunes. Value: traditional knowledge recalls a water snake is located in inland waters.	Hook 2020.	No No No	No (No shoreline accumulation areas) No (No shoreline accumulation areas) No (inland waters)
	Feature: archaeological sites are located on Barrow Island.	Ditchfield et al. 2018	No	No
	Feature: thalu ceremonial sites for the increase of turtle, shark, ray, fish, squid, octopus, hill kangaroo and emu. Feature: ceremonies. Value: connection to Country. Value: transfer of knowledge. Value: access to Country.	DBCA 2022	No No Possible Possible Possible	No (ceremonial use) Possible (submerged thalu sites e.g., petroglyphs) No Possible Possible Possible
	Feature: archaeological sites are located at Barrow and Montebello Islands. Feature: archaeological evidence of the use of resources including fish, turtles, marine mammals, crocodiles, crabs and sea urchins.	Dortch et al. 2019.	No No	Possible (Montebello Islands) Possible (submerged, highly unlikely for most evidence of faunal use to survive inundation)
	Feature: archaeological sites are located on Barrow Island.	Paterson 2017	No	No
Unspecified	Feature: the ocean can include sacred sites and songlines. Value: people have kin relationships to important animals, plants tides and currents.	Smyth 2008	Possible (unspecified) Possible (unspecified)	Possible (unspecified) Possible (unspecified)
	Feature: archaeological sites in submerged landscapes.	Bradshaw 2021	No	Possible

First Nations Group	Features and Values	Source	Potential for overlap	
			PAA	***EMBA***
	Value: sea country has customary law defining ownership and management rights and responsibilities.	Muller 2008	Possible (unspecified)	Possible (unspecified)
	Value: knowledge of Sea Country Value: connection to Sea Country Value: care for Sea Country Value: the extent of Sea Country is determined by the travels of dreaming ancestors. This is recorded and conveyed through songlines.	Kearney et al 2023	Possible (unspecified) Possible (unspecified) Possible (unspecified) Possible (unspecified)	Possible (unspecified) Possible (unspecified) Possible (unspecified) Possible (unspecified)
	Value: sea country includes values, places, resources, stories and cultural obligations. Value: activities relating to resources included: · Dugong hunting; · Turtle hunting; · Turtle egg collecting; · Seabird egg collecting; · Spearing fish; · Reef trapping fish; · Herding fish; · Line fishing; · Collecting fish in stone fish traps; · Poisoning fish; · Gathering shellfish and other marine resources.	Smyth 2007	Possible Possible	Possible Possible
	Feature; archaeological sites indicate that islands were occupied prior to sea level rise.	DBCA 2020	No	Possible
	Value: people have kinship relationships with every plant and animal. Value: certain species, including fish and seafood, must not be eaten during initiation rituals due to their sacredness to the creation being Barrimirndi. Breaking this law may lead to cyclones.	Juluwarlu 2004	Likely No	Likely No

First Nations Group	Features and Values	Source	Potential for overlap	
			PAA	***EMBA***
	Feature: tangible and intangible heritage. Feature: archaeological evidence of varied occupation and adaptation. Value: a distinct way of life centred around the use of limited water and coastal resources.	Macfarlane and McConnell 2017	Possible (unspecified) No No	Possible (unspecified) Possible (submerged, highly unlikely for most evidence of faunal use to survive inundation) Possible (unspecified)

4.9.4.1.2 First Nations Archaeological Heritage Assessment

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

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

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

In recognition of this, Woodside considers the Ancient Landscape between the mainland and the Ancient Coastline KEF as an area where potential First Nations archaeological material may exist on the seabed, as this covers the full extent of this possible First Nations occupation. Known Indigenous heritage places including archaeological sites may be protected subject to declarations under the Aboriginal and Torres Strait Islander Heritage Protection Act 1984, Underwater Cultural Heritage Act 2018 or EPBC Act 1999. However, these Acts only extend protection to heritage places specified by declaration or otherwise included on a statutory list. Woodside understands that there is no First Nations archaeology known to exist anywhere within Commonwealth waters and no declarations or prescriptions under these Acts are located within the EMBA.

The PAA is located beyond the Ancient Landscape. The EMBA overlaps the ancient landscape, but no impacts to the seabed are anticipated. Archaeological material on the Ancient Landscape is not a relevant matter for the proposed activity as there is no overlap between the PAA or areas of potential seabed disturbance and the Ancient Landscape.

The Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Inquiry system was searched for the EMBA, which indicated 55 Registered Aboriginal Sites and Other Heritage Places (Appendix D). The exact location, access, and traditional practices for a number of these sites may not be disclosed and if required, such as in the event of a major oil spill, would involve prioritising further consultation with key contacts within DPLH and relevant local Aboriginal communities.

No sites of significance within the PAA or EMBA were identified by Traditional Custodians during the course of preparing the EP.

Should feedback be received (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process.

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

4.9.4.1.3 Consultation Feedback to Inform Existing Environment

First Nations cultural values are communally held. This is reflected in Vision 3 of Dhawura Ngilan that "Aboriginal and Torres Strait Islander heritage is managed according to community ownership" (Heritage Chairs of Australia and New Zealand 2021). Dhawura Ngilan also specifically notes that "Aboriginal and Torres Strait Islander... intangible knowledge systems, which are held in songlines

and language, are endangered. This knowledge is held by Elders and the community..." Through consultation with relevant persons, Registered Native Title Bodies Corporate have identified or raised topics relating to environmental values of cultural interest. These include a broad interest in the marine fauna.

Additional cultural values and broader interests in the environment are known and have been shared with Woodside in the course of consultation on this activity and other Environment Plans. These cultural values and broader interests that are known to exist within the EMBA are identified below:

The marine ecosystem description (Section 4.5) encompasses the description of the cultural features and Section 4.6 provide a description of turtles and marine cetaceans respectively.

Woodside has committed to ongoing engagement to further understand these values. The Program of Ongoing Engagement with Traditional Custodians provides a mechanism for ongoing dialogue between Woodside and Traditional Custodians. The program enables Woodside to manage uncertainty on the impacts and risks to cultural values which may be identified at any time during Woodside's activities via ongoing dialogue with Traditional Custodians. Should feedback be received (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process.

A summary of the topics/interests and values raised by First Nations groups through consultation relevant to this PAP, or raised in context of general Project activities or other activities are provided in Table 4-19.

4.9.4.2 Summary of cultural features and heritage values

Woodside has developed a robust understanding of cultural features and heritage values relevant to the activity through examination of publicly available information, studies and consultation with relevant persons under regulation 25.

The cultural features and heritage values identified in Section 4.9.4.1 to Section 4.9.4.4 confirms whether there is any potential for these to exist within the PAA or EMBA. As previously described, topics which have been raised in the context of an interest linked to the natural environment are impact and risk assessed in Section 6.

As cultural features are physical elements of a place, these can generally be assessed for impacts; where a feature is avoided, it is not impacted. Heritage values relate less to what is significant and more to why something is significant; interaction between heritage values and the PAA can only be reliably informed by consultation with Traditional Custodians where they are willing to share the necessary knowledge. Assessment of heritage values beyond cultural features alone is addressed in Section 6.11 subject to these caveats.

Table 4-19: Summary of cultural features and heritage values

Identified cultural features and heritage values	Context	EP Source		Potential for overlap	
		Consultation Feedback	Desktop Literature Assessment	PAA	EMBA
Archaeological Heritage and Landscapes					
Coastal/ island archaeological sites	Coastal archaeological sites include shell middens, artefact scatters, skeletal material/burial sites, camps, meeting places, hunting places and water sources.	×	✓	No	Possible (shoreline accumulation only)
Petroglyphs	Petroglyphs are a form of rock art. Petroglyphs are a prominent feature particularly at Murujuga where it is found on hard, volcanic rock.	×	✓	No	Possible (submerged)
Fish traps	Stone arrangements constructed in intertidal areas which fill with fish at high tide and trap them at low tide.	×	✓	No	Possible (submerged)
Submerged archaeological sites	The Ancient Landscape extends between 125m and 130m below current sea level. Ancient occupation of this area may have left traces through now submerged archaeological sites.	×	✓	No	Possible
Rivers, waterholes, tidal channels and seeps	Water sources on the Ancient Landscape which may be culturally significant or archeologically prospective. Traditional knowledge retains knowledge of some water sources on the Ancient landscape and some submerged waterholes are related to a Kangaroo songline.	×	✓	No	Known to occur
Submerged hills	Hills on the Ancient Landscape which may be culturally significant or archeologically prospective. As sea level rose these hills would have become islands and eventually submerged.	×	✓	No	Possible
Intangible values					

Identified cultural features and heritage values	Context	EP Source		Potential for overlap	
		Consultation Feedback	Desktop Literature Assessment	PAA	EMBA
Songlines	Consultation and publicly available literature talks to songlines associated with ancestral beings that travelled Sea Country. Energy lines were raised in consultation. Energy lines are understood by Woodside to be the same as songlines.	✓	✓	Possible (unspecified)	Possible (unspecified)
Creation/ dreaming sites, sacred sites and ancestral beings	Publicly available literature talks to creation/dreaming and ancestral beings, including water serpents, connected to or originating from the sea generally.	✓	✓	Possible (unspecified)	Possible (unspecified)
Ceremonial sites	Places where ceremony (e.g. thalu ceremonies) are performed. All identified ceremonial sites are located onshore.	×	✓	No	Possible (unspecified)
Cultural obligations to care for Country	Cultural obligation to care for the environmental values of Sea Country. Exclusion of Traditional Custodians from Sea Country or decision making processes may inhibit ability to care for Country.	✓	✓	Possible (unspecified)	Possible (unspecified)
Cultural Safety	Respecting local Lore and culturally significant areas to protect individuals from cultural harm.	×	✓	No	Possible (unspecified)
Knowledge of Country/ customary law and transfer of knowledge	The preservation and transmission of knowledge is dependent on the preservation of the environment generally. Exclusion of Traditional Custodians from Sea Country may inhibit the transfer of knowledge.	✓	✓	Possible (unspecified)	Possible (unspecified)

Identified cultural features and heritage values	Context	EP Source		Potential for overlap	
		Consultation Feedback	Desktop Literature Assessment	PAA	EMBA
Connection to Country	Connection to Country is described in publicly available literature as “important to the Traditional owners’ spirituality and religion”. Connection to Country may be damaged where people are displaced or disrupted (e.g. during colonisation) or where there is a loss of technical skills or environmental knowledge	×	✓	Possible (unspecified)	Possible (unspecified)
Access to Country	Limitations on Traditional Custodians accessing or enjoying areas of Sea Country	✓	✓	No	No (No limitations on access beyond the PAA)
Kinship systems and totemic species	Traditional Custodians have connection to species through kinship and totemic systems. An individual may have obligation to care for or not consume a species to which they are kin.	✓	✓	Possible	Possible
Resource collection	Fishing, hunting, trapping, crabbing, gathering of marine species including marine mammals, marine reptiles, fish and invertebrates including molluscs.	✓	✓	No	Possible
Marine ecosystems and species					
Marine species	Generally raised in consultation and literature as an interest	✓	✓	Possible	Possible

Identified cultural features and heritage values	Context	EP Source		Potential for overlap	
		Consultation Feedback	Desktop Literature Assessment	PAA	EMBA
Marine mammals: Whales	Generally raised in consultation and identified in publicly available literature. Thalu species of totemic importance Linked to songlines and dreaming stories Humpback whales in particular	✓	✓	Possible	Possible
Marine mammals: Dugongs	Culturally important species Used as a resource	✓	✓	No	Possible
Marine reptiles: Marine turtles	Culturally important species and migration There are Thalu ceremonies associated with turtles Turtles and turtle eggs as a resource	✓	✓	Possible	Possible
Fish: Fish, whale sharks, sharks and rays	Culturally important species Used as a resource There are Thalu ceremonies associated with increasing fish stocks Whale sharks are known as guardians of the sea by the Mayala People. Fish, including bream and sting rays are totemic species Fish, including sharks and rays raised as a natural environment interest	✓	✓	Possible	Possible
Cephalopods: Squid and Octopus	Octopus are a species of totemic importance Resource	✓	✓	Possible	Possible

Identified cultural features and heritage values	Context	EP Source		Potential for overlap	
		Consultation Feedback	Desktop Literature Assessment	PAA	EMBA
Intertidal communities: Bivalves, Gastropods, echinoderms, sea urchins, crustaceans	Resource. Bivalve and gastropod shells such as pearl shells, baler shells and trochus shells used in traditional trading practices and in resource collection. Molluscs are collected as a resource.	×	✓	No	Possible
Seabirds	Culturally important species Birds (including shags, seagulls and osprey) and bird eggs as a resource Bird feathers also used as a resource Kestrel are a species of totemic importance	✓	✓	Possible	Possible
Plankton	Interest only, raised as a natural environment interest	×	×	Possible	Possible
Benthic habitats: Coral and Reefs	Publicly available literature identified coral and reefs as culturally important with regard to connection with fish and important for food gathering.	×	✓	No	Possible
Benthic habitats: Seagrass	Publicly available literature identified seagrass as a culturally important species, providing for the protection of other marine species (e.g. turtles, dugongs).	×	✓	No	Possible
Benthic habitats: Macroalgal communities	Interest only, raised as a natural environment interest.	×	✓	No	Possible
Benthic habitats: Epifauna and infauna	Interest only, subtidal soft bottom communities raised as a natural environment interest.	×	✓	No	Yes

Identified cultural features and heritage values	Context	EP Source		Potential for overlap	
		Consultation Feedback	Desktop Literature Assessment	PAA	EMBA
Shoreline habitats: Mangroves and saltmarsh communities	Mangrove seeds as resource Critical breeding ground for marine and terrestrial wildlife. Mangroves would have provided shelter, crabbing, digging for shellfish, could be turtle nurseries. Saltmarshes would have provided an environment for crabbing and digging for shellfish. Coastal vegetation, raised as an interest	✓	✓	No	Possible
Shoreline habitats: Intertidal sand/ mudflat communities	Interest only, raised as a natural environment interest.	×	✓	No	Possible
Shorelines and coastal landforms	Interest only, raised as a natural environment interest.	✓	×	No	Possible
Estuarine crocodiles	Publicly available literature identified estuarine crocodiles as a culturally important species Resource	×	✓	No	Possible
Marine Park/ coastal reserves	Interest and responsibility	×	×	No	Yes
Nearshore and offshore islands	Interest in protection of islands and species that inhabit the islands, including Rosemary Island and Solitary Island Interest in access to nearshore islands Offshore islands are culturally significant	✓	×	No	Yes (Rosemary Island, other islands) No (Solitary Island)

4.9.4.2.1 Further context: Archaeological heritage

The PAA is in water depths of 40 to 960 m, some of which overlaps the Ancient Landscape. No coastal areas or islands exist within the PAA. Islands do exist within the EMBA boundary, however given the EMBA is driven by an unplanned loss of well containment there is no anticipated impact pathway from this activity to onshore archaeological sites above highest astronomical tide (HAT).

Archaeological sites identified onshore with the potential to exist in intertidal or submerged locations include petroglyphs, fish traps and artefact scatters or burials contained within sand dunes. As archaeological sites, these features have archaeological value which relates to the preservation of their fabric (i.e. the tangible features) and their context (i.e. their location and relationship to other archaeological and natural features). Archaeological sites may also have intangible dimensions (ICOMOS 2013) cultural value that exist in addition to their archaeological or scientific value and are assessed separately.

Certain landscapes have been identified as archaeologically prospective on the submerged Ancient Landscape, including:

- submerged water sources (rivers, waterholes, tidal channels and seeps) which have an increased likelihood of use or habitation as past generations used the associated resources (UWA 2021).
- submerged calcarenite ridges younger that human occupation of the continent which may have formed over and protected artefacts in situ (Veth 2019),
- prominent landscape features (e.g. hills, particularly of igneous rock formations) that may have been foci for cultural activity (UWA 2021),
- Karst depressions and other “catch points” where artefacts may accumulate following disturbances caused by inundation (UWA 2021, Nutley 2022, Nutley 2023a).

4.9.4.2.2 Further context: Intangible Cultural Heritage

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

In terms of identified cultural features and heritage values related to intangible values, see below some additional context:

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

protect in order to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. No specific details of songlies have been provided by relevant persons during consultation for this Activity. The Activity is located beyond the Ancient Landscape where prominent landscape features (e.g. rocks, mountains, rivers, caves and hills) would have been visible or used by Traditional Custodians and therefore likely to be incorporated in songlines. In Australia, songlines can stretch thousands of kilometres, making up a complex and organic network of stories containing cultural knowledge of First Nations communities across the land (Neale and Kelly, 2020). Songlines can also extend out to Sea Country and contain cultural knowledge that is tied to geographic features, atmospheric phenomena and marine plants and animals. Often songlines containing references to a seascape or Sea Country make mention of mythical events occurring around marine life, fishing areas, submerged rocks or coral. Songlines that embody seascapes can reflect how a group may relate to, or value, Sea Country—for example connections to nearby islands that they once inhabited in their songlines (Smyth and Isherwood, 2016). Songlines can also be used as proof of long-standing connection to land and support a legal entitlement to land rights (Higgins, 2021). Examples where songlines contain strong references to Sea Country are more common in Pacific Islander and Torres Strait Islander communities, who often refer to seascapes and skylines in their songlines in order to communicate sacred knowledge that assists in safe navigation of the ocean (Neale and Kelly, 2020).

- Creation/dreaming sites, sacred sites and ancestral beings: The only sources identified by Woodside that contained detailed descriptions of the location of ancestral beings or creation/dreaming/ sacred sites placed these locations or sites on land, islands or within inland water sources such as rivers or pools. It is acknowledged that some ancestral beings are noted to live within or originate from the sea generally, and some creation stories talk to the creation of features from or in the sea. Additionally, places on shore or at sea are (without further information or specificity) assumed to have been created on some level in First Nations cosmology.
- Cultural obligations to care for Country: Caring for Country collectively refers to the cultural obligations of individuals and groups, as well as rituals and ceremonies required for the physical and spiritual health of the environment. In the literature reviewed by Woodside, caring for Country was noted to include, but is not limited to, maintenance of the physical environment and ecosystem. It may also have cultural, spiritual and ritual dimensions such as caring for ancestral beings or ensuring cultural safety. Thalu sites are places where ceremonies are performed to increase, enhance or maintain populations of plants, animals or phenomena. All references to active ceremonial sites were confined to onshore locations, though the values may extend offshore where e.g., a thalu relates to marine species populations.
- Knowledge of Country/customary law and transfer of knowledge: Knowledge of and familiarity with the features of Sea Country is itself a “value”. The inherent potential for restricted or secret knowledge (or information that is not wished to be shared) makes this difficult to assess even through consultation with Traditional Custodians. However, aspects such as limitations on access to sites or disruption/relocation of First Nations communities may have implications for the preservation of First Nations knowledge. Further, connection to Country may be damaged where people are displaced or disrupted (e.g., during colonisation) or where there is a loss of technical skills or environmental knowledge (McDonald and Phillips, 2021). Transfer of knowledge includes continuing traditional practices to pass on practical skills. This transfer of knowledge may be integral to managing a group’s intangible cultural heritage (UNESCO 2003).
- Connection to Country: Describes the multi-faceted relationship between First Nations people and the landscape, which is envisioned as having personhood and spirit. It is also an aspect of personal identity for many First Nations people. In the case of Sea Country this can mean identifying as a Saltwater person, where “essence ‘f being a''Saltwater' person is ontological…

it is about how people relate spiritually to the sea and engage with spiritual forces that created it, the marine flora and fauna and people" (McDonald and Phillips, 2021).

- Access to Country, including Sea Country: Is necessary for the continuation of other values including caring for Country and the transfer of traditional knowledge. Being on Country can be an important way of expressing or maintaining connection to Country (Australian Indigenous HealthInfoNet n.d.). Access is also a value in its own right, as a continuation of traditional Sea Country access and use.
- Cultural Safety: refers to respecting local Lore and culturally significant areas to protect individuals from cultural harm. There are many cultural implications for those (Aboriginal and non-Aboriginal) who do not follow cultural advice or access Country in culturally inappropriate ways. Cultural safety may include observing gender restricted areas, respecting significant places and restricted areas as well as following the advice from those with cultural authority.
- Kinship systems and totemic species: Individuals may have kinship to specific species (Smyth 2008, Juluwarlu 2004) and/or a responsibility to care for species (Muller 2008). Kinship arises from totemic associations within First Nations "skin group" systems. It is forbidden for an individual to kill or eat a species who is from the same "skin group" (Juluwarlu 2004). They may also have certain obligations linked to the discussion of caring for Country below. It is assumed that marine species may have kinship/totemic relationships to Traditional Custodians, but it is understood that these relationships do not prohibit people outside of that "skin group" from hunting or eating that same species (Juluwarlu 2004).
- Resource collection: A number of marine species are identified through consultation and literature as important resources, particularly as food sources. In addition to their immediate value as sustenance, the gathering and preparation of these resources is informed by cultural knowledge, and an inability to use these resources may result in a loss of ability to transfer that knowledge to future generations.

4.9.4.2.3 Further context: Marine ecosystems and species

First Nations people have noted through consultation that they have a general interest in environmental management and ecosystem health (i.e., natural environment interest). This was noted in the context of a group/individual seeking further information about potential impacts and risks from the Petroleum Activities Program on marine species and benthic communities in the PAA and EMBA. This includes marine mammals, marine reptiles, fish, seabirds, plankton, benthic and shoreline habitats and marine parks, which are described in context of their distribution and populations in Section 4.6 to 4.8, with further details in Master Existing Environment (Woodside, 2022).

In terms of identified cultural features and heritage values related to marine ecosystems and species summarised in Section 4.9, see below some additional context:

- Marine mammals: Whales, and in particular humpback whales, have been identified through consultation with First Nations people as culturally important species, with totemic importance including their populations, biodiversity, and migration patterns. Cultural ceremonies associated with communicating with dolphins have also been raised by MAC through consultation and dugongs predominantly as a resource. Details pertaining to whales, dugongs and dolphins, their distribution, migration patterns and populations are described in Section 4.6.3, with further details in the Master Existing Environment (Woodside, 2022).
- Marine reptiles: Turtles and sea snakes have been identified through consultation with First Nations people as culturally important species, with turtles identified as a resource. First Nations people that identify marine reptiles as species of totemic importance or integral to songlines may place high cultural value on their protection. No specific marine reptiles-related songlines have been identified as per Section 4.9 that have the potential to interact with the

PAA or EMBA. Note the only specific songline related to marine reptiles (turtles) was shared by MAC, and was geographically restricted from Fortescue to Withnell Bay, in Mermaid Sound (MAC 2021). Cultural knowledge of turtles at a population level (turtle migration, behaviour and the related marine environment) may all be important in ensuring the continuation of cultural functions and activities that remain valuable to First Nations people (Fijn 2021:47; Delisle et al.2018). Details pertaining to marine reptiles, their distribution, and populations are described in Section 4.6.2, with further details in the Master Existing Environment (Woodside, 2022).

- Fish and Cephalopods: Fish and squid have been identified through consultation with First Nations people as a culturally important species, with fish generally being identified as a resource. First Nations may identify cultural values associated with fish species as important to maintaining both tangible (physical cultural sites) and intangible (cultural knowledge) cultural heritage. Tangible cultural heritage associated with fish can include important cultural sites such as midden sites, fish traps and thalu sites. While the octopus is an important totem to Ngarla People and features in the creation story of Solitary Island. There are increase ceremonies / rituals for species of squid and octopus to enhance or maintain populations. Thalu are places where these increase ceremonies are performed. Details pertaining to fish and cephalopods are described in Section 4.9, with further details in the Master Existing Environment (Woodside, 2022).
- Seabirds: Seabird eggs have been identified through literature as a culturally significant resource (Smyth 2007). Details pertaining to seabirds and migratory shorebirds are described in Section 4.6.4, with further details in the Master Existing Environment (Woodside, 2022).
- Benthic habitats: Through consultation, First Nations groups identified benthic habitats as valuable for their ecological values, including corals attracting fish and seagrass providing shelters for fauna, as well as an important resource for dugongs. Additionally, coral is valued by MAC for its aesthetic values. Details pertaining to benthic habitats and communities, including their distribution, with further details in the Master Existing Environment (Woodside, 2022).
- Shoreline habitats: Through consultation, First Nations groups identified shoreline habitats as valuable for their ecological values, including mangroves for providing shelter to marine invertebrates, which are identified resources, and potential nursery for turtles. Literature also notes that mangroves are also valued for the flora and fauna they are associated with and support (Commonwealth of Australia 2002) and Smyth (2007) reports that mangrove seeds are used as a resource by Ngarda-Ngarli. Details pertaining to shoreline and coastal habitats, including their distribution, with further details in the Master Existing Environment (Woodside, 2022).

4.9.5 Summary of Existing Research on Murujuga Petroglyphs and Anthropogenic Air Emissions

Murujuga (Burrup Peninsula), including the Murujuga National Park, is most widely known for its large collection of rock art (petroglyphs). The Traditional Owners of Murujuga have a deep cultural and spiritual connection to the rock art of the Burrup Peninsula, which provides a record of Aboriginal lore, dreamtime stories, customs, and local knowledge of the land and its resources (MAC 2019).

The presence of industry on the Burrup Peninsula has generated concerns from some stakeholders that these emissions may lead to an accelerated weathering of rocks on which rock art is present which may reduce the visibility or destroy the rock art. This is based on a hypothesis that deposition of compounds such as NOx, SOx and ammonia (NH_3) from anthropogenic industrial sources have the potential to increase the acidity of the rock surface through chemical

and/or biological processes and that acidic conditions may then accelerate the weathering of rock patina, eroding or affecting the contrast of the rock art. There have been several independent studies and rock art monitoring initiatives since the mid-2000s, none of which have conclusively demonstrated a causal link between degradation of rock art and industrial activity. There are therefore also no applicable environmental air quality standards or guidelines available that can be applied to engraved rock art (Government of Western Australia, 2023).

Nevertheless, relevant persons have raised through consultation (**Appendix F, Table 2**) the possibility that emissions from the processing of LNG onshore at Murujuga may have an impact on the preservation of rock art. While these onshore emissions are not within the scope of the PAP, the research related to this topic is summarised in this section and evaluated to consider the potential for indirect impact (**Section 6.7.11**).

Further research continues to be undertaken by the Murujuga Rock Art Monitoring Program (MRAMP), run by the Traditional Custodians of the petroglyphs, the Murujuga Aboriginal Corporation, and Western Australian Department of Water and Environmental Regulation (DWER). MRAMP is described as "A best practice monitoring and analysis program" by the Western Australian Government which "will provide reliable information on changes and trends in the condition of the rock art and whether the rock art is showing signs of accelerated change… The results from these studies will guide management and protection of the rock art" (Government of Western Australia, 2023). MRAMP will provide the necessary certainty to guide management and protection of the rock art. The MRAMP website also describes the role of MRAS as part of the proposed World Heritage listing for Murujuga:
"The Department of Biodiversity, Conservation and Attractions (DBCA) works with MAC to lead the development of the World Heritage nomination of the Murujuga Cultural Landscape, as well as joint management of the Murujuga National Park. The World Heritage nomination for Murujuga includes a comprehensive and effective management framework that outlines how the potential 'Outstanding Universal Value' of the area will be protected, conserved and monitored. As part of this framework, the State Government and MAC will demonstrate how they are working closely together to protect the rock art through the Murujuga Rock Art Strategy and the Murujuga Rock Art Monitoring Program". (Government of Western Australia, 2023)

Refer to **Section 6.7.11** for further information on Murujuga cultural heritage management framework.

4.9.5.1 Research, Monitoring and Publications

Bednarik (2002) speculates the existence of several possible impact pathways for industrial emissions to impact rock art, including acidification of rain and promotion of microbial activity. A key indicator for this is identified as colour change in the rock surfaces. The data provided by Bednarik is not sufficient to demonstrate that industrial emissions have negative impacts on the rock art, but did warrant further study.

In 2002, the Western Australian Government established the Burrup Rock Art Monitoring Management Committee (BRAMMC) to assess the possible impacts of industrial emissions on the rock art of Murujuga. Research conducted by the BRAMMC included measurements of colour change as well as air quality, microclimate, dust deposition, mineral spectrometry, microbiological analyses, air dispersion modelling, and laboratory simulations of chemical impacts at contemporary, predicted and 10-times predicted pollutant estimates.

During the course of the BRAMMC studies, several further publications were produced including:

MacLeod 2005, which found that acidity of rockfaces on Murujuga is higher than samples kept in museum conditions. The paper does not demonstrate that the museum samples, which have been subject to decades of museum preservation conditions, are representative of the natural pH of Murujuga's rocks nor does it draw any conclusions on the impacts of acidity on rock art preservation.

Bednarik 2006 and 2007a were editorials, which did not include any original research. Bednarik 2007b argued that industrial emissions were impacting rock art but provided no evidence beyond analogy to bird droppings and expert advice that the absence of rock patina near trees was not the result of any known process caused by plants. The data provided by Bednarik is not sufficient to demonstrate that industrial emissions have negative impacts on the rock art but did warrant further study (which was already underway at that time).

In 2009, the BRAMMC reviewed the results of studies conducted under their program and concluded that "there is no scientific evidence to indicate that there is any measurable impact of emissions on the rate of deterioration of the Aboriginal rock art in the Burrup" and recommended that a technical working group be established to continue long-term monitoring.

In 2010, the Burrup Rock Art Technical Working Group (BRATWG) was established. Under the BRATWG, the CSIRO continued to monitor potential colour change on the rock art (Markley et al 2015). In 2016, an unpublished paper by Black and Diffey concluded, contrary to CSIRO analysis at the time, that colour change was detected but that "a cause for the colour changes cannot be properly determined" and "the colour changes at the southern [non-control] sites are not readily explained by the concentrations of NOx and SOx compounds in the air."

These criticisms of the statistical methods used by CSIRO prompted the Department of Environment Regulation to commission Data Analysis Australia (DAA) to review the CSIRO research. The DAA report found that "superficially our analyses and those of Black and Diffey suggest that some changes may have taken place, but… we have substantial doubts about the reliability of the data and hence any conclusions drawn" and, in relation to the conclusions of Black and Diffey, "it would not be appropriate for the Draft paper to be published in its current form – the findings are based on highly doubtful data rendering any discussion of statistical significance moot" (DAA, 2016). The final CSIRO report includes a reassessment using more robust methods informed by the DAA report. The result of this analysis was "not fully conclusive" (Duffey et al 2017).

In 2016, the BRATWG commissioned an extreme condition weathering study to investigate the effects of different concentrations of acids on weathered rock surfaces. This study found that the dissolution of chemicals began at lower pH levels than previously estimated (pH 3 for aluminium, manganese and iron), but was recognised as a preliminary study and did not provide definitive results (Ramanaidou et al 2017). These results cannot be relied on as a meaningful threshold for determining whether rock art is being impacted by emissions.

Since the 2016 BRATWG extreme weathering study, several additional papers have been produced, including:

- Black et al 2017a provides a review of the conclusions of earlier studies into emissions impacts by the CSIRO, specifically those undertaken with regards to the fumigation of rock samples with acid gasses, emersion of iron-rich rocks in acids, air pollution modelling and colour change. This review concluded that a number of errors and inaccuracies prevent any

meaningful conclusion being drawn from the CSIRO data. This review did not demonstrate impacts to rock art from industrial emissions.

- Black et al 2017b provides a theoretical evaluation of MacLeod 2005 research. It provides no data that links industrial air emissions or subsequent deposition to changes in pH on Murujuga rock surfaces. There are practical limitations that prevent the MacLeod data from being adapted to the paper's purpose, including variation in sample dilution and the arbitrary exclusion of data.
- Black et al 2018 speculates the existence of several possible impact pathways, including acidification of rain and promotion of microbial activity. The paper recognises, however, that "there is no proof yet that the patina on Murujuga rocks is dissolving" and asserts that "there has not been credible research to determine" whether rock art is being degraded. In drawing conclusions regarding changes in acidity this paper assumes, without evidence, that geological samples which have been subject to decades of preservation in a museum are representative of the natural pH of Murujuga's rocks. The key conclusions of this paper are that further, more robust research is required, and that the precautionary principle should be applied in the interim.
- Gleeson et al 2018 primarily discusses microbial organisms that may be responsible for the formation of rock varnish. The paper briefly speculates on the possible impacts of industrial emissions but does not purport to provide evidence of impacts to Murujuga's rock art.
- In 2019 the Department of Water and Environmental Regulation (DWER) produced the Murujuga Rock Art Strategy, which built on the research to that date, and according to DWER will establish a world's best practice program to monitor, evaluate and report on factors that could affect the condition of rock art. This will be undertaken in consultation with a team of national and international experts in relevant disciplines and funded by industry including from Woodside. Research by this program is led independently by MAC and DWER working with leading research groups.
- CBG Solutions 2020 repurposes previous pH records from 2003 and 2004 (as a baseline) and data collected between 2017 and 2019 to assess changes in acidity on rock surfaces. The report repurposes historical and inconsistent pH data and acknowledges a number of resulting statistical issues which "makes determination of long-term pH changes problematic." The report states that "there appears to be no detrimental (acidification) impact that can be statistically supported regarding proximity to either the NW Gas plant or to the Pluto plant" and "owing to the many variables that determine the surface pH of the Burrup rocks and the significant impact of periodic cyclonic heavy rain and the lack of historic data on all the tested sites, it is not possible to claim that there is sufficient evidence for the statement that there is a continuing increase in acidity across Murujuga since measurements commenced in 2003."
- Dorn 2020 discusses competing theories of desert varnish growth and how chemical changes to desert varnish result from human sources, such as lead concentration following the addition of lead to petrol. The chapter predominantly focusses on North America, but uncritically restates the conclusions of Black et al 2017b. Only one other example in the paper, regarding an apparent change in varnish texture from near Los Angeles, appears to have even tangential relevance to industry on Murujuga. Acid fog is proposed as one *possible* cause, but this suggestion is not supported by any provided data and is based on examinations from an area with significantly higher acid gas concentration than Murujuga experiences.
- MacLeod 2020 provided results of a study commissioned by Yara Pilbara Nitrates. This report observes a variability of the relationship between colour difference and pH, with colour difference diminishing with increasing pH at some points, and diminishing with decreasing pH at other points although the final sentence of the report claims "there is unequivocal evidence that the changes in colour contrast are affected by the changes in the

mean and in the minimum pH observed on the rock art sites at the reference positions." At several points this report notes that rainfall events—particularly cyclonic events—appear to substantially reduce the acidity. The executive summary states that "there is a clear link between the minimum pH and the amount of sulphate on the rock surfaces, *which indicates some of the sulphate comes from anthropogenic sources*" (emphasis added) though the report does not articulate how a link between pH and sulphate contributes to an understanding of sulphate origin. MacLeod (2020) comments in relation to the two sites that are closest to Pluto LNG Plant and Karratha Gas Plant that the observed low sulphate concentrations "strongly supports that these exhaust sources are not resulting in any significant SOx deposition on the rock surfaces."

- MacLeod 2021 provides an update to this previous work which found that pH had increased during the study period but pH changes were affected by microclimate at each site including seasonal variations, microbial activity, and localised rainfall events. Any relationship between anthropogenic NOx and SOx emissions and acidity was not established and "just as the mechanisms of adsorption of NOx and SOx onto the moistened rock surfaces are yet to be unequivocally established, the presence of a direct relationship between the concentration of sulphate in the wash solutions with the underlying acidity can be regarded as a de-facto correlation." Once again the report states that "there is unequivocal evidence that the changes in colour contrast are affected by the changes in the mean and in the minimum pH observed on the rock art sites at the reference positions."
- Also in 2021, MacLeod and Fish (2021) published results of the studies commissioned by Yara Pilbara Nitrates, including that "there is presently no adverse impact on the rock engravings from industrial pollution owing to a lower NOx level than when the studies commenced 14 years ago". This conclusion was critiqued by Smith et al 2022a, who correctly noted that this conclusion is based on limited data and makes a number of key assumptions without adequate peer-reviewed research.
- Gagan et al 2022 is an investigation of anthropogenic air-borne sulphur on rock art on limestone in Sulawesi, Indonesia. This is not comparable to the Murujuga petroglyphs as the Murujuga petroglyphs are not on a limestone substrate. The research notes that "the bulk of the damage was present before 1950 CE" for example due to biomass burning ~3,500 years ago; current threats include "vandalism and sulphur emissions from diesel-powered traffic and cement-based infrastructure"; and that "the rate of rock art loss may be on the decline."
- Smith et al 2022a is a review of the Fish and McLeod report; the review does not contain original research and therefore does not further the existing scientific understanding of the subject. Claims that Smith et al 2022a demonstrate that emissions from industry are impacting rock art are incorrect.
- Smith et al 2022b does provide evidence of impacts to rock art and attributes these to three sources: mechanical removal and damage, chemicals emitted by industry, and an increased unsympathetic human presence in the landscape – examples provided include "rock scratching from off-road vehicles and graffiti, broken rocks from inappropriate trampling… rock splitting and discolouration from non-traditional burning practices". Evidence of the first and third of these is apparent and easily demonstrated from the photographic record, yet the paper itself notes that the use of photographic records to assess chemical impacts through colour change are subject to considerable errors including distortion and degradation of early photographs, variable lighting conditions and other factors. The researchers do note that several petroglyphs (numbered 2, 5, 6, 9, 16, 17, 21, 22 and 24) appear to have lightened over time in line with a hypothesis that emissions have played a role in this, while one petroglyph (1) appears to have darkened and at least 13 do not demonstrate any change, including several in close proximity to

industry. The paper appropriately notes that further research is required to determine the causes of these perceived changes.

- Neumann et al 2022 is an important proof-of-concept for analytical techniques, but is clear in its conclusion that:

Although our data clearly demonstrate that acidic rain has measurable effects on the varnish surface, including its colour and increased dissolution of Fe and Mn compounds, it should be stressed here that this does not necessarily mean that natural weathering of the petroglyphs is accelerated by anthropogenic pollution.

- Ruffolo et al 2023 review the formation of "black crusts", accumulation of materials on the surface of stone buildings, in highly polluted urban environments, and intervention strategies to mitigate damage to built heritage from black crusts. The study notes "the research outcomes have established some correlations between black crusts and the surrounding air pollution, leading to them being considered as a "record" and also a "passive sampler" of past pollution patterns. However, in this case, there is not yet a well-defined procedure to obtain accurate and unambiguous information." This paper does not provide new science applicable to the Murujuga petroglyphs due to its focus on built heritage and urban pollution.
- In December 2023 the first interim report of MRAMP was published. An accompanying summary report notes that "data collected in the first year of observation do not permit any firm conclusions to be drawn about trends in rock surface condition and any relationship to air quality over time." However, several techniques were considered promising for future analysis, including spectral measurement of rock art condition, geological studies and mineralogical studies. Though requiring more data to draw any conclusions, the report and summary both note that the correlation observed between acid-producing emissions and pH were the inverse of predictions if these gasses were causing acidification of rock surfaces (that is, higher concentrations of these gasses were associated with *less* acidic rock surfaces). These results are not definitive and recognise that further work by MRAMP is required. Final results by MRAMP are scheduled for publication in December 2025 with interim Environmental Quality Criteria anticipated to be published in the preceding years. This will provide the relevant data to guide management and protection of the rock art for industry on Murujuga.
- Smith 2024 provides the results of laboratory studies on Murujuga rock samples. The methodology for these experiments is not provided. The reported results are that particles of weathering rind begin to detach from the rock samples when the pH of rocks reach 6 or lower—significantly higher than, for example, the level suggested in Ramanaidou et al 2017. This report also reinterprets results from the MRAMP program (although excluding results from the first campaign of this work from consideration). This reinterpretation requires cautious consideration, noting the MRAMP interim report's caveats that the available data is insufficient for drawing meaningful conclusions. The conclusions of Smith 2024 state that "the rock surfaces of Murujuga have become increasingly acidic *due to the nitric and sulphuric dusts emitted by industry in the area.*" (emphasis added). This causal link is not supported in the report by reference to any other study, and as the report does not provide a clearly stated methodology it is unclear that this is supported by the laboratory work performed. A correlation may, perhaps, be implied by reference to historic trends reported in reports discussed elsewhere in this section, which have noted methodological issues. Smith 2024 also fails to address, in its reinterpretation of MRAMP data, the preliminary observation that higher levels of acid-producing emissions were found to correlate with less acidic rock surfaces.
- The MRAMP is a "best practice monitoring and analysis program" which "will provide reliable information on changes and trends in the condition of the rock art and whether the rock art is showing signs of accelerated change" (Government of Western Australia 2024).

As a basic principle of managing First Nations cultural heritage, as reflected in Woodside's First Nations Communities Policy, the involvement of MAC as representatives of Traditional Custodians in this project is also important so that the broader values of Murujuga are appropriately managed. Further results from the MRAMP are expected periodically until its conclusion in 2025, and relevant findings as applicable to the Pluto PAA will be managed through Woodside's Management of Change process.

4.9.6 Historic Sites of Significance

Historic sites of significance and heritage value are found along adjacent foreshores of the NWMR. Heritage places are protected in Western Australia under the Heritage Act 2018.

There are no known sites of Historic cultural heritage significance within the PAA.

4.9.7 Historic 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 there are no sites within the PAA; however, a number of shipwrecks exist within the EMBA and detailed in the Master Existing Environment (Woodside, 2022).

Table 4-20: Historic shipwrecks within 100 km of the PAA

Shipwreck	Distance from PAA to Shipwreck (km)
Curlew	<1
Marietta	<1
Wild Wave (China)	<1
Vianen	<1
McDermott Derrick Barge No 20	14
Zelma	17
Tanami	28
Trial	28
HMS Plym	36
Tropic Queen	41
Parks Lugger	45

4.9.8 World, National and Commonwealth Heritage Listed Places

No World, National or Commonwealth heritage listed places overlap the PAA. World, National and Commonwealth heritage places within the EMBA are identified in Table 4-21. The Master Existing Environment (Woodside, 2022) outlines the values and sensitivities of these places.

Table 4-21: World, National and Commonwealth Heritage Listed places within the EMBA

Listed Place	Distance and Direction from PAA to Listed Place (km)
World Heritage Places	
The Ningaloo Coast	208 south-west (Facility and Xena-03 Operational Areas)
National Heritage Places	
The Ningaloo Coast	194 south-west (Facility and Xena-03 Operational Areas)
Dampier Archipelago	9 km south-east (Export Pipeline Operational Area)

4.10 Socio-Economic Environment

4.10.1 Commercial Fisheries

Five Commonwealth and eighteen State fishery management areas are located within the PAA and EMBA. For additional detail, the PAA is presented here in two parts; the Export Pipeline Operational Area and the combined Facility and Xena-03 Drilling Operational Areas.

The Annual Fishery Status Reports published by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) were used to identify whether Commonwealth-managed fisheries were active within the PAA and EMBA in the last five years. FishCube data were also requested from the WA Department of Primary Industries and Regional Development (DPIRD) for the most recently available 5-year period for each fishery (2019-2023). Data obtained from the catch and effort system (CAES) was analysed to assess the potential for fisheries interaction with the PAA and Petroleum Activities Program. Data was reviewed from the last 5 years as a subset of past fishing effort. This was deemed an appropriate period to represent potential future fishing effort over the lifecycle of this EP (5 years from NOPSEMA acceptance). In addition, any impacts to fish are expected to be temporary in nature (See Section 6) and therefore not extend beyond the life of the EP.

This information was used to determine relevant fisheries for consultation who may be impacted by the proposed petroleum activities Table 4-22 provides an assessment of the potential interaction and the Master Existing Environment (Woodside, 2022) provides further detail on the fisheries that have been identified through desk-based assessment and consultation (Section 5). One Commonwealth managed, and ten (10) State managed fisheries were identified as having a potential interaction with the Petroleum Activities Program, within the PAA (Figure 4-14).

Table 4-22: Commonwealth and State commercial fisheries management areas overlapping the PAA and EMBA and potential for interaction during the Petroleum Activities Program.

Fishery	PAA/EMBA			Description
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program ✗ no spatial overlap ✓ spatial overlap Blue shading possibility for interaction with the PAA
Commonwealth Managed Fisheries				
North West Slope Trawl Fishery	✓	✗	✓	The North West Slope Trawl Fishery management area overlaps the Facility and Xena-03 Operational Area and the EMBA. The fishery operates off north-western Australia from 114oE to 125 oE roughly between the 200 m isobath and the outer boundary of the Australian Fishing Zone (Keller and Curtotti, 2023). Fishing effort commenced in 1985 with vessel numbers between 1 and 6 vessels per year since 2005-2006 (Keller and Curtotti, 2023). Three vessels operated in the 2021-2022 season, decreasing from 4 in 2020-2021 season (Keller and Curtotti, 2023). Woodside considers it a possibility that interactions with the fishery may occur in the Facility and Xena-03 Operational Area and the EMBA.

Fishery	PAA/EMBA			Description
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program ✗ no spatial overlap ✓ spatial overlap Blue shading possibility for interaction with the PAA
Southern Bluefin Tuna Fishery	✓	✓	✓	The Southern Bluefin Tuna Fishery management area overlaps the PAA and the EMBA. The Southern Bluefin Tuna Fishery spans the Australian Fishing Zone, however since 1992, the majority of Australian catch has concentrated in south-eastern Australia (Patterson and Dylewski, 2023a). Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Western Deepwater Trawl Fishery	✗	✗	✓	The Western Deepwater Trawl management area overlaps the EMBA. The fishery operates off the coast between the western boundary off the Southern and Eastern Scalefish and Shark Fishery in the south, and the western boundary of the North West Slope Trawl Fishery in the north (Kell et al., 2023). Fishing effort has been relatively low since 2005-2006, with 1 to 3 vessels active in the fishery since 2004-2005, and 2 active vessels recorded in 2021-2022 (Keller et al., 2023). Woodside considers it a possibility that interactions with the fishery may occur in the EMBA.
Western Tuna and Billfish Fishery	✓	✓	✓	The Western Tuna and Billfish Fishery management area overlaps the PAA and the EMBA. However, the majority of Australian catch has concentrated off south-west Western Australia with occasional activity off South Australia (Patterson et al., 2023). Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Western Skipjack Tuna Fishery	✓	✓	✓	The Western Skipjack Tuna Fishery management area overlaps the PAA and the EMBA. The Western Skipjack Tuna Fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. The Fishery is currently not active, and no fishing has occurred since 2009 (Patterson and Dylewski, 2023b).
State Managed Fisheries				

Fishery	PAA/EMBA			Description
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program ✗ no spatial overlap ✓ spatial overlap Blue shading possibility for interaction with the PAA
Exmouth Gulf Prawn Managed Fishery	✗	✗	✓	The Exmouth Gulf Prawn Fishery is a prawn trawl fishery operating in Exmouth Gulf. Target species generally < 50 m water depth. Fishing effort has been stable in the last 5 years with 6 vessels active during the 2020-2021 and 2021-2022 season (Wilkin et al., 2023a). The fishery management area overlaps with the EMBA. The fishery is limited to the spatial extent within the Exmouth Gulf and Muiron Islands. Woodside considers there to be a potential for interaction with this fishery in the EMBA.
Hermit Crab Fishery	✗	✓	✓	The Hermit Crab Fishery management area overlaps the Export Pipeline Operational Area and the EMBA. The Land Hermit Crab Fishery is a shoreline fishery active North of Exmouth, with crabs taken onshore at night by hand. The fishery is active within the Export Pipeline Operational Area, with 60 NM CAES blocks only (DPIRD, 2023) with 2 licences active during the 2021-2022 fishing season (Newman et al., 2023). The activity is likely to occur predominantly in coastal waters outside of the Export Pipeline Operational Area. Woodside considers it a possibility that interactions with the fishery may occur in the Export Pipeline Operational Area and the EMBA.
Mackerel Managed Fishery	✓	✓	✓	The Mackerel Managed Fishery management area(Area 2) overlaps the PAA and the EMBA (Area 2 and 3). The fishery is active within the Facility and Xena-03 Operational Areas, and the Export Pipeline Operational Area. FishCube data for the Mackerel Managed Fishery reported less than 3 vessels active during the 2020-2021 season under 10 NM, and up to 6 vessels active over the last 5 years under 60 NM CAES blocks (DPIRD, 2023). The fishery is managed through designated Areas, and extends from coastal waters to the EEZ, in waters northwards of Cape Leeuwin to the NT border. Nominal catch rates in Area 2 (Pilbara) have been generally decreasing since 2004 (Lewis and Watt, 2023). Woodside considers it a possibility that interactions with the fishery may occur within the PAA and the EMBA.

Fishery	PAA/EMBA			Description		
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program		
				✖ no spatial overlap	✓ spatial overlap	Blue shading possibility for interaction with the PAA
Marine Aquarium Managed Fishery	✓	✓	✓			The Marine Aquarium Managed Fishery management area overlaps the PAA and the EMBA. The Marine Aquarium Fishery is a diver-based fishery and therefore typically restricted to relatively shallow waters. FishCube data for the fishery from within the EMBA is provided at 10 NM and 60 NM CAES blocks reporting a maximum of 4 licences under 10 NM and 7 licences active under 60 NM across the 2017-2023 seasons (DPIRD, 2023). Woodside considers it a possibility that interactions with the fishery may occur within the Export Trunkline Operations Area and the EMBA.
Nickol Bay Prawn Managed Fishery	✖	✖	✓			The Nickol Bay Prawn Managed Fishery management area overlaps the EMBA. The fishery is active in State waters and the EMBA with fishing effort at 10 NM CAES blocks recording 3 vessels active during the 2021-2022 fishing season, a decrease from 8 vessels in 2021-2022 (Wilkin et al., 2023b). Woodside considers it a possibility that interactions with this fishery may occur within the EMBA.
Onslow Prawn Managed Fishery	✓	✓	✓			The Onslow Prawn Managed Fishery management area overlaps the PAA and the EMBA. The fishery is active within the Export Pipeline Operational Area and EMBA with 60 NM CAES blocks reporting less than 3 vessels active during the 2021-2022 season (DPIRD, 2023). Woodside considers it a possibility that interactions with the fishery may occur in the Export Pipeline Operational Area and EMBA.

Fishery	PAA/EMBA			Description
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program ✖ no spatial overlap ✓ spatial overlap Blue shading possibility for interaction with the PAA
Pearl Oyster Managed Fishery (Zone 1 and 2)	✓	✓	✓	The Pearl Oyster Managed Fishery management area overlaps the PAA and the EMBA. Fishing effort is mostly focused within coastal waters (10-15 m depth) with a maximum depth of 35 m (Lulofs et al., 2002), collecting wild oysters for use in the aquaculture production of pearls. These are collected from fishing grounds primarily off the coast of Eighty Mile Beach with smaller catches from the Lacepede Islands. Woodside considers there to be no potential for interaction with this fishery and the Petroleum Activities Program.
Pilbara Line Fishery (Condition)	✓	✓	✓	The Pilbara Line Fishery (Condition) licensees are permitted to operate anywhere within Pilbara waters (Wakefield et al., 2023), overlapping the PAA and the EMBA. The fishery is active in the PAA and the EMBA, with 60 NM CAES blocks reporting up to 5 vessels active across the 2017-2023 seasons (DPIRD, 2023). Fishing effort has decreased form 7 vessels activin in 2020-2021 to 6 vessels active in 2021-2022 (Wakefield, et al., 2023).
Pilbara Crab Managed Fishery	✓	✓	✓	The Pilbara Crab Managed Fishery management area overlaps the PAA and the EMBA. The fishery operates via trap-based fishery methods up to 50 m and is concentrated around Dampier. The fishery is active in the Export Pipeline Operational Area and the EMBA, with 60 NM CAES blocks reporting less than 3 vessels active across the 2017-2023 seasons (DPIRD, 2023). Fishing effort has remained stable from 2020-2022 with 2 vessels active within the EMBA (Johnston et al., 2023). Woodside considers it a possibility that interactions with the fishery may occur within the Export Pipeline Operational Area and the EMBA.

Fishery	PAA/EMBA			Description
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program ✖ no spatial overlap ✓ spatial overlap Blue shading possibility for interaction with the PAA
Pilbara Trap Managed Fishery	✓	✓	✓	The Pilbara Trap Managed Fishery management area overlaps the PAA and EMBA. The fishery is active within the Facility and Xena-03 Operational Areas, Export Pipeline Operational Area and the EMBA, with 60 MN CAES blocks reporting less than 3 vessels active across the 2017-2023 seasons (DPIRD, 2023). Fishing effort has increased from 7 active vessels during 2020-2021 to 8 vessels active in 2021-2022 (Wakefield et al., 2023). Woodside considers it a possibility that interactions with the fishery may occur within the PAA as well as the EMBA.
Pilbara Fish Trawl (Interim) Managed Fishery	✖	✓	✓	The Pilbara Fish Trawl (Interim) Managed Fishery management area (Area 1) overlaps the Export Pipeline Operational Area and the EMBA. The fishery is active within the Export Pipeline Operational Area and EMBA with four 10NM CAES blocks reporting up to four vessels across the 2017–2023 seasons (DPIRD, 2023). Fishing effort within the EMBA has been stable with 2 vessels active between 2018 and 2022 (Wakefield et al., 2023). Woodside considers it a possibility that interactions with the fishery may occur within the EMBA and the Export Pipeline Operational Area.
Specimen Shell Managed Fishery	✓	✓	✓	The Specimen Shell Managed Fishery management area overlaps the PAA and the EMBA. The fishery is active within the Export Pipeline Operational Area and the EMBA. FishCube data for the fishery is provided at 10 NM and 60 NM CAES blocks reporting less than 3 licences under 10 NM and up to 3 licences under 60 NM CAES blocks active across 2017-2023 seasons (DPIRD, 2023). The fishery is largely diver-based, targeting specimen shells in water depths mostly < 30 m. Given the depth of the Export Pipeline Operational Area at its shallowest, it is not likely to interact with the fishery. Woodside considers it a possibility that interactions with the fishery may occur in the Export Pipeline Operational Area and the EMBA.

Fishery	PAA/EMBA			Description
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program ✖ no spatial overlap ✓ spatial overlap Blue shading possibility for interaction with the PAA
West Coast Deep Sea Crustacean Managed Fishery	✓	✓	✓	The West Coast Deep Sea Crustacean Managed Fishery management area overlaps the PAA and the EMBA. The fishery is prohibited to fish landwards of the 150m isobath, restricting any potential interactions to activities within the Facility and Xena-03 Operational Area. Most of the commercial crab catch is taken in depth of 500 m – 800 m (WAFIC 2024). The fishery is active within the EMBA, with 5 vessels active during the 2021-2022 season (Tuffley, et al., 2023). Woodside considers it a possibility that interactions with the fishery may occur within the EMBA only.
Western Australian Sea Cucumber Fishery	✓	✓	✓	The Western Australian Sea Cucumber Fishery management area overlaps the PAA and the EMBA. The fishery is active within the EMBA, with 60 NM CAES blocks reporting less than 3 vessels active across 2017-2019 seasons. The fishery operates as a wader and diver-based fishery in the Kimberley region and therefore would typically be restricted to coastal waters outside of the Export Pipeline Operational Area. Woodside considers it a possibility that interactions with the fishery may occur in the Export Pipeline Operational Area and the EMBA.
South West Coast Salmon Managed Fishery	✓	✓	✓	The South West Coast Salmon Managed Fishery management area overlaps the PAA and EMBA. Historically, no fishing has occurred north of the Perth Metropolitan Area. Therefore, no effort is reported within the EMBA (Duffy et al., 2023) and Woodside considers there to be no potential for interaction with this fishery within the PAA and EMBA.

Fishery	PAA/EMBA			Description
	Facility and Xena-03 Operational Area	Export Pipeline Operational Area	EMBA	Potential for interaction during Petroleum Activity Program ✖ no spatial overlap ✓ spatial overlap Blue shading possibility for interaction with the PAA
Western Australian Abalone Managed Fishery	✓	✓	✓	The Abalone Fishery management area overlaps the PAA and the EMBA. The fishery operates in shallow coastal waters off the south-west and south coasts of WA (Strain et al., 2023). Given the fishery method (shore-based and hand caught) and water depths of the PAA there are no CAES blocks reporting fishing effort within the PAA. Woodside considers there to be no potential for interactions with the fishery within the EMBA or PAA.
West Coast Rock Lobster Managed Fishery	✖	✖	✓	The Western Rock Lobster Fishery management area overlaps the EMBA. The fishery mainly operates off the west coast of WA between Shark Bay and Cape Leeuwin (de Lestang and Walsh, 2023). There are no CAES block reporting fishing effort within the EMBA. Woodside considers there to be no potential for interactions with the fishery within the EMBA.
WA North Coast Shark Fishery	✓	✓	✓	The North Coast Shark Fishing area overlaps the PAA and the EMBA. The northern shark fisheries comprise of the North Coast Shark Fishery in the Pilbara and Western Kimberly (closed since 1998), and the Joint Authority of Northern Shark Fishery in the eastern Kimberly, which has not been active since 2008-2009 season (AFMA 2021). Woodside considers there to be no interaction with the fishery and the Petroleum Activities Program.
Charter based commercial operators				
Tour Operators	✓	✓	✓	Fishing Tour Operators are permitted to operate across WA state waters and are required to report monthly logbook records of client fish catches. The fishery is active within the Facility and Xena-03 Operational Areas and Export Pipeline Operational Area as well as the EMBA. FishCube data indicates fishing effort across the 10 NM and 60 NM CAES blocks overlap the PAA. Fishing effort at 10 NM scale has been consistent over the last 5 years reporting no more than 3 licence holders (DPIRD,

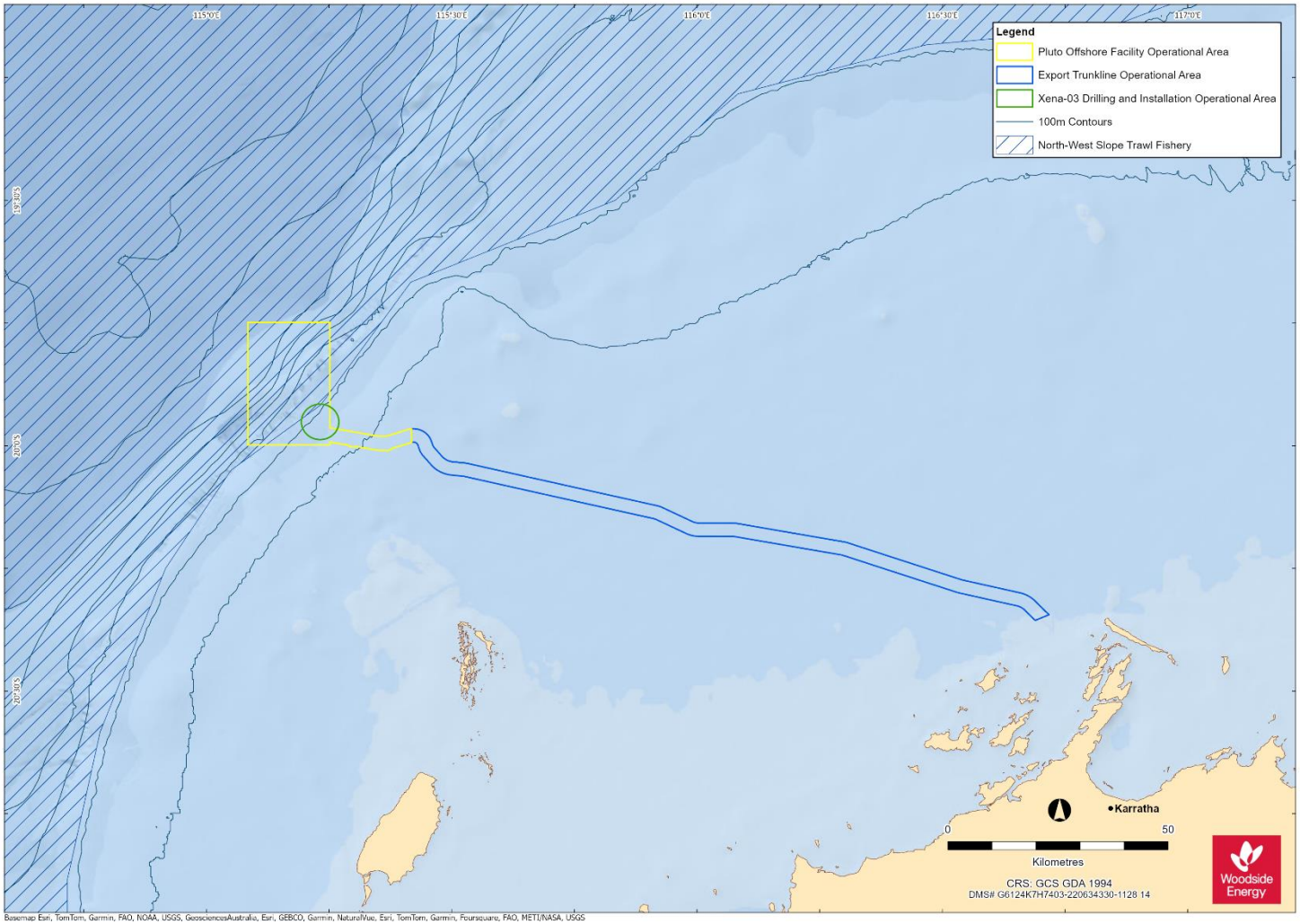

Figure 4-14: Commonwealth managed Commercial Fisheries overlapping the PAA with a potential for Interaction with the Petroleum Activities Program

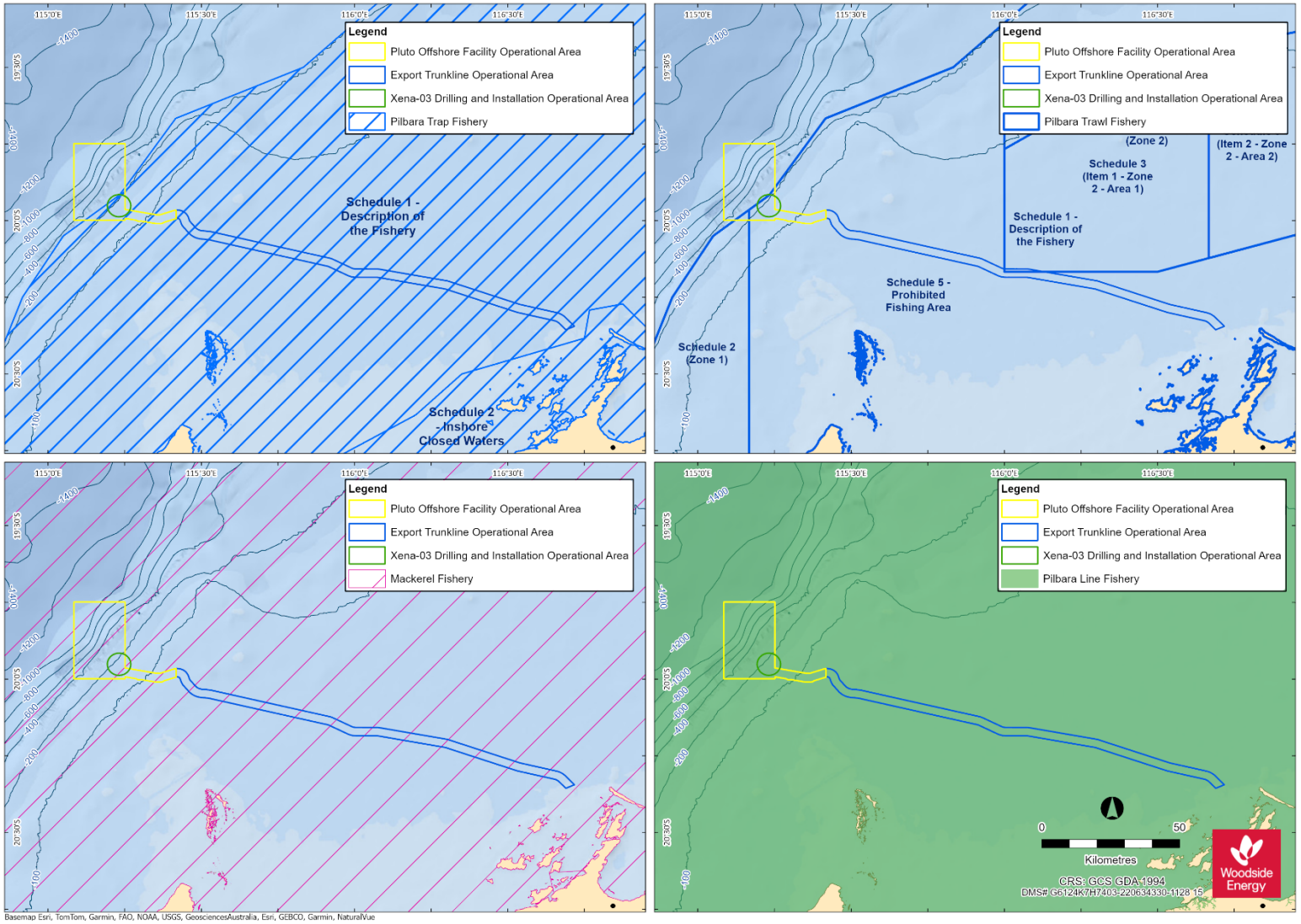

Figure 4-15: State managed (WA) Commercial Fisheries overlapping the PAA with a potential for Interaction with the Petroleum Activities Program

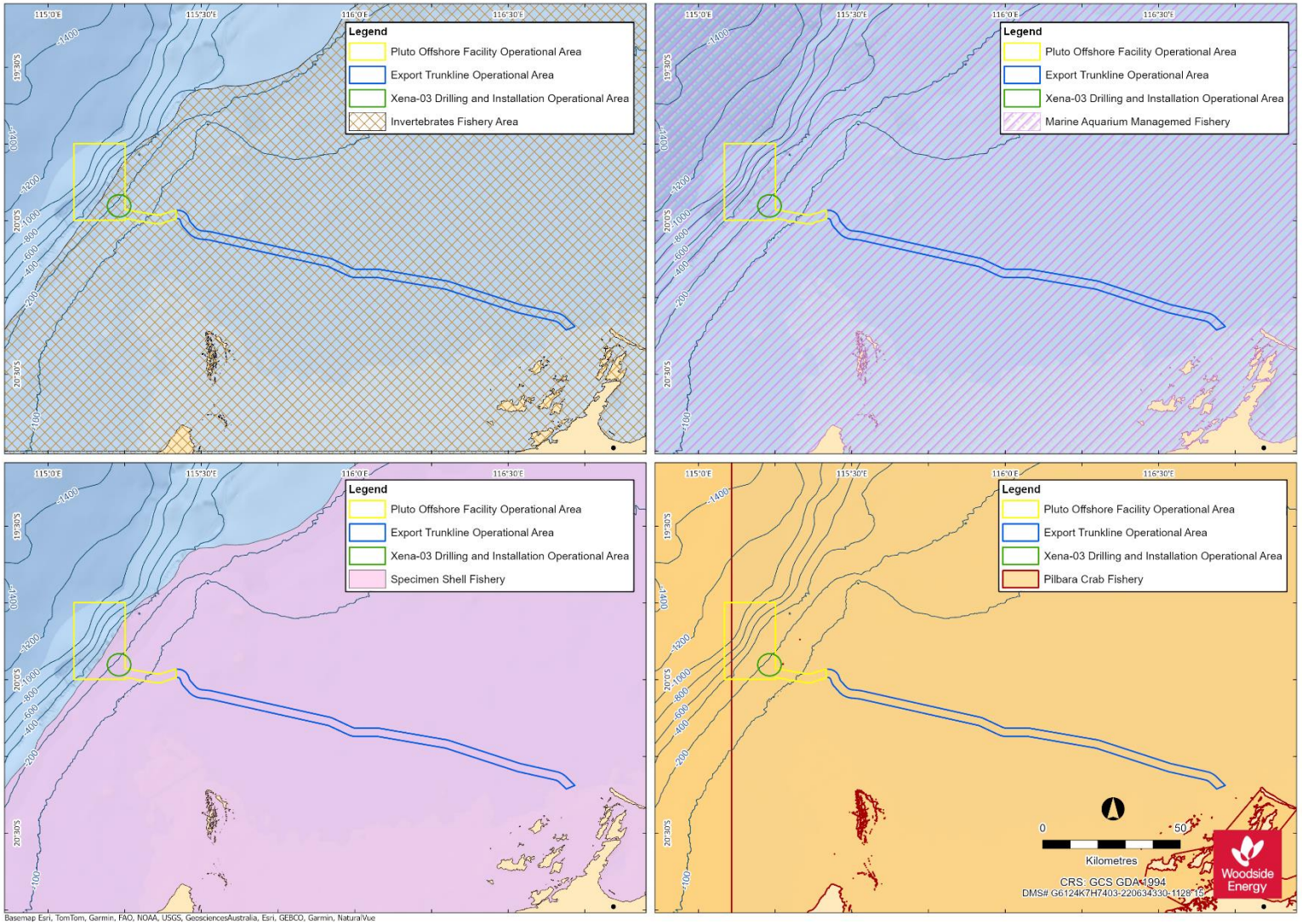

Figure 4-16: State managed (WA) Commercial Fisheries overlapping the PAA with a potential for Interaction with the Petroleum Activities Program

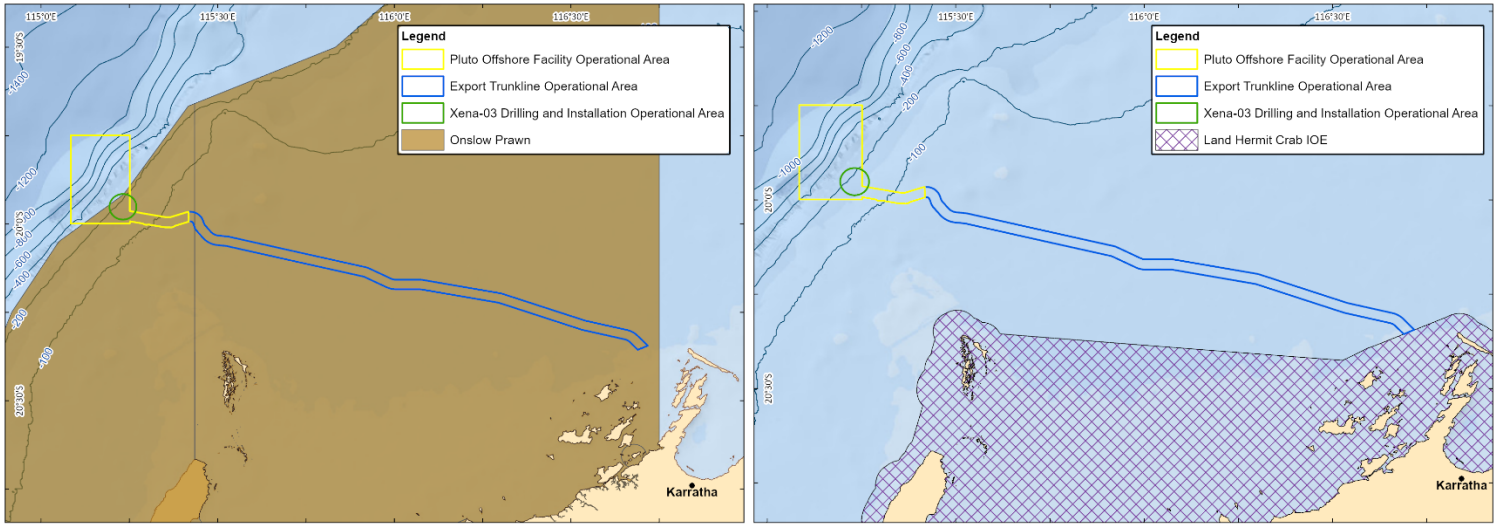

Figure 4-17: State managed (WA) Commercial Fisheries overlapping the PAA with a potential for Interaction with the Petroleum Activities Program

4.10.2 Traditional Fisheries

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

Further information on traditional fishing activity that is likely to occur in the EMBA is provided in the Master Existing Environment (Woodside, 2022).

4.10.3 Tourism and Recreation

The recreation and tourism industries in the Pilbara are of high social value with approximately 965,000 visitors over the last 5 years (Tourism Western Australia, 2023). Tourism continued to grow in 2022, with over 1 million visitors (Tourism Western Australia, 2023). Growth and the potential for further expansion in tourism and recreational activities are recognised for the Pilbara region, with the development of regional centres and a workforce associated with the resources sector (SGS Economics and Planning 2012).

The PAA is located offshore of the North West tourism region, which includes parts of the Gascoyne, Pilbara, and Kimberley region. Tourism is concentrated in the vicinity of population centres such as Broome, Dampier, Exmouth, Coral Bay, and Shark Bay. The population centre closest to the PAA is the town of Dampier (31 km from the Export Pipeline Operational Area and 157 km from the Facility and Xena-03 Operational Areas). No tourist activities take place specifically within the PAA.

The nearest tourism areas include the Montebello State Marine Park (25 km from the Export Pipeline Operational Area and 34 km from the Facility and Xena-03 Operational Areas), as well as the Montebello Marine Park, which is located in deeper offshore waters and overlaps the PAA. These tourism areas have some charter boat operators taking visitors to islands (Department of Environment and Conservation, 2007). Recreational fishing in the Pilbara and Gascoyne regions is mainly concentrated around the coastal waters and islands and has grown considerably with the expanding regional centres, seasonal tourism and increasing residential and fly in/fly out work force, particularly in the Pilbara region (Fletcher et al., 2017). Some recreational fishing has historically taken place at Rankin Bank (approximately 29 km north-east of the PAA at the closest point). However, due to the distance from access nodes, such as Dampier and Onslow (approximately 31 km south and 180 km southwest from the PAA at the closest point respectively) recreational fishing effort is expected to be restricted to relatively large vessels and hence is considered to be low.

4.10.4 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. Two fairways overlap the Export Pipeline Operational Area, and none overlap with the Facility and Xena-03 Operational Areas (Figure 4-188). Ports in the region are nodes of increased vessel activities. Active ports within the vicinity of the PAA include:

- Dampier (approximately 31 km south)
- Barrow Island (approximately 84 km south)
- Port Walcott (approximately 160 km south)
- Onslow (approximately 180 km south)

- Port Headland (approximately 207 km south-east)

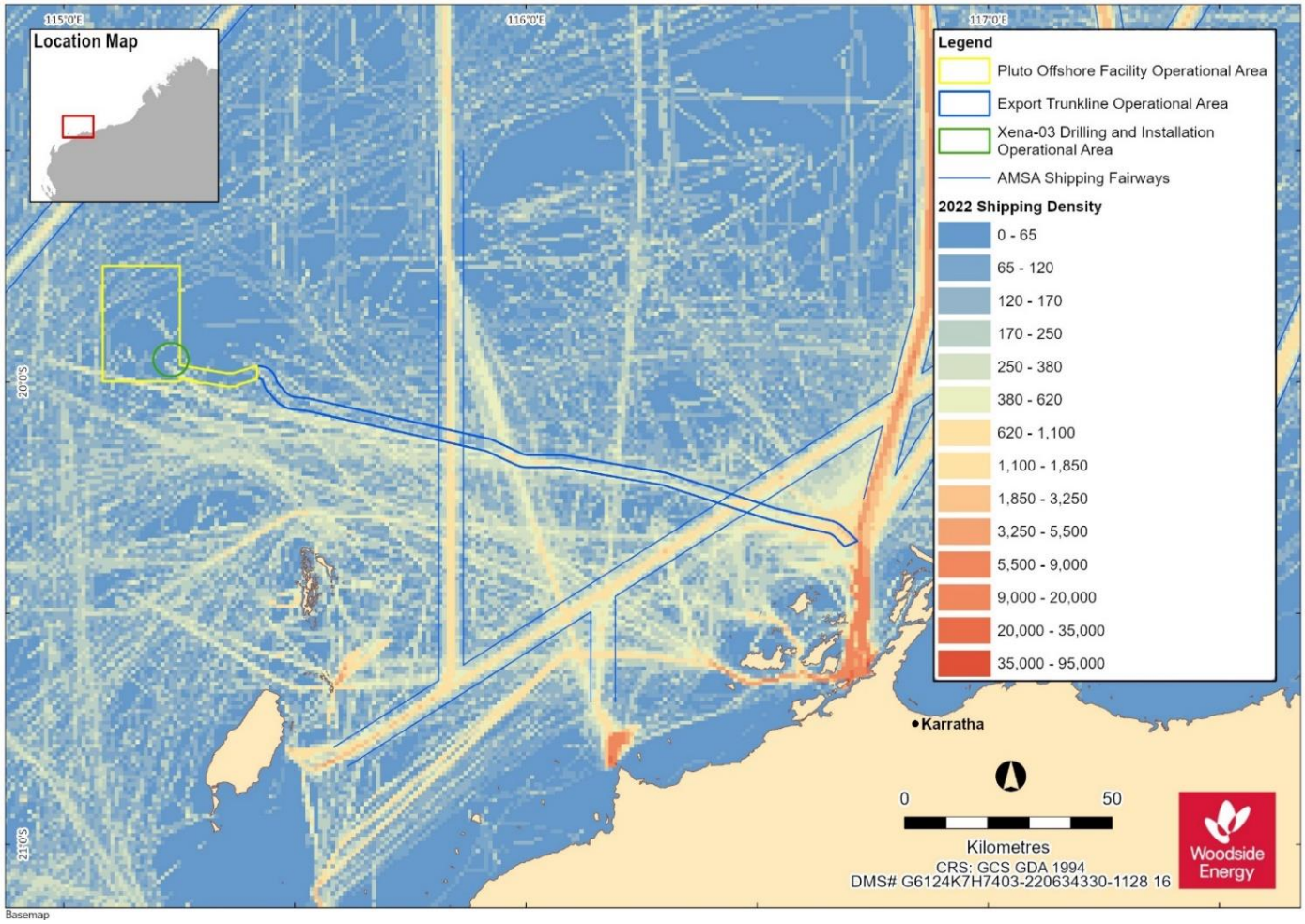

Figure 4-18: Vessel density map for the PAA, derived from AMSA satellite tracking system data (vessels include cargo, LNG tanker, passenger vessels, support vessels, and others/unnamed vessels

4.10.5 Oil and Gas

The PAA is located within an area of established oil and gas operations in the broader NWMR. Table 4-22 details the proximity of other oil and gas facilities within the region to the operational areas within the PAA. The Master Existing Environment (Woodside, 2022) describes current oil and gas development within the EMBA, also shown in Figure 4-199.

There are also facilities with intersecting subsea infrastructure including:

- Julimar Brunello production pipeline (Woodside)
- Wheatstone pipeline (Chevron)
- Reindeer offshore gas supply pipeline (Santos)
- Scarborough export trunkline (Woodside)

Table 4-22: Other Oil and Gas Facilities located within 70 km of the Facility and Xena-03 combined Operational Areas and the Export Pipeline Operational Area

Facility Name and Operator	Distance and direction from Facility and Xena-03 OA	Distance and direction from Export pipeline OA
Wheatstone platform (Chevron)	5 km north	5 km north
Angel platform (Woodside)	48 km north	48 km north
John Brookes (Santos)	50 km south	57 km south-west
Goodwyn Alpha platform (Woodside)	72 km north-east	51 km north
North Rankin Complex (Woodside)	86 km north-east	64 km north
Reindeer wellhead platform (Santos)	109 km east	12 km north
Stag A (Jadestone)	112 km south-east	8 km south
Wandoo B (VOGA)	123 km south-east	12 km south

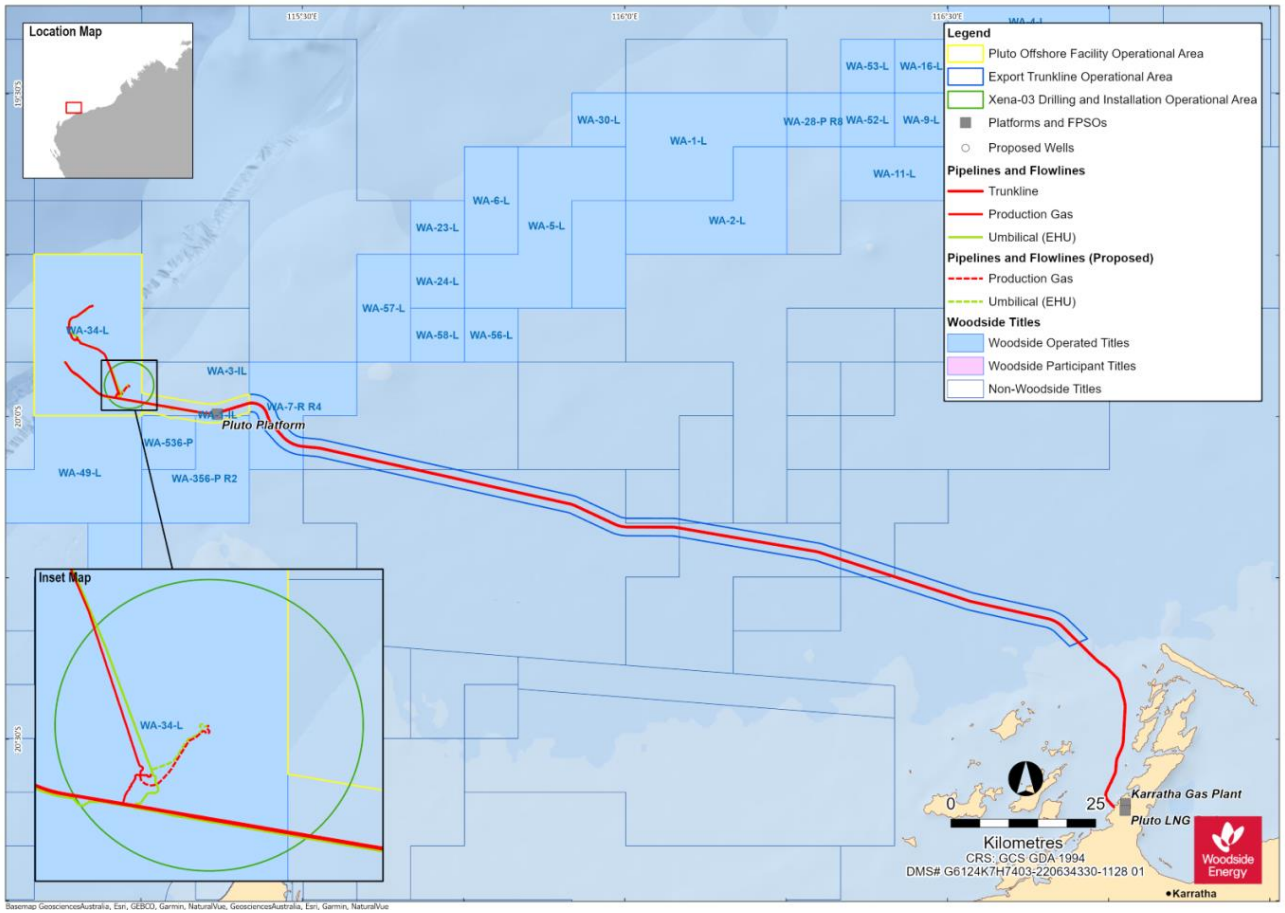

Figure 4-19: Oil and Gas Facilities located within the EMBA

4.10.6 Defence

Department of Defence (DoD) areas, facilities and UXOs near the PAA and within the EMBA are outlined in Table 4-23. There are no DoD areas overlapping the PAA. The Master Existing Environment (Woodside, 2022) describes key DoD areas and facilities.

Table 4-23: Defence areas, facilities and UXOs overlapping the Operational Area and/or EMBA.

Defence area/ facility	Presence	
	PAA	EMBA
UXO SDG096 Sea Dumping: Anchor Island. This site is an area used for the dumping at sea of ordnance and other items.		✓
Potential Depth Charge UXO DEP022: Northwest of Bessieres Island. This site was an area where Depth Charges were used in WWII and where some depth charges failed to function.		✓
Potential Depth Charge UXO DEP027: East of Montebello Islands. This site was an area where Depth Charges were used in WW2 and where some depth charges failed to function.		✓

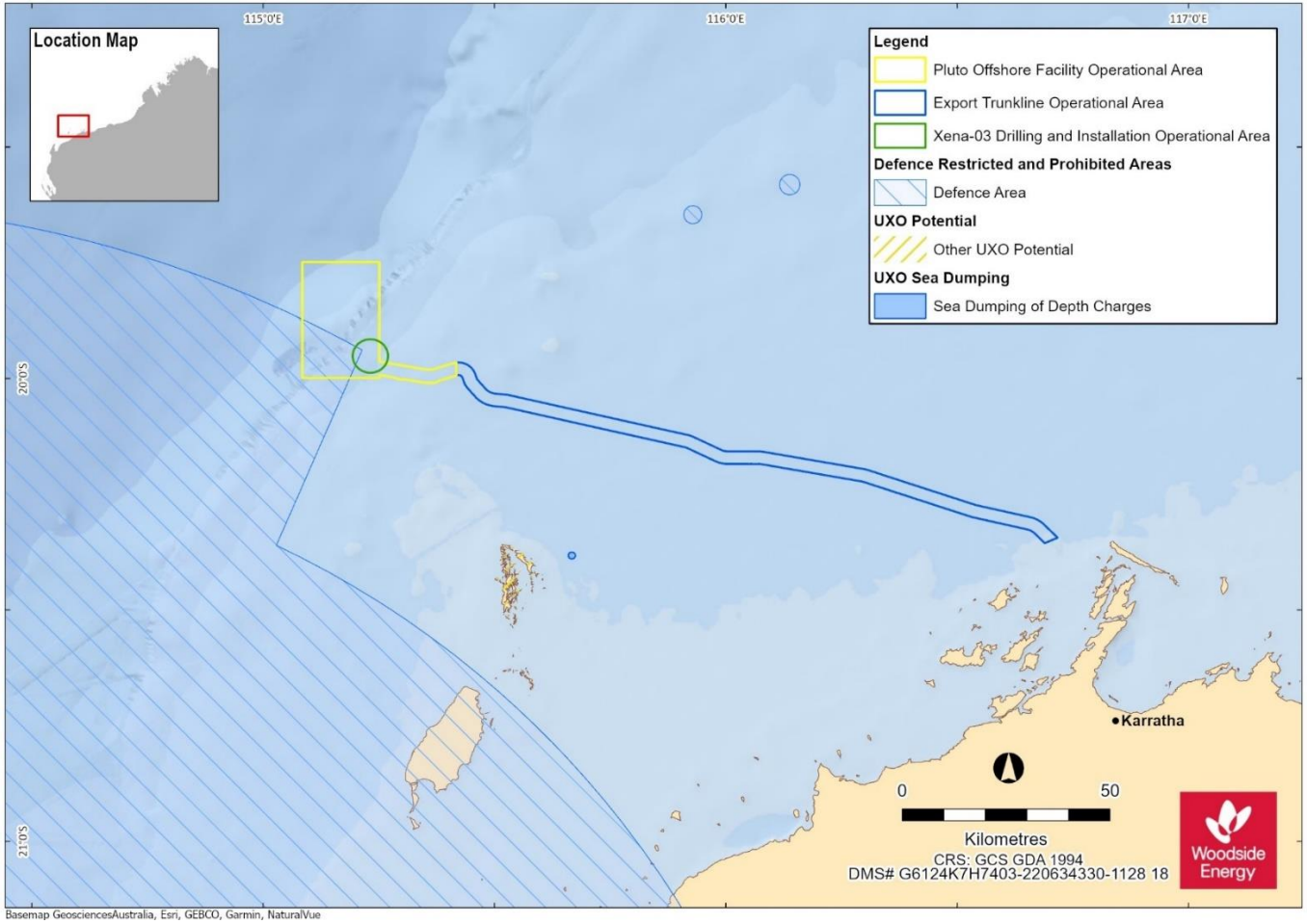

Figure 4-20: Defence areas relative to the PAA

5. CONSULTATION

5.1 Summary

Woodside consults relevant persons in the course of preparing an Environment Plan (EP) in accordance with regulation 25 of the Environment Regulations. (In this Section, references to 'regulations' are to regulations of the Environment Regulations, unless otherwise stated).

Consultation is designed to identify relevant persons and provide them with sufficient information and a reasonable period to allow them to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities. This enables Woodside to consider and assess claims or objections received from relevant persons and for Woodside to adopt appropriate measures in response to those objections or claims so that the activity is carried out in a manner by which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable (ALARP) and will be of an acceptable level.

Consultation is to be informed by both the Environment Regulations and the findings of relevant Courts, including the Full Federal Court in the Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 (Tipakalippa Appeal) (see Section 5.2 and 5.5.1) and Munkara v Santos NA Barossa Pty Ltd (No 3) [2024] FCA 9 (Munkara Case).

For this EP, Woodside has considered both the PAA and the broader EMBA in undertaking consultation (see further discussion in Section 5.2). The broadest extent of the EMBA has been determined by reference to the highly unlikely event of a hydrocarbon release resulting from the activities in the PAA (see Section 4).

Woodside's consultation methodology is divided into two parts:

- The first section (Section 5.2 to 5.5) provides an overview of Woodside's consultation methodology for its EPs, including how we apply regulation 25(1) to identify relevant persons.
- The second section (Section 5.6 to Section 5.7) details Woodside's approach to accepting feedback and assessment of the merit of each objection or claim, and engaging in ongoing consultation for this EP.

Woodside's consultation record is at Appendix F and includes a summary of the following:

- assessment and identification of relevant persons
- consultation information provided to relevant persons, feedback received, Woodside's assessment of the merits of objections or claims and Woodside's response to relevant persons and other stakeholders Woodside chose to consult
- engagement with persons or organisations that Woodside chose to contact who are not relevant persons for the purposes of regulation 25(1) (see Section 5.3.4)
- opportunities provided to persons or organisations to participate in consultation.

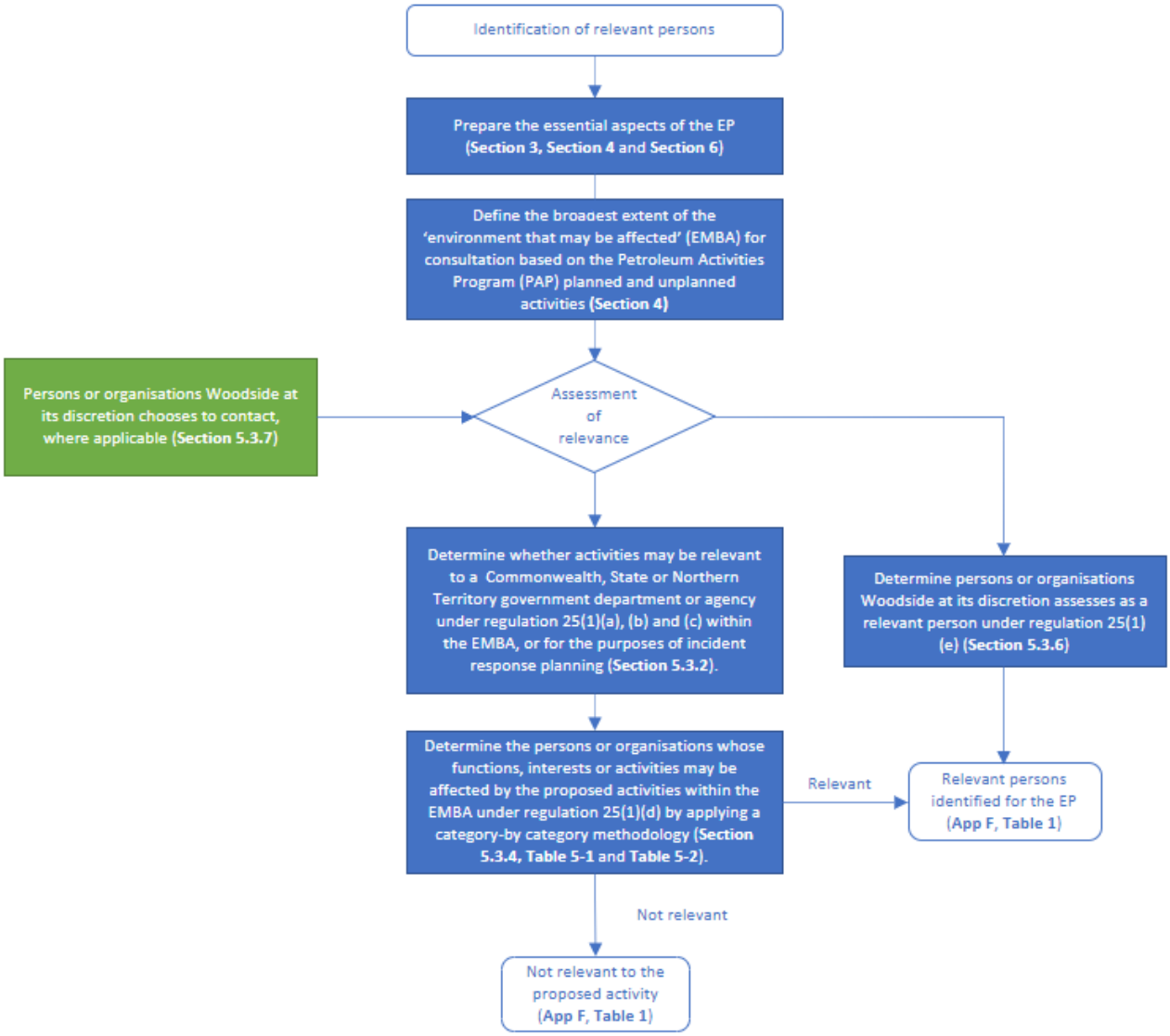

Figure 5-1: Overview of Woodside's methodology to identify relevant persons

5.2 Consultation – General Context

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

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

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

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

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

To undertake consultation, Woodside has developed a methodology for identifying relevant persons in accordance with regulation 25(1) (Section 5). This methodology is consistent with NOPSEMA's Guideline and demonstrates that, to meet the requirements of regulation 34 (criteria for EP acceptance) when preparing the EP, Woodside understands:

- our planned activities in the PAA, being the area in which our planned activities are proposed to occur (see Section 3.3.2)
- the geographical extent to which the environment may be affected (EMBA) by risks and impacts from our activities (unplanned) (identified in Section 4.1 and assessed in Section 6.8).

Woodside has undertaken consultation in the course of preparing this EP in compliance with regulation 25, which requires a titleholder to:

- consult with each of the following (a relevant person):
  - each Commonwealth, State or Northern Territory agency or authority to which the activities to be carried out under the EP may be relevant
  - if the plan relates to activities in the offshore area of a State – the Department of the responsible State Minister
  - if the plan relates to activities in the Principal Northern Territory offshore area – the Department of 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 EP
  - any other person or organisation that the titleholder considers relevant (regulation 25(1)).
- give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on their functions, interests or activities (regulation 25(2))
- allow a relevant person a reasonable period for the consultation (regulation 25(3))

- tell each relevant person that the titleholder consults with, that the relevant person may request that particular information it provides in the consultation not be published and any information subject to such a request is not to be published (regulation 25(4)).

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

- is consistent with the principles of ecologically sustainable development (ESDev) set out in section 3A of the EPBC Act – see Section 2
- is intended to reduce the environmental impacts and risks from the activity to ALARP and an acceptable level (regulation 4)
- is intended to minimise harm to the relevant person and the environment from the proposed petroleum activities and to enable Woodside to consider measures that may be taken to mitigate the potential adverse environmental impacts from the petroleum activity
- is collaborative. Woodside respects that, for a relevant person, consultation is voluntary. Where the relevant person seeks to engage, Woodside engages with the relevant person with the aim of seeking genuine and meaningful two-way dialogue
- provides opportunities for relevant persons to provide feedback throughout the life of the EP through its ongoing consultation process (refer to Section 5.7 and Section 7.8.2.1).

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

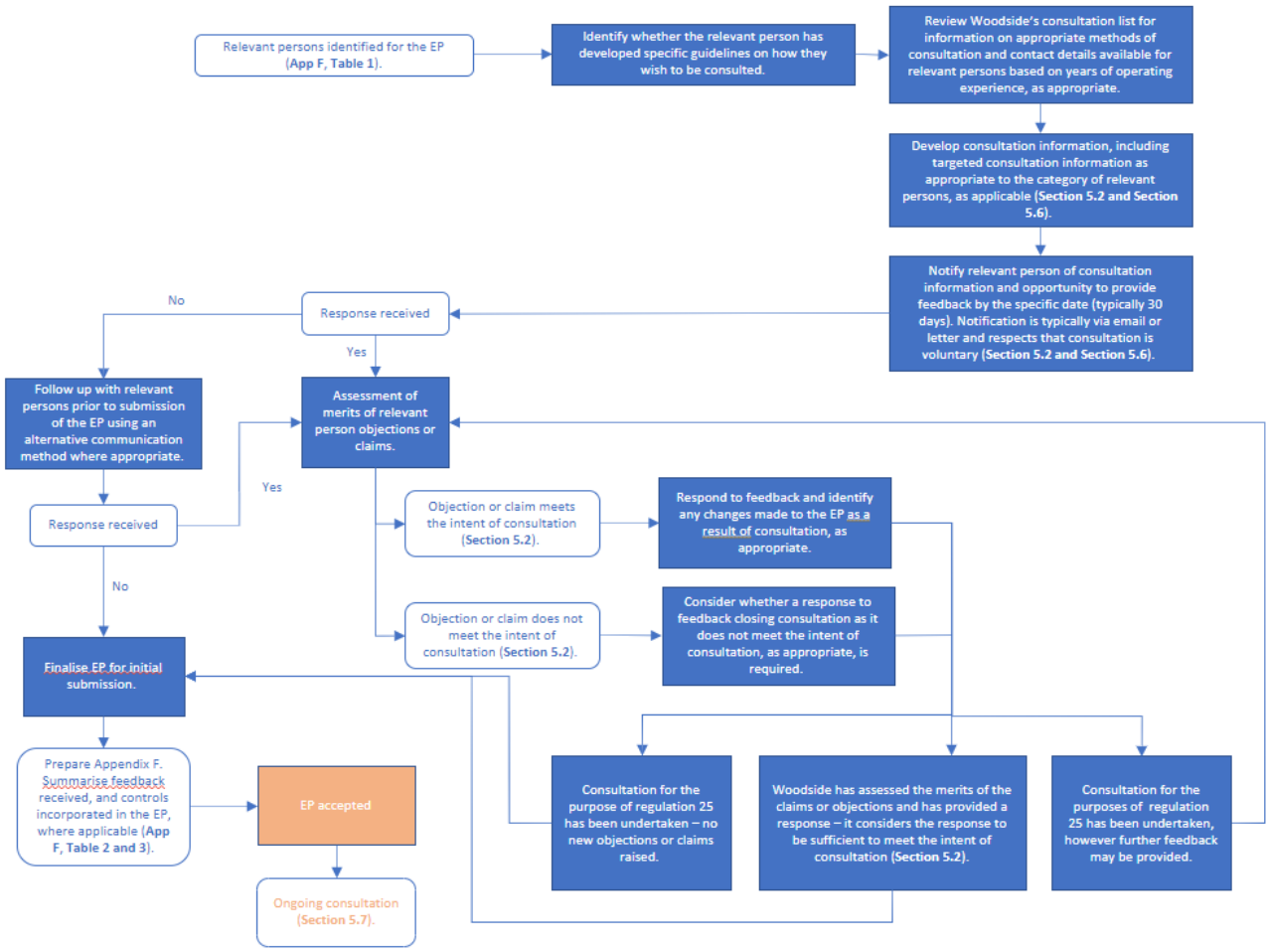

Figure 5-2: Overview of Woodside's consultation approach.

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

Federal Court:

- Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193
- Munkara v Santos NA Barossa Pty Ltd (No 3) [2024] FCA 9

NOPSEMA:

- GL2086 – Consultation in the course of preparing an environment plan – May 2023
- GN1847 – Responding to public comment on environment plans – January 2024
- GN1344 - Environment plan content requirements - September 2020
- GL1721 – Environment Plan decision making – January 2024
- GN1488 - Oil pollution risk management - July 2021
- GN1785 – Petroleum activities and Australian Marine Parks – January 2024
- GL 1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2024
- PL9028 Managing gender-restricted information – December 2023

- Consultation on offshore petroleum environment plans – Information for the community

Department of Climate Change, Energy, the Environment and Water (DCCEEW)

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

Australian Fisheries Management Authority (AFMA):

- Petroleum industry consultation with the commercial fishing industry

Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF):

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

WA Department of Primary Industries and Regional Development (DPIRD):

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

WA Department of Transport (DoT):

- Offshore Petroleum Industry Guidance Note

WA Australian Fishing Industry Council (WAFIC)

- Oil and Gas Consultation Framework

Good practice consultation:

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

5.3 Identification of Relevant Persons for Consultation

5.3.1 Regulations 25(1)(a), (b) and (c)

The relevant inquiry for determining relevant persons under regulations 25(1)(a) and (b) is whether the activities to be carried out under the EP may be relevant to one of the government departments or agencies in those regulations. The government departments and agencies relevant to the EP are listed in Appendix F, Table 1. In accordance with Regulation 25(1)(b), Woodside consults with the Department of the relevant State Minister.

5.3.2 Identification of Relevant Persons under Regulations 25(1)(a), (b) and (c)

Woodside's methodology for identifying relevant persons under regulations 25(1)(a), (b) and (c) is as follows:

- Woodside considers the defined responsibilities of each of the departments and agencies to which the activities to be carried out in the EMBA under the EP may be relevant. This list of relevant departments and agencies is formulated by reference to the responsibilities of the government departments, as set out on their websites, in NOPSEMA's GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area guideline (January 2024), which describes where the Department is a relevant agency under the Environment Regulations, as well as experience and knowledge that Woodside has gained from years of operating. This list is revised from time to time, for example, for the purposes of accommodating government restructures, renaming of departments, shifting portfolios and/or to account for new agencies that might arise.

Woodside has categorised government department or agency groups as follows:

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

- Woodside considers each of the responsibilities of the departments and agencies, determining whether those responsibilities overlap with potential risks and impacts specific to the PPA in the EMBA. The assessment is both activity and location based.
- Woodside acknowledges the roles and responsibilities of government departments and agencies acting on behalf of various industry participants. For example, AMSA – Marine Safety is responsible for the safety of vessels and the seafarers who are operating in the domestic commercial shipping industry; and AHO is responsible for maritime safety and Notices to Mariners. To undertake the PAP in a manner that prevents a substantially adverse effect on the potential displacement of marine users, Woodside therefore consults AMSA – Marine Safety and AHO on its proposed activities. Woodside considers each of the responsibilities of the departments and agencies and determines those that would either be involved in the incident response itself or in relation to the regulatory or decision-making capacity with respect to planning for the unlikely event of a worst-case hydrocarbon release incident response specific to the OA. Feedback received, if any, is assessed in accordance with the intended outcome of consultation.
- The list of government departments and agencies assessed as relevant is set out in Appendix F, Table 1.
- Feedback received, if any, is assessed in accordance with the intended outcome of consultation and summarised at Appendix F, Table 2 and Table 3 as appropriate to the relevance assessment.

Woodside does not consult with departments or agencies with interests that do not overlap with risks and impacts specific to the PPA in the EMBA or would not be involved in incident response planning.

5.3.3 Regulation 25(1)(d)

To identify a relevant person for the purposes of regulation 25(1)(d), the meaning of “functions, interests or activities” needs to be understood. In regulation 25(1)(d), the phrase “functions, interests or activities” should be construed broadly and consistently with the objects of the Environment Regulations (regulation 4) and the objects of the EPBC Act (section 3A).

In developing its methodology for consultation, Woodside acknowledges the guidance below from NOPSEMA’s GL2086 – Consultation in the course of preparing an environment plan guideline (May 2023):

Functions	Refers to a power or duty to do something.
Interests	Conforms to the accepted concept of ‘interest’ in other areas of public administrative law and includes any interest possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation.
Activities	Broader than the definition of ‘activity’ in regulation 5 of the Environment Regulations and is likely be directed to what the relevant person is already doing.

Woodside’s methodology for determining ‘relevant persons’ for the purpose of regulation 25(1)(d) includes consideration of:

- whether a person or organisation has functions interests or activities that overlap with the OA or PAA, and EMBA

- whether a person or organisation's functions, interests or activities may be affected by Woodside's proposed planned or unplanned activities.

5.3.4 Identification of Relevant Persons under Regulation 25(1)(d)

Relevant persons under regulation 25(1)(d) are defined as a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the EP. In identifying relevant persons, Woodside considers:

- the planned activities to be carried out under the EP (described in Section 3)
- the EMBA by unplanned activities (identified in Section 4 and assessed in Section 6).
- To identify relevant persons who fall within regulation 25(1)(d), Woodside adopts the following methodology, and then undertakes consultation with relevant persons.
- As a general proposition, Woodside assesses whether a person or organisation is a relevant person having regard to:
- whether a person or organisation has functions, interests or activities that overlap with the OA or PAA, and EMBA
- whether a person or organisation's functions, interests or activities may be affected by Woodside's proposed planned or unplanned activities to be carried out under the EP.
- This assessment will include applying judgement, knowledge and considering available, relevant literature.
- To assist in identifying the full range of relevant persons, Woodside considers the impacts and risks associated with its proposed activities and considers the broad categories of relevant persons who may be affected by the activities to be carried out under the EP. The broad categories are identified in Table 5-1 below and identification methodology applied as set out in Table 5-1.
- The list of those persons or organisations assessed as relevant persons or organisations Woodside separately chose to contact is set out in Appendix F, Table 1.
- Feedback received, if any, is assessed in accordance with the intended outcome of consultation and applying the categories of relevant persons methodology outlined in Table 5-2, as appropriate.
- Feedback from relevant persons is summarised at Appendix F, Table 2. Feedback from persons assessed as "not relevant" but whom Woodside chose to contact, or self-identified and Woodside assessed as "not relevant", are summarised at Appendix F, Table 3.

Table 5-1: Categories of relevant persons

Category	Explanation
Commercial fisheries (Commonwealth and State) and peak representative bodies	Commonwealth or State Commercial Fishery with a fishery management plan recognised under the Commonwealth Fisheries Management Act 1991 (Cth) and the Western Australian Fish Resources Management Act 1994 (WA), which may be amended from time to time. Commonwealth peak fishery representative bodies are identified by AFMA. WAFIC is the peak representative body for state fishers in Western Australia.
Recreational marine users and peak representative bodies	Charter boat, tourism and dive operators identified by DPIRD specific to the location of the proposed activity. Representative bodies are the recognised peak organisation(s) for recreational marine users.

Titleholders and Operators	Registered holder of an offshore petroleum title or GHG title under the OPGGS Act and associated regulations.
Peak industry representative bodies	Recognised peak organisation(s) for the oil and gas sector.
Traditional Custodians (individuals and/or groups/entity)	Traditional Custodians are First Nations Australians with cultural rights and interests or cultural functions or who perform cultural activities over particular lands and waters. Where a First Nations person, group or entity self-identifies and asserts cultural rights, functions, interests or activities they will be considered under the definition of Traditional Custodian for the purpose of this EP (as appropriate).
Nominated Representative Corporations	Nominated representative corporations are Traditional Custodians' nominated representative institutions such as Prescribed Body Corporates (PBC). PBCs are established under the Native Title Act 1993 (Cth) by Traditional Custodians to represent their entire Traditional Custodian group (defined broadly by reference to descents from an ancestor set who were known to be the Traditional Custodians at the time of European colonisation) and their interests including, among other things, management and protection of cultural values.
Native Title Representative Bodies	A Representative Aboriginal/Torres Strait Islander Bodies (RATSIB) is a regional organisation appointed under the Native Title Act 1993 with prescribed functions, set out in Part 11 of the Native Title Act 1993, which relate to: facilitation and assistance; certification; dispute resolution; notifications; agreement making. They are also known, and referred to here, as Native Title Representative Bodies.
Historical heritage groups or organisations	Legislated or government enlisted groups or organisations responsible for the management of marine heritage.
Local government and recognised local community reference/liaison groups or organisations	Local government body formed under the Local Government Act 1995 (WA) which is responsible for representing the local community. Recognised local community reference or liaison group or organisation in relation to oil and gas matters.
Other non-government groups, organisations or individuals	Non-government organisation with public website material targeting the proposed activity. Individual who demonstrates the proposed activity could potentially impact their interests, functions or activities.
Research institutes and local conservation groups or organisations	Research institutes are government or private institutions that conduct marine or terrestrial research. Local conservation groups are local non-government organisation that regularly conduct conservation activities focused on the local environment or wildlife.

Table 5-2: Methodology for identifying relevant persons within the EMBA undertaken under Regulation 25(1)(d) – by category

Category	Relevant person identification methodology
Commercial fisheries (Commonwealth and State) and peak representative bodies	Woodside assesses relevance for commercial fisheries (Commonwealth and State) and their representative bodies using the following next steps in its methodology: • Defining the parameters having regard to timing, location and duration of the proposed petroleum activity. • Confirming whether the EMBA overlaps with the fisheries management area (i.e., the spatial area the fishery is legally permitted to fish in) (see Section 4.10.1).

	• Woodside acknowledges WAFIC's consultation guidance20, that Titleholders develop separate consultation strategies for significant unplanned events (for example an oil spill) where titleholders can demonstrate the likelihood of such events occurring is extremely low. WAFIC's guidance is that consultation on unplanned events resulting in an emergency scenario should only be undertaken if an incident occurs. • For Commonwealth and State commercial fisheries, Woodside assesses the potential spatial and temporal extent for interaction with the fishery by reviewing AFMA, ABARES and DPIRD Fishcube data within the Operational Area and EMBA (see Section 4.10.2). Assessment of relevance: • State commercial fisheries that have been assessed as having a potential for interaction within the Operational Area or EMBA (see Section 4.10.2) are assessed as relevant to the proposed activity. However, to avoid over consulting and as requested in WAFIC's guidance, Woodside only consults individual licence holders based on WAFIC's advice. Woodside also utilises WAFIC's consultation service whereby WAFIC: - directly consults fishery licence holders that are assessed as having a potential for interaction in the Operational Area - consults fisheries that are assessed as having a potential for interaction in the EMBA only in the event of an unplanned emergency scenario. • Commonwealth commercial fisheries that have been assessed as having a potential for interaction within the Operational Area or EMBA (see Section 4.10.2) are assessed as relevant to the proposed activity. • If Woodside has identified that a Commonwealth or State fishery is a relevant person, then Woodside also consults the fisheries relevant representative body. For example, WAFIC represents the interests of State fisheries in Western Australia. If a State fishery is identified as relevant, Woodside would also identify WAFIC as relevant. Recognised Commonwealth fishery representative bodies are identified by AFMA via its website. WAFIC is the only recognised State fishery representative body.
Recreational marine users and peak representative bodies	Woodside assesses relevance for recreational marine users and peak representative bodies using the following next steps in its methodology: • Using Woodside knowledge and operating experience, applying knowledge of recreational marine users in the area. This assessment is both activity and location based. • Defining the parameters having regard to timing, location and duration of the proposed petroleum activity. • Assessing the potential spatial and temporal extent for interaction with recreational marine users by reviewing DPIRD Fishcube data to assess whether there has been activity within the EMBA in the past 5 years. Assessment of relevance: • Recreational marine users that have been active in the past 5 years within the EMBA are assessed as relevant to the proposed activity. Woodside is provided with the contact details of charter, boat tourism and dive operators specific to the region of the EMBA by DPIRD to consult with the relevant persons. • If Woodside has identified recreational marine users as relevant persons, then Woodside also consults identified peak

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	recreational marine user representative bodies. For example, Recfishwest represents the interests of recreational fishers. These representative bodies are identified via Woodside's existing consultation list, which is updated as appropriate via advice from known groups and DPIRD.
Titleholders and Operators	Woodside assesses relevance for other Titleholders and operators using the following steps in its methodology: • Using GPInfo to determine overlap with other Titleholders or Operators permit areas within the EMBA. • Using Woodside knowledge and operating experience, applying knowledge of other operators in the area. • Woodside produces a map showing the outcome of this assessment. Assessment of relevance: • Titleholders and Operators whose permit areas are identified as having an overlap within the EMBA are assessed as relevant.
Peak industry representative bodies	Woodside assesses relevance for peak industry representative bodies using the following steps in its methodology: • Review of peak industry representative bodies responsibilities that Woodside actively participates in, with consideration of overlap between industry focus area and Woodside's proposed activities within the EMBA. • Review of Woodside's existing consultation list. • Website search to identify whether any additional peak industry representative bodies have been created whose responsibilities may overlap with Woodside's proposed activities within the EMBA. Assessment of relevance: Peak industry representative bodies whose responsibilities are identified as having an overlap with Woodside's proposed activities within the EMBA are assessed as relevant.
Traditional Custodians (individuals and/or groups/entity) and Nominated Representative Corporations	Consistent with its understanding of the matters discussed in Section 4.9, to identify Traditional Custodian groups or individuals, Woodside: • uses existing systems of recognition to identify First Nations groups who overlap or are coastally adjacent to the EMBA (for example, recognition provided under native title or cultural heritage legislation, or marine park management plans, or identification by other First Nations groups or entities) • notifies and invites consultation with First Nations people through their nominated representative corporation (for example PBCs); or, in the case of native title and where appropriate, the Native Title Representative Body • requests the nominated representative body to forward the notifications and invitations to consult to their members (members are individual communal rights holders; • requests advice as to other First Nations groups or individuals that should be consulted • advertises widely so as to invite self-identification and consultation by First Nations groups and individuals. Further detail to Woodsides methodology is as follows. Woodside uses the databases of the National Native Title Tribunal: • to understand whether there are any Native Title Claims (historical or current) or determinations overlapping or coastally adjacent to the EMBA • to understand whether there are any relevant Indigenous Land Use Agreements (ILUA), registered with the National Native Title Tribunal that overlap or are adjacent to the EMBA that may

	identify Traditional Custodians or representative bodies to contact regarding potential cultural values. Where there is a positive determination of native title, contacting the PBC or, where their representative is a Native Title Representative Body, contacting the Native Title Representative Body. Where appropriate, contacting the relevant Native Title Representative Body to request a list of any First Nations groups asserting Traditional Custodianship over an area of coastline adjacent to the EMBA. Review of Commonwealth and State Marine Park Management Plans that overlap the EMBA which may identify Traditional Custodians or representative bodies to contact regarding potential cultural values. In Victoria, using the Victorian Aboriginal Heritage Council data to determine whether there are any Registered Aboriginal Parties (RAP) appointed under the Aboriginal Heritage Act 2006 (Vic), that overlap or are adjacent to the EMBA. First Nations groups or individuals identified by a Traditional Custodian, nominated representative corporation, Native Title Representative Body. Request to the PBC to distribute Woodside consultation materials through its membership. Woodside is unable to contact this membership through any other means. Woodside has a number of public notification and information sharing processes by which individual Traditional Custodians can become aware of the proposed activity, its risks and impacts, and self-identify. Individuals that consider their functions, interests or activities may be affected by a proposed activity are provided an opportunity to self-identify for each EP. Woodside does not presume that self-identification for an activity, covered by another EP, automatically means that an individual/s functions, interests and activities may be affected by other activities where EMBAs overlap. This decision is for the individual to make. The public notification, information sharing, and consultation processes Woodside puts in place enables Traditional Custodians to become aware of proposed activities, assess risks and impacts to their values, and enable individuals to self-identify. Assessment of relevance: Traditional Custodian groups, entities or individuals and Nominated Representative Corporations who are identified through the above methodology and overlap or are coastally adjacent to the EMBA are assessed as relevant.
Native Title Representative Bodies	Woodside assesses relevance for Native Title Representative Bodies using the following steps in its methodology: • A Representative Aboriginal/Torres Strait Islander Body (RATSIB) is a regional organisation appointed under the Native Title Act 1993 with prescribed functions set out in Part 11 of the Native Title Act 1993, which relate to: facilitation and assistance; certification; dispute resolution; notifications; agreement making. They are also known, and referred to here, as Native Title Representative Bodies. • Review of National Native Title Tribunal RATSIB areas that overlap or are coastally adjacent to the EMBA. Assessment of relevance: • Where the area for which a Native Title Representative Body is recognised under the Native Title Act 1993, overlaps with the EMBA or is coastally adjacent to the EMBA, Woodside will assess the Native Title Representative Body as relevant.
Historical heritage groups or organisations	Woodside assesses relevance for groups or organisations whose responsibilities are focused on historical heritage using the following steps in its methodology: • Using the Australasian Underwater Cultural Heritage Database to assess known records Maritime Cultural Heritage sites

	(shipwrecks, aircraft and relics) within the EMBA (see Section 4.9.1). Assessment of relevance: • Where there is a known underwater heritage site (shipwrecks, aircraft and relics) within the EMBA, the relevant group or organisation that manages the site will be assessed as relevant.
Local government and recognised local community reference/liaison groups or organisations	Woodside assesses relevance for local government and recognised local community reference/liaison groups or organisations using the following steps in its methodology: • Review of Woodside maps (developed based on data from the WA Local Government, Sport and Cultural Industries 'My Council' database and WA Local Government Association (WALGA) Local Government Directory maps to assess overlap between the local government's defined area of responsibility and the EMBA. • Woodside hosts regular community reference/liaison group meetings. Members represent a cross-section of the community and local towns interests. Representatives are from community and industry and generally include, Woodside, State Government (for instance relevant Regional Development Commissions), Local Government, Indigenous Groups, Industry representative bodies, community and industry organisations. Woodside considers these reference/liaison groups to be the appropriate recognised representatives of the local community for the oil and gas sector. • Woodside reviews the community reference/liaison group's terms of reference to determine its area of responsibility and overlap with the EMBA. For example, the Exmouth Community Liaison Group's area of responsibility in relation to Woodside's operational, development and planning activities, is defined in the terms of reference as the Exmouth sub-basin. Comparatively, the Karratha Community Liaison Group's area of responsibility is the Pilbara region (i.e., onshore). Assessment of relevance: • The local government whose defined area of responsibility overlaps the EMBA is assessed as relevant. • The community reference/liaison group whose defined area of responsibility overlaps the EMBA is assessed as relevant and consulted collectively via the relevant reference/liaison group.
Other non-government groups, organisations or individuals	Woodside assesses relevance for other non-government groups, organisations or individuals using the following steps in its methodology: • Review of Woodside's existing consultation list. • Website search of registered non-government groups or organisations (i.e., registered with an Australian Business Number (ABN) and publicly available contact information) that may have public website material specific to the proposed activity at the time of development of the EP. • Organisation has a publicly available mission statement (or purpose) that clearly describes their collective functions, interests or activities. • Review of current website material to identify targeted information which demonstrates functions, interests or activities relevant to the potential risks and impacts associated with planned activities. • Review of an individual's feedback to consider whether their functions, interests or activities could be impacted. Assessment of relevance:

	• Registered non-government groups or organisations with current targeted public website material specific to the proposed activity at the time of developing the EP and who have demonstrated functions, interests or activities relevant to the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation will be assessed as relevant. • Individual demonstrates their functions, interests or activities could be impacted will be assessed as relevant.
Research institutes and local conservation groups or organisations	Woodside assesses relevance for research institutes and local conservation groups or organisations using the following steps in its methodology: • Review of Woodside's existing consultation list. • Website search for research institutes that may operate within the EMBA. This assessment is both activity and location based. • Website search for local conservation groups or organisations that regularly conduct conservation activities within the EMBA. Assessment of relevance: • Where there is known research being undertaken by a research institute within the EMBA, the research institute that is conducting the research will be assessed as relevant. • Local environmental conservation groups who regularly conduct conservation activities or have demonstrated conservation functions, interests or activities within the EMBA are assessed as relevant. This assessment is both activity and location based.

5.3.5 Regulation 25(1)(e)

In addition to assessing relevance under regulation 25(1)(d), Woodside has discretion to categorise any other person or organisation as a relevant person under regulation 25(1)(e).

5.3.6 Identification of Relevant Persons under Regulation 25(1)(e)

Woodside adopts a case-by-case approach for each EP to assess relevance under regulation 25(1)(e).

5.3.7 Persons or Organisations Woodside Chooses to Contact

In addition to undertaking consultation with relevant persons under regulation 25(1), from time to time there are persons or organisations that Woodside chooses to contact in relation to a proposed activity. For example, these are persons or organisations:

- that are 'not relevant' pursuant to regulation 25(1) but that Woodside has chosen to seek additional guidance from, for example, to inform the correct contact person that Woodside should consult, or engage with
- that are 'not relevant' pursuant to regulation 25(1) but have been contacted as a result of consultation requirements changing or updated guidance from the Regulator
- where it is unclear what their functions, interests or activities are, or whether their functions, interests or activities may be affected. In this circumstance, engagement is used to inform relevance under Woodside's methodology. Woodside follows the same methodology for assessing a person or organisations relevance as it does during its initial assessment (as described in Figure 5-1 and Section 5.3). The result of Woodside's assessment of relevance during the development of the EP is outlined at Appendix F, Table 1.

5.3.8 Assessment of Relevant Persons for the Proposed Activity

The result of Woodside's assessment of relevant persons in accordance with regulation 25(1) is outlined at Appendix F, Table 1 and Appendix F, Table 2.

Persons or organisations that Woodside assessed as not relevant but chose to contact at its discretion in accordance with Section 5.3.4, or self-identified and Woodside assessed as not relevant, are summarised at Appendix F, Table 1 and Appendix F, Table 3.

5.4 Consultation Material and Timing

Regulation 25(2) provides that a titleholder must give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person. Regulation 25(3) provides that the titleholder must allow a relevant person a reasonable period for the consultation.

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

5.4.1 Sufficient Information

Woodside produces a Consultation Information Sheet for each EP. This is provided to relevant persons and organisations and is also available on Woodside's website for interested parties to access and to provide feedback on. The Consultation Information Sheet typically includes:

- a description of the proposed petroleum activity
- the OA or PAA, dependent on the EP
- where the activity will take place
- the timing and duration of the activity
- a location map of the OA or PAA, and EMBA
- a description of the EMBA
- relevant exclusion zones
- a summary of relevant risks and mitigation and management control measures relevant to the proposed petroleum activity (PPA).

It also sets out contact details to provide feedback to Woodside.

The level of information necessary to assist a person or organisation to understand the impacts of the proposed activity on their functions, interests or activities may vary and may depend on the degree to which a relevant person is affected. For example, Woodside considers that relevant persons who may be impacted by planned activities in the PAA, as a result of temporary displacement due to exclusion zones, may require more targeted information relevant to their functions, interests or activities. Sufficient information may have been provided to a relevant person even where all documents requested by a relevant person have not been provided. Woodside acknowledges NOPSEMA's brochure entitled Consultation on offshore petroleum environment plans

information for the community, which advises persons being consulted that they may inform titleholders that they only want to be consulted in the very unlikely event of an oil spill.

Woodside places advertisements in selected local, state and national newspapers. This typically includes:

- the name of the EP Woodside is seeking feedback on
- an overview of the activity
- the consultation feedback date
- the ways in which a person or organisation can provide feedback.

Advertising in the local paper in the area of the activity is also consistent with the public notification process under section 66 of the Native Title Act 1993 for native title applications. Woodside typically aligns advertisement feedback timeframes with the timing described below. Feedback received is assessed in accordance with Section 5.3 to determine relevance and evidenced in Appendix F, Table 1 as appropriate.

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

- Consultation Information Sheet available on Woodside's website and shared directly with relevant persons
- Summary Consultation Information Sheet, presentations or summaries specific to a particular relevant person group
- subscription available on Woodside's website to receive notification of new Consultation Information Sheets for Woodside EPs
- emails
- letters
- phone calls
- face-to-face meetings (virtual or in person) with presentation slides or handouts as appropriate
- Let's Talk newsletter – digital and hard copy
- maps outlining a person or organisation's defined area of responsibility in relation to the proposed activity, for example a fisheries management area or defence training area
- community meetings, as appropriate
- attendance at on-the-ground community events or planned regional roadshows
- broader awareness campaigns on the how to be involved in the EP consultation process.

Woodside recognises that information may be provided to relevant persons in an iterative manner during the consultation process. Woodside considers that genuine two-way engagement may be demonstrated via information on incorporation of controls, where applicable, being provided to the relevant person so that the relevant persons understand how their input has been considered in the development of the EP.

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

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

Category of relevant person	Typically accepted form of communication
Government departments / agencies – marine	Woodside applies NOPSEMA's guideline for engagement with Commonwealth government departments or agencies GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023 by using email for its consultation unless another form of communication is requested. Other forms of communication, such as phone calls, meetings and/or presentation briefings are used on request.
Government departments / agencies – environment	
Government departments / agencies – industry	
Commercial fisheries and peak representative bodies	Commonwealth commercial fisheries: Email is used as the primary form of communication with Commonwealth commercial fisheries in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request. State commercial fisheries and recreational marine users: The Western Australian Department of Primary Industries and Regional Development (DPIRD) has responsibility for managing the Fish Resources Management Act 1994 and Aquatic Resources Management Act 2016, which limits the provision of contact details from the register to the name and business address of licence holders. Alternative forms of communication are at the licence holder's discretion. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request. Peak representative bodies: Email is used as the primary form of communication with commercial fishery and recreational marine user peak representative bodies in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request.
Recreational marine users and peak representative bodies	
Titleholders and Operators	Email is used as the primary form of communication between titleholders and operators in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request.
Peak industry representative bodies	Email is used as the primary form of communication with peak representative bodies in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request.
Traditional Custodians and nominated representative corporations	There are many forms of communication that Woodside uses on a case-by-case basis and as appropriate to or requested by the specific group, such as email, phone calls, meetings and community forums. Other forms of communication are used on request.
Native Title Representative Bodies	There are many forms of communication that Woodside uses on a case-by-case basis and as appropriate to or requested by the specific group, such as email, phone calls, meetings and community forums. Other forms of communication are used on request.
Historical heritage groups or organisations	NOPSEMA's guideline (GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023) for engagement with government departments or agencies is used as a reference for Woodside's approach for communicating with historical heritage groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request.
Local government and recognised local community reference/liaison groups or organisations	Local government: NOPSEMA's guideline (GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2023) for engagement with local government is used as a reference for Woodside's approach for communicating with historical heritage groups or organisations. Community reference/liaison groups and chambers of commerce: Email and presentations are used as the primary form of communication with local community reference/liaison groups or organisations in the ordinary course of business. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request.
Other non-government groups or organisations	Email is used as the primary form of communication with Other non-government groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request.

Research Institutes and Local conservation groups or organisations	Email is used as the primary form of communication with research institutes and local conservation groups or organisations. Other forms of communication, such as phone calls, and meetings and/or presentation briefings are used on request.

Information which is provided to relevant persons for the purposes of consultation on this EP is summarised at Appendix F, Table 2.

Appendix F, Table 3 sets out the information which is provided to persons or organisations that are not relevant for the purposes of regulation 25 but which Woodside has chosen to contact.

When engaging in consultation, Woodside notifies relevant persons that, in accordance with regulation 25(4), the relevant person may request that the titleholder notifies NOPSEMA that particular information the person or organisation provides in the consultation not be published, and that information subject to that request will not be published under the Environment Regulations.

5.4.2 Reasonable Period for Consultation

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

Woodside recognises that information may need to be provided to relevant persons in an iterative manner during the consultation process. Woodside considers that genuine two-way engagement may be demonstrated via information on incorporation of controls, where applicable, being provided to the relevant person so that the relevant person understands how their input has been considered in the development of the EP.

Woodside's methodology allows relevant persons a reasonable period for consultation (regulation 25(3)). A reasonable period for all relevant persons, including Traditional Custodians, to participate in consultation for this EP has been provided.

The consultation period under this EP has satisfied benchmark periods under other relevant legislative processes:

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

This period of consultation demonstrates that Woodside has provided a "reasonable period" for relevant persons to consult in accordance with regulation 25(3). Commentary in the Tipakalippa Appeal judgment limits consultation to a process that must be capable of being discharged within a reasonable time:

"it must be taken to be the regulatory intention that the consultation requirement cannot be one that is incapable of being complied with within a reasonable time..."[21]

Woodside seeks feedback in order to support preparation of its EP. What constitutes a reasonable period for consultation is considered on a case-by-case basis, with reference to the person being consulted and the nature, scale and complexity of the activity.

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

Woodside's typical approach to providing a reasonable period for consultation is as follows:

- advertising in selected local, state and national newspapers to give persons or organisations the opportunity to understand the activity and identify whether their functions, interests or activities may be affected
- providing consultation materials directly to identified relevant persons as well as persons who are not relevant but Woodside chose to contact and providing a target date for feedback. Woodside acknowledges that feedback may be received from relevant persons following the target date
- acknowledging that the way in which Woodside provides consultation information may vary depending on the relevant person or organisation and, may depend on the degree to which a relevant person or organisation is affected. Different consultation processes may be required for relevant persons and organisations depending on the information requirements
- following up with relevant persons prior to EP submission. Where possible, Woodside will endeavour to use an alternative method of communication to contact the relevant person
- engaging in two-way dialogue with relevant persons or organisations where feedback is received.

Appendix F, Table 2 and Table 3 sets out a history of ongoing consultation and demonstrates that a reasonable period of consultation has been provided.

Woodside considers that consultation for this EP has closed.

As detailed in Section 5.6, if comments and feedback are received after the EP has been submitted, Woodside will consider those comments and update controls as appropriate and at all stages of the life of the EP as per Woodside's ongoing consultation approach described in Section 5.7.

5.4.3 Discharge of Regulation 25

The Full Federal Court made clear in the Tipakalippa Appeal that consultation should be approached in a "reasonable", "pragmatic" and "not so literal" way, so that consultation obligations were capable of being met by titleholders (Section 5.5.1).22 Consultation is a "real world activity" and must be capable of reasonable discharge.23 The Full Federal Court referred to Native Title cases as an illustration that reasonable limits should be applied to consultation efforts to ensure the process is workable.[24]

When the titleholder demonstrates that it has provided sufficient information and a reasonable period for consultation, then regulation 25 consultation requirements are met.25 Meeting these obligations requires evaluative judgement to determine reasonable satisfaction of the consultation obligation and, as such, the Regulator uses its discretion to determine if this criteria are met. The nature of the person being consulted and their function, interest and activity that may be affected, will inform the manner of consultation and the reasonable period to be afforded.26

While a titleholder is required to provide an opportunity to consult, the titleholder is not required to obtain consent to engage in the activity from a person being consulted, or confirmation from a person being consulted, that consultation is complete. The Federal Court has commented that a "reasonable

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

opportunity" for consultation must be afforded to relevant persons.[27] A reasonable opportunity may not be every opportunity requested and is limited to reasonable opportunities to consult.

Woodside has completed steps required to discharge its consultation obligations. Woodside has provided sufficient information and a reasonable period of time to enable relevant persons to make an informed assessment of the possible consequences of the activity on their functions, interests or activities; and sufficient time to provide relevant feedback for Woodside to assess relevant persons objections or claims. Woodside has also provided a reasonable opportunity for there to be genuine two-way dialogue on a person's claims or objections.

Woodside has discharged its duty under regulation 25 and considers that is complete.

Appendix F, Table 2 and Table 3 of this EP sets out the history of consultation under regulation 25. To the extent a relevant person says that they have further information to share or claims that consultation under regulation 25 has not been completed, Appendix F, Table 2 and Table 3 provide reasons why Woodside considers consultation under regulation 25 has been met, in relation to that relevant person.

5.5 Context of Consultation Approach with First Nations

To comply with regulation 25, Woodside identifies and consults Traditional Custodians whose functions, interests or activities may be affected by the activities under an EP.

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

Woodside has implemented a consultation methodology consistent with regulation 25 and guidance provided in the Tipakalippa Appeal. Woodside's consultation methodology allows for a sufficiently broad capture of Traditional Custodian relevant persons, provides for informed consultation, follows cultural protocols and allows a reasonable opportunity for consultation with Traditional Custodians whose functions, interests or activities may be affected by the activity described in this EP.

Woodside notes the Full Federal Court discussed several Native Title Act 1993 (Cth) cases in response to a submission made in that case that a requirement under regulation 25 to consult "each and every" relevant person would be "unworkable". The reference to native title cases dealt with how decision-making processes under the NTA requiring "all" members of a group to be contacted for communal approval are interpreted by courts in a "reasonable", "pragmatic" and "not so literal" way,[28] and how obligations to consult "each and every" person under regulation 25 should be interpreted in a similarly pragmatic way, so that consultation is workable. The reference to NTA authorities was made by analogy:

"It can be seen that the terms of [the native title legislation] are somewhat absolute – "all". However, [the native title legislation] has consistently been construed in a way that is not so literal … The cases concerning [the native title legislation] … have reiterated … that [the native title legislation] does not require that "all" of the members of the relevant claim group be involved in the decision. The key question will be whether a reasonable opportunity to participate in the decision-making process has been afforded by the notice for a relevant meeting." [29]

"We consider the authorities in relation to processes under the NTA to be illustrative of how a seemingly rigid statutory obligation to consult persons holding a communal interest may operate in a workable manner"[30] *(emphasis added).*

[27] Cooper v National Offshore Petroleum Safety and Environmental Management Authority (No 2) [2023] FCA 1158 at paragraph [11]; Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at [153].
[28] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [95], [98], [103]-[104] and [109].
[29] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [98].
[30] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [96].

"there is no definition of what constitutes "consultation for the purpose of Reg11A [now regulation 25] ... A titleholder will need to "demonstrate" to NOPSEMA that what it did constituted consultation appropriate and adapted to the nature of the interests of the relevant persons"[31] *(emphasis added).*

The Judgment in the *Tipakalippa Appeal* makes it clear that a titleholder will have some decisional choice in identifying which person(s) are to be approached, how the information will be given to allow the "relevant person" to assess the possible consequence of the proposed activities on their functions, interests or activities, and how the requisite consultation is undertaken.[32] Consultation is not fixed to a rigid process and will be adapted so that it is informed by the relevant person or group. Woodside has met its regulation 25 requirements through its consultation methodology (Section 5.5.2).

Consistent with the *Tipakalippa Appeal*, Woodside considers NTA-style "full group" meetings are not required for there to be compliance with regulation 25. Nominated representative corporations (such as PBCs established under the NTA) have a designated role of representing the views of their member Traditional Custodians. They have established methods for engaging with their own members. Woodside will not undermine the purpose and authority of nominated representative corporations by requiring full group meetings where the nominated representative corporations have not requested engagement of members via full group meetings. It is not appropriate for titleholders to direct or challenge the nominated representative corporations on how to engage with their members.

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

5.5.2 Consultation Method

Woodside's First Nations team has experience in engaging and working with First Nations organisations and individuals, including within the Commonwealth native title and cultural heritage systems, and state and territory cultural heritage and land rights systems. The team understands the complexities of making information accessible to groups and individuals and engaging in accordance with First Nations groups' established channels of communication and methods of consultation. The First Nations team exercises its professional judgement and is respectful of long-standing relationships (where in place) when considering consultation with First Nations groups. The First Nations team's approach is also informed by the established systems of recognition for First Nations groups and their nominated representative corporations within particular jurisdictions. For example, the methodology for engaging with First Nations groups in the Northern Territory (not relevant for this EP) tends to centre around engagement through Aboriginal land councils (under the Aboriginal Land Rights (Northern Territory) Act 1976 (Cth)) as well as community meetings that target clan groups where they do not have PBCs or other nominated representative corporations to represent them.

By contrast, recognition for First Nations groups and their nominated representative corporations in Western Australia falls under the Native Title Act 1993 (Cth) because the vast majority of the Western Australian coastline is settled under the native title regime. This means that the methodology and process for consultation in Western Australia places greater emphasis on, but is not limited to, Native Title Representative Bodies and PBCs.

Native title determinations provide certainty about the appropriate Traditional Custodian groups that have the cultural authority to speak for country adjacent to the EMBA and help Woodside to identify Traditional Custodian persons and groups asserting Traditional Custodianship. The Judgment in the

[31] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [104].
[32] Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 at paragraph [47] and [48].

Tipakalippa Appeal endorses methods of consultation with groups of relevant persons that are appropriate and adapted to the characteristics of groups.33 Woodside's consultation methodology is adapted and appropriate to the recognised systems of communal interests in Western Australia.

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

Using these processes, Woodside communicates information about EPs by:

- advertising in relevant newspapers. This encourages self-identification, by advertising proposed activities widely through newspapers that have national and intra-state circulation, i.e., Koori Mail, National Indigenous Times, The West Australian
- creating carefully considered Consultation Summary Sheets with information developed by an Indigenous member of the First Nations Team to remove jargon and provide relevant information for people to have informed understandings about the activities
- direct contact through nominated representative corporations
- utilising social media (i.e. Facebook/Instagram), texts and emails. These mediums are the preferred communication methods used by Traditional Custodians throughout Western Australia and, on that basis, used by Native Title Representative Bodies and other government agencies and industry, to engage with Traditional Custodians or call meetings. First Nations woman, Professor Bronwyn Castle, through 10 years of research found "Social media is an intrinsic part of daily life. The use of Facebook is around 20 per cent higher [among First Nations people] than the national average across all geographical locations" (Social media mob: being Indigenous online, Professor Bronwyn Carlson (2018))
- For ongoing consultation post regulation 25 consultation, Woodside has a Program of Ongoing Engagement with Traditional Custodians which sets out Woodside's commitment to ongoing engagement and support to care for and manage country, including Sea Country. The program was developed in response to Traditional Custodian feedback.
- Woodside has members of its First Nations team who are based in Karratha and Roebourne and who serve as on-Country points of contact for First Nations organisations and individuals. These team members have broad local knowledge and established, on-the-ground relationships within communities. This helps contribute to positive outcomes including encouraging First Nations attendance and involvement at Woodside's information sessions and Community roadshows. Team members on the ground engage in a great deal of preparatory work including by distributing information and providing notice to the community to support First Nations attendance at information sessions and Community roadshows.
- From the commencement of engagement with Traditional Custodians, Woodside seeks direction on how they prefer to be consulted and has consulted accordingly. Consultation processes that are informed by Traditional Custodians and co-designed on a case-by-case basis and includes their direction as to cultural protocols, structure of consultation and who to appropriately consult with (such as elders)
- Holding meetings on country at a place and time agreed with Traditional Custodians and offering and providing financial assistance for meeting expenses (as appropriate)

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

- Providing information specifically designed to be easily understood, to reach all relevant people, and give a reasonable period of time for those people to make an informed assessment of the possible consequences of the proposed activity on them.

The First Nations team approach to consultation is also consistent with the Federal Court's decision in the *Munkara Case.* The *Munkara Case* notes that the word "culture" (and hence the word "cultural") has a communal aspect to it. To establish cultural features, it is necessary that the beliefs and values are held by the relevant people as a people. For values, features or beliefs that are expressed by an individual to be "cultural" they cannot simply be an individual's belief - the belief must have a communal aspect too, and demonstrate that the "individual beliefs are broadly representative of the beliefs of other members of the group"[34]. The phrase "cultural features", when applied to "people" as constituent parts of an ecosystem, is not directed to idiosyncratic views or beliefs of an individual35. When the First Nations team is told that a particular value is cultural by an individual Traditional Owner, that information is taken back to the relevant cultural authority to test its broad acceptance. In the case of gender sensitive information, that information would be restricted to the specific gender within the community.

5.5.2.1 Identification of Relevant Persons

To undertake consultation, Woodside has developed a methodology for identifying relevant persons, in accordance with regulation 25(1) (Section 5.2 and 5.3).

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

Woodside asks nominated representative corporations (such as PBCs) and Native Title Representative Bodies to identify individuals that should be consulted, and enables individuals to self-identify in response to national and local advertising, social media and community engagement opportunities (Section 5.5.2.54). Where there is a nominated representative corporation for an area, unless directed by the nominated representative corporation, Woodside does not directly approach individuals for consultation, because this has the potential to undermine the role of the nominated representative corporation. Approaching individuals directly is a practice that is no longer considered acceptable because of divisions it has been shown to cause in communities. In addition to asking for the identification of individuals, Woodside also asks nominated representative corporations to distribute consultation information to whomever the nominated representative corporations deem appropriate, including members of the nominated representative corporations who are communal rights holders.

Having said this, as set out in further detail in Section 5.5.2.54 below, individuals are also given the opportunity to self-identify, consult and provide their own feedback on the proposed activity. When approached in this way, Woodside will engage individuals as relevant persons and will also (subject to any confidentiality or cultural restrictions) advise the nominated representative body of the consultation where it relates to cultural values. These methods of consultation are consistent with requirements for notification under the Native Title Act 1993 (Cth), such as under the future act provisions (section 29), which requires notification of the Native Title Representative Body, the PBC (or nominated representative) and notification through newspapers. The notification process has been selected as a respectful, practical and pragmatic analogue for consultation with First Nations

[34] Munkara v Santos NA Barossa Pty Ltd (No 3) [2024] FCA 9 at [205]
[35] Munkara v Santos NA Barossa Pty Ltd (No 3) [2024] FCA 9 at [205]

peoples, rather than requiring members to be notified via a formal authorisation process which seeks, from members, authorisation of agreements and native title/compensation claims under the Native Title Act 1993 (Cth)36.

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

5.5.2.2 Opportunity to Self-identify and Identifying Other Individuals

Woodside requests nominated representative corporations and Native Title Representative Bodies to identify other individuals to consult with or individuals who may seek to self-identify for a proposed activity. Woodside also advertises broadly through Indigenous, national and local advertising, social media and community engagement opportunities to provide individuals with an opportunity to consult. Woodside does not directly approach individuals for consultation, as this undermines the role of the nominated representative corporations (Section 5.5.2.1). Woodside's approach to providing individual Traditional Custodians the opportunity to self-identify and consult for an EP is as follows:

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

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

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

Woodside has nevertheless provided reasonable opportunity for individual Traditional Custodians to engage in consultation through appropriate and adapted consultation methods.

5.5.2.3 Sufficient Information

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

Woodside produces Consultation Information Sheets for each EP which is provided to relevant persons and organisations for the purpose of seeking feedback on the activity (Section 5.4.1). In response to feedback from Traditional Custodians' feedback on information provisions, Woodside has tailored effective consultation methods for its activities, specifically designed for Traditional Custodians, so that information is provided in a form that is readily accessible and appropriate. The targeted Summary Information Sheet developed and reviewed by Woodside's First Nations Engagement Team and First Nations staff to ensure that content is appropriate to the intended recipients, which is then provided to relevant Traditional Custodian groups. Phone calls are made to provide context to the consultation.

Where face-to-face consultation meetings are requested, Woodside coordinates engagement at the Traditional Custodians location of choice (where practicable) and with their nominated attendees. Key project personnel, environmental and First Nations relations experts are typically present to enable effective communication and prompt response to questions. Materials for these sessions incorporate visual aids such as photos, maps and videos, and plain language suitable for people with a non-technical background.

During consultation, Woodside provides relevant persons with additional information as appropriate in response to requests. There is no requirement to provide relevant persons with all information or documents requested and a titleholder will have provided sufficient information even where it has not provided all information or documents requested.

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

5.5.2.4 Reasonable Period for Consultation

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

5.5.2.5 Discharge of Regulation 25

Woodside's consideration and approach to discharging regulation 25 for relevant persons is discussed in Section 5.4.3. In addition to this, Woodside has considered the application of regulation 25 specific to First Nations based on the *Tipakalippa Appeal*.

In relation to Traditional Custodian relevant persons (and all relevant persons), Woodside has discharged its duty under regulation 25 of the Environment Regulations. Woodside considers that consultation under regulation 25 is complete.

5.6 Providing Feedback and Assessment of Merit of Objections or Claims

There are a number of ways in which feedback can be provided. Feedback can be provided through the Woodside feedback email or via the Woodside feedback toll free phone line as outlined in the

Consultation Information Sheet and the Woodside website. Where appropriate, consultation may also be supported by phone calls or meetings. An EP feedback form is also available on Woodside's website enabling stakeholders to provide feedback on proposed activities, or to request additional information.

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

Woodside accepts feedback and engages in consultation in order to achieve the aims set out in Section 5.2. Woodside recognises that there are persons and organisations that take a view that Woodside's operations and/or growth projects should be stopped or at least delayed as far as possible. Whilst Woodside assesses the merits of objections or claims received, it acknowledges NOPSEMA's guidance in its brochure entitled Consultation on offshore petroleum environment plans information for the community, which states that relevant persons are free to respond on any matter and raise any concern, however this may not be able to be considered if it is outside the scope or purpose of the EP and approval process, for example, statements of fundamental objection to offshore petroleum activities or information containing personal threats or profanities. Under regulation 34(g), there is no requirement for a relevant person to agree or confirm that they have been adequately consulted.

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

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

In accordance with regulation 26(8), sensitive information (if any) in an EP, and the full text of any response by a relevant person to consultation under regulation 25, must be contained in the sensitive information part of the plan and not anywhere else in the plan.

5.7 Ongoing Consultation

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

As per Woodside's ongoing consultation approach (refer to Section 7.8.2.1), feedback and comments received from relevant persons continue to be assessed and responded to, as required, throughout the life of an EP, including during its assessment and once accepted, in accordance with the intended outcome of consultation.

Should consultation feedback be received following the acceptance of an EP that identifies a measure or control that Woodside considers requires implementation or updates to meet the intended outcome of consultation, Woodside will apply its Management of Change and Review process as appropriate (see Section 7.6).

6. ENVIRONMENTAL IMPACT AND RISK ASSESSMENT, PERFORMANCE OUTCOMES, STANDARDS 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. MEEs require a further level of analysis and are assessed separately in Section 6.8.

6.2 Analysis and Evaluation

As required by Regulation 21(5) and 21(6) of the Environment Regulations, the analysis and evaluation demonstrate that the identified risks and impacts associated with the Petroleum Activities Program are reduced to ALARP, are of an acceptable level and consider all operations of the activity, including potential emergency conditions.

Impacts and risks identified during the ENVID (including Decision Type, current risk level, acceptability of risk and tools used to demonstrate acceptability and ALARP) have been divided into two broad categories:

- planned (routine and non-routine) activities; and
- unplanned events (accidents, incidents or emergency situations).

Within these categories, impact and risk assessment groupings are based on environmental aspect[37] (e.g. emissions, physical presence, etc.). For all hazardous events considered, the worst credible consequence was assumed.

The ENVID identified 11 impacts and 15 risks associated with the Petroleum Activities Program. Planned activities and unplanned events are summarised in Table 6-1 and Table 6-2.

The analysis and evaluation for the Petroleum Activities Program indicate that current environmental risks and impacts associated with the activity are reduced to ALARP and are of an acceptable level, as discussed further in Section 6.

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

Table 6-1: Environmental impact and risk analysis summary table – planned activities

Aspect	EP Section	Source of Impact	Key Potential Environmental Impacts (Refer to relevant EP section for details)	Controlled Impact Classification	Residual Impact Level (ALARP controls in place)	Acceptability of Impact
Planned Activities (Routine and Non-routine)						
Physical Presence: Interaction with other Marine Users	6.7.1	Presence of facility displacing and/or excluding other users from PSZ during routine and IMMR activities within the PAA, respectively.	Potential isolated social impact resulting from interference with other sea users (e.g. commercial and recreational fishing, and shipping).	F	Socio-Economic – No lasting effect (<1 month). Localised impact not significant to area/item of cultural significance.	Broadly Acceptable
		Presence of MODU, AHVs, installation vessels and other support vessels displacing and/or excluding other users during Xena-03 Tie-back activities.				
		Presence of subsea infrastructure interfering with or displacing third party vessels (commercial fishing).				
Physical Presence: Disturbance to the Seabed	6.7.2	Presence of Pluto Facility and subsea infrastructure	Localised modification of seabed habitat (formation of artificial reef) within PAA.	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	Broadly Acceptable
		Subsea operations, inspection, maintenance and repair activities including installation of pig receivers/launchers at the subsea wells.	Potential minor, localised modification of seabed habitat within PAA.	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	
		Presence of redundant infrastructure remaining infield until Facility EOFL.	Potential slight, short-term loss or damage to benthic habitats, including benthic communities and marine primary producers.	F	Environment – No lasting effect (<1 month). Localised impact not significant to environmental receptor.	
		Disturbance to seabed from drilling operations.		F	Environment – No lasting effect (<1 month). Localised impact not significant to environmental receptor.	
		Disturbance to seabed from subsea installation of infrastructure (e.g. flowlines, umbilicals, flying leads) as well as rectification and stabilisation activities (e.g. installation of concrete mattresses).		F	Environment – No lasting effect (<1 month). Localised impact not significant to environmental receptor.	
		Disturbance to seabed from ROV operation (including localised sediment relocation from sediment mobilisation techniques and marine growth removal).		E	Environment – Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	
		Disturbance to seabed from mooring installation.		E	Environment – Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	
		Placement and retrieval of seabed transponders and temporary installation aids.		E	Environment – Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute.	
Acoustic Emissions: Generation of Noise for Facility Operations	6.7.3	Noise generated within the PAA from: Pluto Facility and associated infrastructure Vessels (ASV and support vessels) Helicopters Subsea IMMR activities	Potential localised behavioural impacts to marine fauna around and within the PAA.	F	Environment – No lasting effect (<1 month). Localised impact not significant to environmental receptor.	Broadly Acceptable
Acoustic Emissions: Generation of Noise during Xena-03 Tie-Back Activities	6.7.4	Generation of noise from MODU, AHVs and support vessels.	Slight, short-term impacts to marine mammals, reptiles and fish, varying from behavioural responses to physiological impact (TTS).	F	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	Broadly Acceptable
		Generation of noise from DP systems on support vessels		F	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	

Aspect	EP Section	Source of Impact	Key Potential Environmental Impacts (Refer to relevant EP section for details)	Controlled Impact Classification	Residual Impact Level (ALARP controls in place)	Acceptability of Impact
		Generation of noise from cutting of well infrastructure and contingency activities		F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	
Routine and Non-Routine Discharges: Discharge of Hydrocarbons and Chemicals	6.7.5	Discharge of subsea control fluids.	Localised decrease in water quality around subsea system within PAA with no lasting effect.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	Broadly Acceptable
		Discharge of hydrocarbons remaining in subsea pipeworks and equipment as a result of subsea intervention works (including pigging).	Slight short term decrease in water quality at release location during IMMR activities.	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.	
		Discharge of chemicals remaining in subsea pipeworks and equipment or the use of chemicals for subsea IMMR activities.	Localised decrease in water quality at release location during IMMR activities.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	
		Discharge of minor fugitive hydrocarbons from subsea equipment.	Potential slight short-term, localised decrease in water quality around subsea system within PAA with no lasting effect.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	
		Discharge of chemicals (e.g. MEG) during installation and leak testing of new infrastructure.	Localised decrease in water quality at discharge location during installation and leak testing of new infrastructure.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	
Routine and Non-Routine Marine Wastewater Discharges: Utility Systems and Drains	6.7.6	Discharge of sewage, grey water and putrescible waste from the Pluto Facility, MODU, ASV, installation and support vessels to the marine environment.	Potential localised, short-term decrease in water quality (increased nutrients and biological oxygen demand) at the discharge location.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	Broadly Acceptable
		Discharge of deck, bilge and drain water from the Pluto Facility, MODU, ASV, installation and support vessels to the marine environment.	Potential localised, short-term decrease in water quality (increased hydrocarbon and chemical concentrations) at the discharge location.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	
		Discharge of brine and cooling water from the Pluto Facility, MODU, ASV, installation and support vessels to the marine environment.	Negligible, localised increase in salinity at the discharge location.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	
Routine and Non-Routine Discharges: Produced Water	6.7.7	Discharge of produced water during routine and non-routine operations.	Potential slight short-term, localised decrease in water quality (increased hydrocarbon and chemical concentrations) at discharge location and within mixing zone, with potential impacts to marine fauna (toxicity).	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	Broadly Acceptable
Routine and Non-Routine Discharges: Drill Cuttings, Drilling Fluids and Well Removal Fluids	6.7.8	Routine discharge of WBM drill cuttings to the seabed and the marine environment	Potential slight, short-term toxic effects to marine biota, as well as localised reduction in water quality with potential effects on both water quality and benthic communities	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	Broadly Acceptable
		Routine discharge of drilling muds (WBM) to the seabed and the marine environment		D		
		Non-routine discharge of treated NWBM drill cuttings to the marine environment		D		
		Non-routine discharge of wash water from mud pits and vessel tank wash fluids		E		
		Routine discharge of well clean-out fluids		E		
		Non-routine discharge of well annular fluids		F		
Routine and Non-Routine Discharges: Cement,	6.7.9	Routine discharge of cement and cementing fluids, to the seabed and the marine environment.	Potential slight, short term toxic effects to marine biota, as well as localised reduction in water quality	F		Broadly Acceptable

Aspect	EP Section	Source of Impact	Key Potential Environmental Impacts (Refer to relevant EP section for details)	Controlled Impact Classification	Residual Impact Level (ALARP controls in place)	Acceptability of Impact
Cementing Fluids, Subsea Well Fluids, Unused Bulk Product and Subsea Chemicals from Xena-03 Tie-back Activities		Routine discharge of subsea well fluids (including BOP and well construction activity control fluids).	with potential effects on both water quality and benthic communities.		Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	
		Produced / reservoir water disposal				
		Non-routine discharge of unused bulk products at campaign end.				
Routine and Non-routine Atmospheric (direct) and GHG Emissions (direct and indirect)	6.7.10	Operational flaring, exhaust emissions from fuel combust–on, fugitive emissions from the Pluto facility.	Potential short-term localised decrease in air quality, limited to the airshed local to the facility.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	Broadly Acceptable
		Exhaust emissions from fuel combustion and incinerators on the ASV, MODU, installation and support vessels and helicopters				
		Contingent MODU flaring (well test non-routine) during well unloading for pressure test and clean up.				
		Contingent venting of gas during drilling (e.g. well kick)				
		Consideration of indirect emissions associated onshore processing, third party transportation, regassification and combustion by end users				
Routine Atmospheric Emissions: Indirect Emissions from Gas Processing Onshore	6.7.11	Consideration of potential indirect impact from atmospheric emissions associated with onshore processing of Pluto gas.	Negligible, small contribution to cumulative air quality relative to defined air quality criteria. Risk of processing of Pluto gas at onshore facilities adversely impacting rock art on Murujuga is considered to be low, and no impact classification assigned.	F	Environment – No lasting effect (< 1 month). Localised air quality impact not significant to environmental receptors.	Broadly Acceptable
Routine Light Emissions: Light Emissions from Facility Operations and Xena-03 Tie-back Activities	0	Light emissions from the Pluto Facility, ASV, MODU, installation and support vessels.	Negligible, localised potential for behavioural disturbance of species in close proximity to riser platform and vessels.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	Broadly Acceptable
		Light emissions during flaring.	Negligible, localised potential for behavioural disturbance of species in close proximity to riser platform and vessels.	F	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	

Table 6-2: Environmental impact and risk analysis summary table – unplanned events (including MEEs)

Aspect	EP Section	Source of Risk	Key Potential Environmental Impacts (Refer to relevant EP section for details)	Risk Rating				Acceptability of Impact
				Controlled Impact Classification	Residual Impact Level (ALARP controls in place)	Likelihood	Residual Risk Rating	
Unplanned Events (Accidents / Incidents) - MEEs								
Unplanned Hydrocarbon Release: Loss of Well Containment from Operating Wells (MEE-01)	6.8.5	Release of hydrocarbons resulting from subsea loss of well containment.	Potential significant impacts to the marine environment: medium-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines disruption to marine fauna, including protected species potential short-term interference with or displacement of other sea users.	C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	Acceptable if ALARP
Unplanned Hydrocarbon Release: Subsea Equipment Loss of Containment (MEE-02)	6.8.6	Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere within PSZ and to mid-point of export pipeline	Potential significant impacts to the marine environment: medium-term impacts to sensitive offshore and nearshore areas disruption to marine fauna, including protected species potential short-term interference with or displacement of other sea users	C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	Acceptable if ALARP
		Subsea release from export pipeline to the marine environment and atmosphere between mid-point of export pipeline to shore		B	Environment - Major, long-term impact (10–50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	1	M	
Unplanned Hydrocarbon Release: Loss of Structural Integrity (MEE-03)	6.8.7	Marine environment footprint and associated hydrocarbon and chemical release associated with structural collapse of riser platform	Potential significant impacts to the marine environment: medium-term impacts to sensitive offshore and nearshore areas disruption to marine fauna, including protected species potential short-term interference with or displacement of other sea users.	C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	Acceptable if ALARP
		Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere within PSZ (MEE-02) – caused by loss of structural integrity		C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	
Unplanned Hydrocarbon Release: Loss of Marine Vessel Separation (MEE-04)	6.8.8	Hydrocarbon release of marine diesel to the marine environment from vessel due to collision within the PSZ.	Potential significant impacts to the marine environment: medium-term impacts to sensitive offshore and nearshore areas disruption to marine fauna, including protected species potential short-term interference with or displacement of other sea users.	C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	Acceptable if ALARP
		Hydrocarbon release from pipeline, flowline(s) and riser(s) to the marine environment and atmosphere (MEE-02/03) caused by collision and structural integrity failures.		C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	
		Marine environment footprint and associated hydrocarbon and chemical release associated with platform loss of structural integrity (MEE-03) caused by collision.		C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	
Unplanned Hydrocarbon Release: Loss of Control	6.8.9	Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere within PSZ	Potential significant impacts to the marine environment:	C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem,	1	M	Acceptable if ALARP

Aspect	EP Section	Source of Risk	Key Potential Environmental Impacts (Refer to relevant EP section for details)	Risk Rating				Acceptability of Impact
				Controlled Impact Classification	Residual Impact Level (ALARP controls in place)	Likelihood	Residual Risk Rating	
of Suspended Load from Platform (MEE-05)		(MEE-02) – caused by loss of control of suspended load	medium-term impacts to sensitive offshore and nearshore areas disruption to marine fauna, including protected species potential short-term interference with or displacement of other sea users.		species, habitat or physical or biological attribute.			
		Hydrocarbon release from topsides equipment to the marine environment and atmosphere – caused by loss of control of suspended load	Potential minor short-term impacts to the marine environment including disruption to marine fauna, including protected species, and/or temporary impacts to water quality.	D	Environment - Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	1	M	
Unplanned Events (Accidents / Incidents)								
Unplanned Hydrocarbon Release: Loss of Well Integrity during Drilling of Xena-03	6.9.1	Loss of hydrocarbons to marine environment due to loss of well containment during drilling of the Xena-03 well	Potential significant impacts to the marine environment: medium-term impacts to sensitive offshore and nearshore areas disruption to marine fauna, including protected species potential short-term interference with or displacement of other sea users.	B	Environment - Major, long-term impact (10–50 years) on highly valued ecosystem, species, habitat or physical or biological attribute.	1	M	Acceptable if ALARP
Unplanned Hydrocarbon Release: Pluto-A Topsides Loss of Containment	6.9.2	Hydrocarbon release from Pluto-A topsides equipment to the marine environment and atmosphere.	Potential minor short-term impacts to the marine environment including disruption to marine fauna, including protected species, and/or temporary impacts to water quality.	D	Environment - Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	1	M	Broadly Acceptable
Unplanned Hydrocarbon Release: Vessel Collision during Drilling and Tie-Back Activities	6.9.3	Loss of hydrocarbons to marine environment due to a vessel collision during drilling and tie-back of the Xena-03 well	Potential minor short-term impacts to the marine environment: short-term impacts to sensitive offshore and nearshore areas disruption to marine fauna, including protected species potential short-term interference with or displacement of other sea users.	C	Environment - Moderate, medium-term impact (2–10 years) on ecosystem, species, habitat or physical or biological attribute.	1	M	Broadly Acceptable
Unplanned Hydrocarbon or Chemical Release: Hydrocarbon Release during Bunkering, Refuelling and Chemical Release during Transfer, Storage and Use, Rupture of Chemical Supply Lines – Pluto Operations	6.9.4	Accidental discharge of marine diesel/hydrocarbons to the marine environment during bunkering and refuelling,	Potential minor short-term impacts to marine water quality with no lasting effect.	D	Environment - Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	2	M	Broadly Acceptable
		Accidental discharge of chemicals to the marine environment from transfer, storage and use, as well as rupture of chemical supply lines	Potential minor short-term impacts to marine water quality with no lasting effect	D	Environment - Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	1	M	Broadly Acceptable
		Accidental release of MEG from chemical supply lines	Potential slight short-term impacts to marine water quality with no lasting effect.	E	Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	2	M	Broadly Acceptable
Unplanned Discharges: Tie-back Activities	6.9.5	Accidental discharge of hydrocarbons or chemicals from the MODU, ASV,	Potential minor short-term impacts to the marine environment including disruption to	D	Environment - Minor, short-term impact (1–2 years) to a community or highly	2	M	Broadly Acceptable

Aspect	EP Section	Source of Risk	Key Potential Environmental Impacts (Refer to relevant EP section for details)	Risk Rating				Acceptability of Impact
				Controlled Impact Classification	Residual Impact Level (ALARP controls in place)	Likelihood	Residual Risk Rating	
Unplanned Deck and Subsea Spills		installation and support vessel deck activities and equipment, and from subsea ROV hydraulic leaks	marine fauna, including protected species, and/or temporary impacts to water quality.		valued area/item of cultural significance.			
Unplanned Discharge: Drilling Fluids	6.9.6	Accidental discharge of project fluids (WBM/NWBM/base oil) and cement to marine environment	Potential slight short-term impacts to the marine environment including disruption to marine fauna, including protected species, and/or temporary impacts to water quality.	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	1	L	Broadly Acceptable
Unplanned Discharges: Hazardous and Non-hazardous Waste Management	6.9.7	Incorrect disposal or accidental discharge of non-hazardous and hazardous waste to the marine environment.	Potential slight short-term impacts to the marine fauna, and localised temporary impacts to water quality and marine sediments.	E	Environment – No lasting effect (< 1 month). Localised impact not significant to environmental receptors.	2	M	Broadly Acceptable
Physical Presence: Seabed Disturbance from Dropped Objects or Loss of Station Keeping Leading to Anchor Drag	6.9.8	Dropped objects resulting in the disturbance of benthic habitat	Potential minor localised impact to benthic habitat as well as potential seabed infrastructure damage.	D	Environment - Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	1	L	Broadly Acceptable
		Loss of station keeping of the MODU leading to anchor drag and the disturbance of benthic habitat		D	Environment - Minor, short-term impact (1–2 years) to a community or highly valued area/item of cultural significance.	1	L	
Physical Presence: Interactions with Marine Fauna	6.9.9	Physical presence of MODU, ASV, installation and support vessels resulting in collision with marine fauna.	Potential injury or death of marine fauna (single animal), including protected species.	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	1	L	Broadly Acceptable
Physical Presence: Introduction of Invasive Marine Species	6.9.10	Invasive species in vessel ballast tanks or on vessels/submersible equipment	Potential introduction of invasive marine species possibly resulting in an alteration of the localised environment.	E	Environment – Slight, short-term impact (< 1 year) on species, habitat (but not affecting ecosystem function), physical or biological attributes.	1	L	Broadly Acceptable

6.2.1 Cumulative Impacts

Woodside has assessed the cumulative impacts of the Petroleum Activities Program in relation to other relevant petroleum activities that could realistically result in overlapping temporal and spatial extents. The closest facilities to the Pluto Riser Platform and Pluto Export Pipeline include the Wheatstone platform, 5 km north, and the Stag A platform 8 km south, respectively (Section 4.10.5). However, given the concentration of sources of environmental risks and impacts from the Petroleum Activities Program are localised, the potential for cumulative impacts is considered to be low. Cumulative impacts are discussed for sources of risk and impacts where such impacts were deemed to be credible.

6.3 Environmental Performance Outcomes, Standards and Measurement Criteria

Regulation 21(7) of the Environment Regulations requires that an EP includes EPOs, EPSs and MC that address legislative and other controls to manage the environmental risks and impacts of the activity to ALARP and Acceptable levels.

The EPOs, EPSs and MC specified are consistent with legislative requirements and Woodside's standards and procedures. They have been developed based on the Codes and Standards, Good Industry Practices and Professional Judgement outlined in Section 2.6, as part of the acceptability and ALARP justification process.

As defined in regulation 5 of the Environment Regulations, an EPO "for an activity, means a measurable level of performance required for the management of environmental aspects of the activity to ensure that environmental impacts and risks of the activity will be of an acceptable level".

EPOs are set so that they are consistent with the principles of ESD as defined in the section 3A of the EPBC Act and demonstrated through the acceptability process (described in Section 2.8.2), which is applied to the aspects in Section 6, taking into consideration the principles of ESD. The EPOs for planned activities have been set at a level of environmental performance that is equal to the identified environmental impact.

Impact based EPOs, where qualitative terms (e.g. prevent, limit) are used in EPOs, are supported by detailed impact assessment in Section 6 such that they can be interpreted as meaning "impact and risk greater than that predicted in this EP".

A risk-based EPO ties in with Woodside's risk management processes so that risk is maintained within a level that has been evaluated as being appropriate to the nature and scale of the risk. WMS and relevant controls are used to identify and treat potential step-outs (resulting in an increased likelihood) from expected controls performance or integrity envelopes.

EPSs and MC are defined to measure environment performance against the EPOs:

EPS are statements of performance required of a control measure in order to manage risk and/or impacts to ALARP and an acceptable level. EPS are used as a basis for environmental performance reporting and demonstrates compliance against the EPO.

MCs are outlined defining how environmental performance is measured and sets the criteria to determine whether the EPO and EPS have been met during the activity.

For planned activities, where the activity is undertaken as described and the relevant EPS are implemented it confirms that the EPOs are being met.

The EPOs, EPSs and MC are presented throughout this section for both operations and Xena-03 tie-back activities, as relevant. A breach of these EPOs or EPSs constitutes a 'Recordable Incident' under the Environment Regulations (refer to Section 7.13.5).

6.4 Presentation

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

Context Description of the context for the impact/risk. Regulation 21(1), 21(2) and 21(3)														
Description of the Activity – Regulation 21(1)	Description of the Activity – Regulation 21(1)							Description of the Activity – Regulation 21(1)						
Impact and Risk Evaluation Summary Summary of ENVID outcomes														
Source of Risk Regulation 21(1)	***Environmental Value Potentially Impacted*** Regulations 21(2)(3)							***Evaluation*** Section x						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	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 21(1).														
Impact or Consequence Assessment														
Environmental Value/s Potentially Impacted														
Discussion and assessment of the potential impacts to the identified environment value/s. Regulation 21(5) and 21(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)[38]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
ALARP/Hierarchy of Control Tools Used – Section 2.6.2				

[38] Qualitative measure

Demonstration of ALARP				
Summary of control considered to ensure the impacts and risks are continuously reduced to ALARP. Regulation 21(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.
Major Environmental Events				
MEEs are subject to additional analysis and evaluation as outlined in Sections 2.7. ALARP is demonstrated through controls being analysed for selection, based on their independence, and prioritised in accordance with hierarchy of controls, and further analysed to consider the type of effect the control provides.				
ALARP Statement Made on the basis of the environmental risk/impact assessment outcomes, use of the relevant tools appropriate to the Decision Type (Section 2.6.1) and a proportionality assessment. Regulation 34(b).				

Demonstration of Acceptability
Acceptability Statement Made on the basis of applying the process described in Section 2.8.2 and taking into account internal and external expectations, risk/impact to environmental thresholds and use of environment decision principles. Regulation 34(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[39] 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 21(5c).	PS No. Statement of the performance required of a control measure. Regulation 21(7)(a).	MC No. Measurement criteria for determining whether the outcomes and standards have been met. Regulation 21(7)(c).

6.5 Environment Risk/Impacts not Deemed Credible

The ENVID identified a source of environmental risk / impact that was assessed as not being applicable (not credible) within or outside the PAA as a result of the Petroleum Activities Program. It therefore does not form part of this EP. This is described in the following sections for information only.

6.5.1 Shallow/Near-shore Activities

The Petroleum Activities Program is located in water depths of approximately between 40 m at the state-waters boundary of the Pluto Export Pipeline and 962 m at the greatest depths of the hydrocarbon gathering system. The closest land is 12 km from the Export Pipeline Operational Area at Legendre Island and 32 km from the Facility and Xena-03 Operational Area at Montebello Islands. Consequently risks/impacts associated with shallow/near-shore activities such as anchoring and vessel grounding were assessed as not credible.

6.6 Indirect Impacts

For the proposed Petroleum Activities Program, potential 'indirect' environmental impacts and risks are those associated with waste brought onshore, mobilisation/demobilisation of vessels to the PAA, and related to emissions associated with the extraction of Pluto gas for onshore processing and third party transport, regassification, distribution and use. Due to the nature and scale of these potential indirect environmental impacts and risks which could be reasonably attributed to the PAP, and the regulatory frameworks in place to manage them, Woodside considers the potential indirect impacts and risks from these activities to be inherently managed to ALARP and acceptable in its current state.

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

However, recognising stakeholder and regulatory interest with the processing of Pluto gas onshore and concern regarding the potential for indirect impacts from atmospheric emissions; and GHG emissions from third party use, further information and evaluation has been provided in Section 6.7.10 and 6.7.11.

6.7 Planned Activities

6.7.1 Physical Presence: Interaction with other Marine Users

Context		
Facility Layout and Description – Section 3.4 Support Vessel Operations – Section 3.8 Subsea Inspection, Maintenance & Repair Activities – Section 3.10 Xena-03 Drilling &Tie-back Activities – Section 3.11 Vessel-based Activities for the Xena-03 Tie-back – Section 3.12	Socio-economic Environment – Section 4.10	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Presence of facility displacing and/or excluding other users from PSZ during routine and IMMR activities within the PAA, respectively.							x	A	F	-	-	LCS GP PJ	Broadly Acceptable	EPO 1
Presence of MODU, AHVs, installation vessels and other support vessels displacing and/or excluding other users during Xena-03 Tie-back activities.							x							
Presence of subsea infrastructure interfering with or displacing third party vessels (commercial fishing)							x							

Description of Source of Impact

Operations

The facility commenced operation in 2012 and is marked on nautical charts. The riser platform is surrounded by a 500 m radius PSZ, which vessels are prohibited from entering unless authorised by Woodside. The PSZ is a critical safety control intended to reduce the likelihood of interactions between vessels and the platform, which increases safety for both vessels and the facility. Implementation of the PSZ around the riser platform excludes other users from a small area of the sea (approximately 0.079 km2). The riser platform is highly visible under most conditions and is well lit, and the nature of the riser platform (large steel structure) ensures a clear radar return to alert ships fitted with anti-collision radars.

Routine support vessel operations (Section 3.8) associated with the Pluto facility operations activities are concentrated within the PSZ (e.g. platform support vessels during crewed mode), with the exception of IMMR activities. Subsea support vessels may undertake activities (e.g. IMMR, removal of redundant equipment) within the PAA at any time, including within parts of the PAA which are beyond the PSZ. The duration and location of these activities varies

depending on the activity being undertaken. Planned maintenance campaigns undertaken during routine intervention activities typically occur ten times per year, lasting approximately 14 days per campaign. Vessels required for major projects, including AHV and subsea installation vessels may undertake activities within the PAA as required.

Subsea infrastructure associated with operations activities may have the potential for interactions with other marine users. The AHO has been notified of the location of all existing subsea infrastructure, for marking on nautical charts. Water depths of the existing subsea infrastructure range between 40 m at the export pipeline state boundary and 180-962 m, at the hydrocarbon gathering system. The Pluto riser platform itself, is located at the edge of the continental shelf at 85 m depth.

Presence of MODU, Xena-03 Tie-back Activities and associated Subsea Infrastructure

The activity includes mooring system installation, drilling of one well, installation of a wellhead and xmas tree, and connection of the well to the existing Pyxis Hub subsea infrastructure.

Support vessels including ASVs will be used for MODU mooring system installation activities before the arrival of the MODU, and for retrieval of anchors following completion of drilling when the MODU departs. Each of these phases are intended to last 7-10 days.

A MODU is planned to be present for approximately 60 days, including mobilisation, demobilisation and contingency activities. When underway, activities will be 24 hours per day, seven days per week. A 500 m Safety Exclusion Zone (SEZ) will be applied to the MODU within the Xena-03 Operational Area for the duration of the drilling activity. An support vessel would be present in proximity to the MODU, which would also be supported periodically by another support vessel to facilitate resupply.

Installation vessels will be used to install, pre-commission and cold commission the flexible flowline, subsea distribution unit, and other subsea infrastructure following completion of drilling of the new well, as described in Section 3.11. This is expected to take approximately three weeks. Installation is expected to be predominantly undertaken by the Primary Installation Vessel (PIV), which will be surrounded by a 500 m SEZ when on-location within the Xena-03 Operational Area. A smaller vessel (IMMR type) may be utilised to undertake components of the installation activity before or after primary installation has been completed.

Mooring installation, drilling and subsea installation activities are expected to be temporally discrete (i.e. conducted at different times), however they may overlap. If these activities coincide, a vessel (IMMR or PIV type) would be active in the Xena-03 Operational Area while the MODU (supported by two OSVs) is present. A SIMOPS plan would be in place to manage interaction between vessels in the field.

Xena-03 Tie-back activities will include the addition of new infrastructure within the PAA. The proposed Xena-03 wellhead, subsea xmas tree and other subsea infrastructure will remain for the duration of field life. All new infrastructure will be contained within the existing Facility Operational Area and will not constitute a significant increase in the physical presence of the facility.

The AHO will be notified of the Xena-03 well and associated subsea infrastructure locations. Further, once Xena-03 infrastructure is operational, potential interactions with other marine users will be managed as per all other subsea infrastructure associated with Pluto operations.

Impact Assessment

Exclusion and Displacement of Other Users

Interaction with other marine users due to the physical presence of activity-related vessels in the Petroleum Activities Program may result in localised changes to the functions, interests or activities of other users.

The duration and extent of potential for interaction, will depend on the activity undertaken, and are outlined below:

- Pluto facility operations – on-going, for the period of the Petroleum Activities Program, limited to the Facility Operational Area.
- Xena-03 Tie-back activities – Approximately 60 days, limited to the Xena-03 Operational Area.
- IMMR – Typically 14 days, throughout the PAA. Approximately 10 IMMR activities are planned per year, with additional IMMR campaigns carried out as required.

Commercial Fishing

The PAA overlaps 4 Commonwealth and 15 State managed commercial fisheries management areas. Historical fisheries data indicate that only 1 Commonwealth fishery and ten (10) State managed fisheries have been active within the PAA over the last 5 years. To identify active fisheries with the potential for interaction, ABARES and FishCube data at the 10 NM and 60 NM CAES reporting blocks, overlapping the PAA were identified and fishery effort assessed (Section 4.10.1). ***Routine Operations***

The Commonwealth managed North West Slope Trawl Fishery, and ten (10) State managed fisheries are considered to have potential for interaction with project activities in the PAA. There potential to interact with the activity is based on their catch effort drawn from ABARES (Commonwealth) and FishCube (WA State) data. The catch effort is described for each fishery in Table 4-22 in Section 4.10.1.

Continued presence of the Pluto facility and subsea infrastructure

The potential impact to commercial fisheries in the PAA is limited to the navigational hazard of the facility and localised displacement/avoidance by commercial fishing vessels within the immediate vicinity. As such, the potential impact is considered to be localised with no lasting effect.

The continued presence of subsea infrastructure over the field life could present a hazard to bottom trawl fisheries due to the risk of equipment entanglement and subsequent equipment damage/loss. The presence of subsea infrastructure could present a hazard to bottom trawl fisheries due to risk of equipment entanglement and subsequent equipment damage/loss.

Given the catch effort of commercial fisheries outlined in Table 4.22, anticipated impacts from activities associated with the ongoing presence of the Pluto facility and subsea infrastructure are assessed as having no lasting effect.

Xena-03 Tie-back activities

During Xena-03 Tie-back activities, additional vessels will be temporarily present in the Xena-03 Operational Area and may restrict the use of the area by the commercial fisheries and tour operators that have been identified as having potential to use the region. Use will particularly be restricted within the 500 m SEZ (temporary) that will be established around the MODU and installation vessel while undertaking drilling and installation activities. The exclusions represent a relatively small area when compared to the extent of the fishery boundaries that overlap. The MODU is planned to be present for approximately 60 days, and the installation vessels for up to three weeks. Potential impacts to commercial fisheries include damage to fishing equipment and physical displacement from some parts of the managed fishery areas for the duration of the Xena-03 Tie-back activities.

Given the distance offshore and previous fishing effort within the Facility Operational Area (discussed above), the Xena-03 Operational Area is not considered to be an area of high commercial fishing activity. Furthermore, the 500 m temporary exclusion zones around the MODU and installation vessel comprise a relatively small area when compared to the extent of the individual fishery boundaries that overlap. As such, any displacement of commercial fisheries due to the Xena-03 Tie-back activities in the Xena-03 Operational Area are not expected to impact commercial fishing activities or the economic viability of the fisheries.

Tourism and Recreation

Tourism and recreation activity in the PAA is expected to be infrequent, with recreational and charter fishing from vessels the only tourism and recreational activities identified as potentially occurring.

The Montebello Islands State Marine Park (~25 km from the PAA), is the closest location for tourism with some charter boat operators taking visitors to these islands. Reported fishing charter catch effort (at 10 NM CAES blocks) within the PAA, is predominantly located along the Export Pipeline. There may be recreational fishing at Rankin Bank, which is ~29 km from the PAA. The Export Pipeline Operational Area is 13 km from the Dampier Archipelago at the state boundary and therefore, low numbers of recreational vessels may be encountered within that nearshore area.

Given the distance from boating facilities, lack of natural attractions and water depth (~85 m) of the Facility Operational Area, very little recreational or charter fishing is expected to occur. In nearshore waters where the Export Pipeline Operational Area has the potential for greater interaction with tourism and recreational activities, given the infrequent and transient nature of IMMR activities and the known presence of current infrastructure, any impacts are not likely to be of significance. Collectively, activities in the PAA are not likely to significantly impact recreational and tourism activities and are expected to be localised with no lasting effect.

Shipping

Commercial shipping occurs in high numbers across the NWS, based on the proximity to key export ports. Commercial shipping traffic comprises vessels including:

- bulk carriers (e.g. mineral ore, salt) from Port Hedland, Port Walcott and Dampier
- offtake tankers
- support vessels for offshore oil and gas activities
- LNG carriers from Dampier, Barrow Island and Ashburton North.

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

No shipping fairways interact with the Facility and/or Xena-03 operational areas, however two fairways overlap the Export Pipeline Operational Area:

- A fairway directs north/south-bound vessel traffic from Barrow Island and the southern Montebello Islands.
- A fairway travels parallel to the coast, from Barrow Island to the Dampier Shipping Fairways.

In addition, most vessel activity in the vicinity of the PAA is associated with nodes such as offshore facilities (e.g. Wheatstone) and ports; no such nodes occur within the PAA (aside from the Pluto facility).

The presence of the Pluto riser platform, vessels and subsea infrastructure does not result in impacts to commercial shipping beyond a localised exclusion of shipping traffic from the PSZ and the temporary displacement of commercial shipping from subsea support vessels as a result of vessels undertaking activities in the PAA.

Oil and Gas

Several oil and gas facilities are located within 50 km of the PAA (see Section 4.10.5), the nearest being the Wheatstone platform 5 km north of the Pluto riser platform. Operational history of the facility has shown that interactions with other titleholders has not been an issue to date.

Cumulative Impacts

Given the presence of the riser platform, subsea infrastructure and export pipeline as well as support vessels there is the potential for cumulative impacts due to the presence of the Wheatstone platform, subsea infrastructure and support vessels. Additionally, a MODU and support vessels will also be present during Xena-03 Tie-back activities which may incrementally increase cumulative impacts for a shorter period of time ~12 weeks.

Other marine users will be restricted from exclusion zones established around the Pluto riser platform for the duration of this EP and from around the MODU and installation vessels for ~12 weeks. These exclusion zones in combination remain negligible, and partially temporary, relative to the area of overlapping fisheries zones.

Vessel activities in support of both Pluto Facility operations and Xena-03 tie-back activities are usually of a short duration. Any impacts arising from presence of additional vessels in connection with Xena-03 tieback activities are expected to be localised and short-lived with limited, if any, cumulative impacts anticipated.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Contract vessels compliant with Marine Orders for safe vessel operations: Marine Order 21 (Safety of navigation and emergency procedures) 2016 Marine Order 27 (Safety of navigation and radio equipment) 2016 Marine Order 30 (Prevention of Collisions) 2016. Compliance with Marine Orders 21, 27 and 30 reduces the likelihood of interaction of vessels with the facility.	F: Yes CS: Minimal cost. Standard practice.	Marine Orders 21, 27 and 30 are required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Control based on legislative requirement – must be adopted.	Yes C 1.1
Implementation of a 500 m PSZ around riser platform reduces the likelihood of interaction of vessels with the facility.	F: Yes. CS: Minimal cost. Standard practice.	The PSZ is a requirement under Australian regulations and reduces the likelihood of interactions with third parties and the riser platform.	Control based on legislative requirement – must be adopted.	Yes C 1.2

Establishment of a 500 m safety exclusion zone around MODU and primary installation vessel and communicated to marine users.	F: Yes. CS: Minimal cost. Standard practice.	Establishment of a 500 m safety exclusion zone around MODU and the primary installation vessel reduces the likelihood of interaction with other marine users.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes C 1.3
For Xena-03 tieback activities, reasonable attempts at removal of wellhead(s) will be made in the event of a respud.	F: Yes. CS: Additional cost. Standard practice.	In accordance with OPGGS Act Section 572.	Benefits outweigh cost/ sacrifice. Control is also standard practice.	Yes C 1.4
MODU mooring systems (chains/wires and anchors) will be removed.	F: Yes CS: Additional cost. Standard Practice.	In accordance with OPGGS Act Section 572.	Benefits outweigh cost/sacrifice.	Yes C 1.5
Good Practice				
Location of permanent Pluto infrastructure shown on AHO marine charts.	F: Yes. CS: Minimal cost. Standard practice.	Include location of permanent Pluto infrastructure on maritime charts.	Benefits outweigh cost sacrifice.	Yes C 1.6
Consultation undertaken in support of the Petroleum Activities Program, so that marine users are informed and aware.	F: Yes. CS: Minimal cost. Standard practice.	Consultation ensures marine users are informed and aware.	Benefits outweigh cost sacrifice.	Yes C 1.7
Notify AHO of activities no less than four working weeks prior to scheduled activity commencement date, where vessels will be in the Operational Area, but outside of the Petroleum Safety Zone >3 weeks.	F: Yes CS: Minimal cost. Standard Practice.	Notification of AHO will enable them to issue a Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) thereby reducing the likelihood of unplanned interactions with other vessels.	Benefits outweigh cost sacrifice.	Yes C 1.8
Notify AMSA Joint Rescue Coordination Centre (JRCC) of activities where vessels will be in the field >3 weeks, 24 to 48 hrs before activities.	F: Yes CS: Minimal cost. Standard Practice.	Communicating the Petroleum Activities Program to other marine users ensures they are informed and aware should emergency response be required.	Benefits outweigh cost sacrifice.	Yes C 1.9
Notify relevant persons for XNA03 tieback 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 interference with other marine users.	Benefits outweigh cost/ sacrifice. Control is also standard practice.	Yes C 1.10
Notify DoD no less than four weeks before Xena-03 Tie-back activities commence.	F: Yes CS: Additional cost. Standard practice.	In accordance with request made by DoD during consultation.	Benefits outweigh cost/sacrifice	Yes C 1.11

Notify government departments, fishing industry representative bodies and licence holders of activities prior to commencement and upon completion of the Xena-03 Tie-back activities.	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 interference with other marine users.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes C 1.12
Notify AMSA Joint Rescue Coordination Centre (JRCC) of IMMR activities within shipping lanes.	F: Yes CS: Minimal. The control will only apply to IMMR activities undertaken within a shipping lane.	Notification of AMSA ensures they are informed and aware, thereby reducing the risk of unplanned interactions within shipping lanes.	Benefits outweigh cost sacrifice	Yes C 1.13
Develop a SIMOPS Plan to manage rig interactions with other facilities/vessels, where multiple campaigns occur within the PAA (i.e. during xmas tree installation). SIMOPS Plan to contain information on: minimum separation distances communications MODU/vessels/ activities involved in SIMOPS exclusion zone entry and exit processes ROV operations helicopter operations key roles, responsibilities and emergency contacts PTW arrangements incident reporting and investigation management of change.	F: Yes. CS: Minimal cost. Standard practice.	SIMOPS Management Plans between Woodside operated vessels in the PAA will provide for efficient delivery of the activity.	Benefits outweigh cost/sacrifice.	Yes C 1.14
Professional Judgement – Eliminate				
Reducing the PSZ.	F: No. PSZ is mandated by the OPGGS Act and is an SCE; it cannot be reduced. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No

Limit the Petroleum Activities Program to avoid peak shipping and commercial fishing activities.	F: No. Shipping occurs year-round and cannot be avoided. SIMOPS with fishing seasons cannot be eliminated as exact timings for all activities are not confirmed. 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				
Pluto's collision prevention system is implemented to alert marine vessels of the facility location, which reduces the likelihood of adverse interaction with other marine users.	F: Yes. CS: Minimal cost. Standard practice.	Pluto's collision prevention system equipment has the ability to alert marine vessels of the facility location, which reduces the likelihood of adverse interaction with other marine users.	Control is SCE requirement – must be adopted.	Yes C1.15
Over-trawl protection on subsea infrastructure.	F: Yes. Over-trawl protection on subsea infrastructure could be fitted to Pluto subsea infrastructure. CS: Significant additional cost associated with designing and installing trawl protection on subsea infrastructure.	Over-trawl protection on subsea infrastructure could mitigate the potential for commercial fishing trawl gear to damage infrastructure or result in gear loss.	Given the PAA only overlies a small portion of the fisheries management area open to trawl fishing, the cost of installing over-trawl protection is considered grossly disproportionate to the environmental benefit.	No

ALARP Statement:

On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the potential impacts of the physical presence of the facility, subsea infrastructure, MODU and project vessels on other users.

Identified controls comprehensively cover all legislative requirements, relevant industry codes, standards and guidelines as well as company requirements.

Efforts towards reducing potential for impacts by identifying additional or alternative controls was a key feature of HAZID/ENVID studies informing this EP. 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 approach to risk assessment and implementation strategy is consistent with Woodside policies, procedures and standards ensuring consistency and reliability in our environmental management practices. The management of risk and potential impacts of the activity to other marine users and values are also consistent with legislative and other regulatory requirements including relevant policy documents, guidelines and conservation plans. This ensures our activities are aligned with national standards and objectives. Woodside has comprehensively considered the socio-economic context relevant to the activity allowing us to understand and respect the inherent values and sensitivities of other users of the operational area of the activity. We have assessed, responded to and adopted controls from objections and claims received from relevant persons, ensuring community concerns are addressed in our management strategies of the activity. This includes expectations of AMSA and AHO provided in consultation with relevant persons. The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts from the physical presence of the Petroleum Activities Program to a level that is broadly acceptable; and demonstrates the EPOs are met.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 1a Prevent adverse interactions between operational vessels/ facility/subsea infrastructure and other marine users during the Petroleum Activities Program.	C 1.1 Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 21 (Safety of navigation and emergency procedures) 2016 Marine Order 27 (Safety of navigation and radio equipment) 2016 Marine Order 30 (Prevention of Collisions) 2016.	PS 1.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Orders 21, 27 and 30).	MC 1.1.1 Marine verification records demonstrate compliance with standard maritime safety procedures (Marine Orders 21, 27 and 30).
	C 1.2 Implementation of a 500 m Petroleum Safety Zone around riser platform.	PS 1.2 Petroleum Safety Zone maintained and monitored for incursions.	MC 1.2.1 Records of adverse interactions in 500 m Petroleum Safety Zone with other marine users are recorded.
	C 1.6 Permanent infrastructure shown on AHO maritime charts.	PS 1.6 Woodside to notify AHO of location of permanent infrastructure.	MC 1.6.1 Records demonstrate that permanent Pluto infrastructure is shown on AHO maritime charts.
	C 1.7 Undertaking consultation program to advise relevant persons of the Petroleum Activities Program.	PS 1.7 Implement a consultation process that conforms to the requirements of the Environment Regulations.	MC 1.7.1 Records demonstrate a consultation program that conforms to the requirements of the Environment Regulations has been undertaken (refer to Section 5).

EPOs, EPSs and MC for Pluto Facility Operations			
	C 1.8 Notify AHO of activities no less than four working weeks prior to scheduled activity commencement date, where vessels will be in the Operational Area, but outside of the Petroleum Safety Zone >3 weeks.	PS 1.8 Woodside to notify AHO of activities where vessels will be in the Operational Area, but outside of the Petroleum Safety Zone >3 weeks.	MC 1.8.1 Records demonstrate that AHO notifications complete.
	C 1.9 Notify AMSA Joint Rescue Coordination Centre (JRCC), of activities where vessels will be in the Operational Area, but outside of the Petroleum Safety Zone >3 weeks, 24 to 48 hrs before activities commence.	PS 1.9 AMSA's JRCC is notified 24 to 48 hrs before mobilisation, for activities in the Operational Area, but outside of the Petroleum Safety Zone >3 weeks, for awareness should emergency response be required.	MC 1.9.1 Records demonstrate a once-off notification provided to AMSA's JRCC within required timeframes before mobilisation.
	C 1.13 Notify AMSA Joint Rescue Coordination Centre (JRCC) of IMMR activities within shipping lanes.	PS 1.13 Woodside to notify AMSA Joint Rescue Coordination Centre (JRCC) of IMMR activities within shipping lanes 24-48 hours before activity commencement	MC 1.13.1 Records demonstrate AMSA Joint Rescue Coordination Centre (JRCC) has been notified of IMMR activities within shipping lanes.
	C 1.15 Pluto's collision prevention system implemented to alert marine vessels of the facility location, which reduces the likelihood of adverse interaction with other marine users.	PS 15.1 (Refer to Loss of Marine Vessel Separation MEE-04) Integrity managed in accordance with Performance Standard(s) and Safety Critical Element Management Procedure (Section 7.4) to prevent environment risk related damage to SCEs for: P34 Ship Intrusion Detection Systems to: - alert facility of a potential collision with marine vessels - alert marine vessels of facility location so they may take timely action to avoid the facility and hence reduce the likelihood of collision.	MC 1.15.1 Records demonstrate implementation of SCE Performance Standard(s) and Safety Critical Element Management Procedure.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 1b Prevent adverse interactions between MODU/vessels/subsea infrastructure and other marine users during the Petroleum Activities Program.	C 1.1 Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 21 (Safety of navigation and emergency procedures) 2016 Marine Order 27 (Safety of navigation and radio equipment) 2016 Marine Order 30 (Prevention of Collisions) 2016	PS 1.1 Vessels contracted whose practices comply with Marine Order as applicable to vessel size, type and class (Marine Orders 21, 27 and 30).	MC 1.1.1 Marine verification records demonstrate compliance with standard maritime safety procedure (Marine Orders 21, 27 and 30).
	C 1.3 Establishment of a 500 m safety exclusion zone around MODU installation vessel and communicated to marine users.	PS 1.3 No entry of unauthorised vessels within the 500 m safety exclusion zone.	MC 1.3.1 Daily Operations Reports and Incident records demonstrate breaches by unauthorised vessels within the safety exclusion zone are recorded.
	C 1.4 For XNA03 tieback activities, reasonable attempts at removal of wellhead(s) will be made in the event of a respud	PS 1.4 Removal of wellheads attempted during thePetroleum Activities Program in the event of a respud.	MC 1.4.1 Daily Drilling Reports demonstrate reasonable attempts at wellhead removal are made.
	C 1.5 MODU mooring systems (chains/wires and anchors) will be removed	PS 1.5 Mooring systems (chains/wires and anchors) will be removed.	MC 1.5.1 Records demonstrate mooring systems (chains/wires and anchors) were removed
	C 1.7 Undertaking consultation program to advise relevant persons of the Petroleum Activities Program.	PS 1.7 Implement a consultation process that conforms to the requirements of the Environment Regulations.	MC 1.7.1 Consultation records demonstrate a consultation program that conforms to the requirements of the Environment Regulations has been undertaken (refer to Section 5).

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	C 1.8 Notify AHO of activities no less than four working weeks prior to scheduled activity commencement date.	PS 1.8 Notification to AHO of activities and movements to allow generation of navigation warnings (MSIN and NTM) (including AUSCOAST warnings where relevant)).	MC 1.8.1 Consultation records demonstrate that AHS has been notified before commencing an activity to allow generation of navigation warnings (MSIN and NTM (including AUSCOAST warnings where relevant)).
	C 1.9 Notify AMSA Joint Rescue Coordination Centre (JRCC), of activities 24 to 48 hrs before activities commence.	PS 1.9 Notification to AMSA JRCC to prevent activities interfering with other marine users. AMSA's JRCC will require the MODU's details (including name, callsign and Maritime Mobile Service Identity (MMSI)), satellite communications details (including INMARSAT-C and satellite telephone), area of operation, requested clearance from other vessels and need to be advised when operations start and end.	MC 1.9.1 Records demonstrate a once-off notification provided to AMSA's JRCC within required timeframes before mobilisation.
	C 1.12 Notify relevant persons and/ or organisations for XNA03 tieback activities within the Petroleum Activities Profeam that commence more than a year after EP acceptance.	PS 1.12 Relevant persons and/ or organisations will be notified prior to scheduled activity commencement date where XNA03 tieback activities within the Petroleum Activities Program commence more than a year after EP acceptance.	MC 1.12.1 Consultation records demonstrate relevant persons and/ or organisations have been notified if XNA03 tieback activities commence more than a year after EP acceptance.
	C 1.13 Notify DoD of activity no less than four weeks before operations commence.	PS 1.13 Woodside will provide DoD activity notification no less than four weeks prior to commencement of drilling, well interventions / work-overs or subsea installation activities.	MC 1.13.1 Consultation records demonstrate that DoD and AHO have been notified prior to commencement of drilling or subsea installation activities.
	C 1.14 Notify relevant government departments, fishing industry representative bodies and licence holders of activities prior to commencement and upon completion of activities.	PS 1.14 AFMA, DCCEEW, CFA, DAFF – Fisheries, Recfishwest, DPIRD, WAFIC and relevant Fishery Licence Holders (North West Slope and Trawl Fishery, Western Deepwater Trawl Fishery) will be notified no less than ten days before activity commences and following completion of activities.	MC 1.14.1 Consultation records demonstrate that listed relevant persons have been notified prior to commencement and following completion of drilling or subsea installation activities.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	C 1.16 Develop a SIMOPS Plan to manage MODU interactions with other facilities/vessels, where multiple campaigns occur within the PAA (i.e. during xmas tree installation). SIMOPS Plan will contain information on: minimum separation distances communications MODU/vessels/ activities involved in SIMOPS exclusion zone entry and exit processes ROV operations helicopter operations key roles, responsibilities and emergency contacts PTW arrangements incident reporting and investigation management of change.	PS 1.16 MODU and applicable vessels compliant with SIMOPS Plan.	MC 1.16.1 Records demonstrate implementation of SIMOPS Management Plan when MODU working in vicinity of other facilities/vessels, i.e. during xmas tree installation.

6.7.2 Physical Presence: Disturbance to the Seabed

Context		
Facility Layout and Description – Section 3.4 Facility Operations – Section 3.5 Subsea, Inspection, Maintenance & Repair Activities – Section 3.10 Xena-03 Drilling & Tie-back Activities – Section 3.11 Vessel-based Activities for the Xena-03 Tie-back – Section 3.12	Physical Environment – Section 4.4 Habitats and Biological Communities– Section 4.5	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Presence of Pluto Facility and subsea infrastructure		x	x		x			A	E	-	-	LCS GP PJ	Broadly Acceptable	EPO 2
Subsea operations, inspection, monitoring maintenance and repair activities including installation of pig receivers/launchers at the subsea wells		x	x		x				E					
Presence of redundant infrastructure remaining infield until Facility EOFL		x	x		x				F					
Disturbance to seabed from drilling operations		x	x		x				F					
Disturbance to seabed from subsea installation of infrastructure (e.g. flowlines, umbilicals, flying leads) as well as rectification and stabilisation activities (e.g. installation of concrete mattresses)		x	x		x				F					
Disturbance to seabed from ROV operation (including localised sediment relocation from sediment mobilisation techniques and marine growth removal)		x	x		x				E					
Disturbance to seabed from mooring installation		x	x		x				E					

Placement and retrieval of seabed transponders and temporary installation aids		x	x		x				E					

Description of Source of Impact

Seabed disturbance associated with the Petroleum Activities Program can occur during operations and Xena-03 Tie-back activities including:

- physical presence of the facility and subsea infrastructure (operational and redundant)
- scour, spans, and flowline movement inherent in design
- subsea IMMR activities
- Xena-03 tie-back activities

Operations

Physical presence

The physical presence of the Pluto facility provides hard substrate habitats from the surface to the seabed via jackets and risers, as well as along the seabed from pipelines, flowlines and manifolds. The presence of subsea infrastructure and the interaction with hydrodynamic processes may result in localised scouring to the seabed and localised sedimentation of fine substrates around infrastructure.

Flowline movement may occur as per design and within integrity margins along the flowline corridors. Normal flowline operational movement occurs due to factors such as flowline buckling, walking and varying metocean conditions. Lateral movement can occur within the flowline corridor. Management of flowline buckling and walking, and scouring around subsea infrastructure may necessitate IMMR activities, as part of integrity management practices.

Subsea IMMR activities

Woodside may be required to undertake routine subsea IMMR activities within the PAA, to maintain the integrity of subsea infrastructure. IMMR activities identified as impacting the benthic environment include, but are not limited to:

- inspections – localised sediment resuspension by ROV
- marine growth removal – localised resuspension of sediment; removal of marine biota from subsea infrastructure and the Pluto facility jacket
- sediment relocation – localised modification of benthic habitat and sediment resuspension
- span rectification, pipeline protection and stabilisation – minor, localised modification of benthic habitat within footprint of area subject to rectification/protection/stabilisation
- flowline and umbilical replacement – minor, localised modification of benthic habitat in the vicinity of the flowline/umbilical
- spool repair/replacement – minor, localised modification of benthic habitat in the vicinity of the spool
- temporary placement of tools on the seabed e.g. baskets – minor localized modification of the benthic habitat in the vicinity of the items.
- pig launcher/receiver installation and retrieval - minor, localised modification of benthic habitat and sediment resuspension in the vicinity of the receiver.

The area of benthic habitat predicted to be impacted varies depending on the nature and scale of the IMMR activity, however no impact is expected beyond the PAA. Span rectification is the IMMR activity with the greatest potential to modify benthic habitats, due to the alteration of the existing soft sediment habitat to hard substrate. Woodside's operational experience on the North West Shelf indicates these activities (e.g. span rectification, pipeline protection and stabilisation) are typically restricted to relatively short (tens of metres) linear sections of pipeline, with areas of up to approximately 200 m2 impacted. Refer to MEE-02 Subsea equipment loss of containment which includes controls to limit scour and flowline movement within integrity requirements.

Drilling and MODU Operations

Drilling activities may result in intermittent or discontinuous direct physical or mechanical disturbance to the seabed up to an approximate 100 m radial distance around the Xena-03 well location due to the installation of the BOP and conductor. Potential impacts to the seabed from the generation and discharge of cuttings and drilling fluids are considered in Section 6.7.8 and Section 6.7.9 respectively.

Mooring Installation and Anchor Hold Testing

The Xena-03 well may be drilled using a moored or hybrid MODU. Seabed disturbance will result from installation of the MODU anchor mooring system (supported by AHVs), including placement of anchors and chain/wire/fibre lines on the seabed, potential dragging during tensioning, and recovery of anchors. Mooring may require an 8 to 12 point pre-laid mooring system, with RAR and buoyed arrangements an option, depending on the time of year. Although the exact anchoring configurations are not finalised, a semi-submersible MODU with an 8 to 12-point anchoring system

could disturb up to 0.013 km2 (13,000 m2), allowing for anchor footprint and disturbance from anchor chains (NERA, 2018).

The area of seabed affected by mooring installation depends upon water depth, currents, size of the vessels and anchors, and length of anchor chain (NERA, 2018). Seabed disturbance from mooring installation and anchor hold testing will result in localised, small scale seabed disturbance relating to the benthic habitats described in Section 4.5.

The planned anchoring activities are to be within the parameters defined in the Anchoring of Vessels and Floating Facilities Environment Plan Reference Case (Department of Industry, Innovation and Science, undated) for all anchoring activities performed by vessels and floating facilities (excluding FPSOs and Floating LNG vessels) during the Petroleum Activities Program, including:

- installation of moorings, buoys, equipment or other infrastructure for a period of up to two years
- wet storage on seabed of anchor chains, etc. during activities up to two years
- activities with total areas of seabed disturbance less than 13,000 m2
- locations of water depth greater than 70 m. This boundary is set to exclude areas of sensitive primary producer habitats (e.g. corals, seagrass) that occur in shallower waters.

Subsea Installation Activities

Subsea installation will include the installation of subsea infrastructure (including placement of materials/equipment on the seabed), supporting structures (including wellhead, flowline, flying leads, subsea distribution unit, mudmats) and installation aids (clump weights, concrete mattresses, sandbags). Subsea infrastructure components are described in Section 3.4. The estimated total footprint of the Xena-03 Tie-back is 1405 m2, with additional subsea infrastructure including the 500 m flowline, wellhead, EHU, concrete mats and UTAs.

Subsea structures (subsea distribution unit, mudmats) will be deployed to the seabed by the installation vessel's primary crane and guided to final position by ROV. Commencement of the flowline installation generally requires tension to the flowline as it transitions from the installation vessel to the seabed. Therefore, commencement of the flowline installation may start with landing the end of flowline termination head into the manifold connection system or on the seabed attached to the initiation anchor (drag anchor or clump weight/dead anchor). This will cause small, localised and temporary impacts to water quality in the vicinity of flowline landout.

Once the termination end is fully landed, the flowline is to be continuously laid using vertical lay system and at the same time, the ROV monitors the touch-down point on the seabed as well as the flexible lay back radius. Flying leads will be deployed to the seabed in deployment baskets, and final subsea tie-in will be completed using ROVs.

Span rectification

The optimum flexible flowline route will be selected by considering seabed bathymetry, pre-installation ROV surveys and installation risk management, including dropped object risks and buckling/walking impacts. This reduces the potential for spanning and therefore the need for span rectification, while avoiding potential hard substrate habitats.

Where span rectification is required, concrete mattresses may be positioned at the identified free span location using the vessel crane and ROV. The dimensions for each concrete mattress are expected to be 6 m x 3 m x 0.3 m. Post-lay span rectification may involve placing grout bags (multiple ~25 kg) on the seabed, with the extent of any impact limited to the footprint of the installed flexible flowline.

Scouring

Scouring is the movement of sediment around the base of subsea structures due to prevailing wind conditions. Concrete mattresses may be installed at the Xena-03 UTA if required, to mitigate scouring.

Stabilisation

Stabilisation is a post lay activity so that light items, such as HFL, EFL and flowlines, remain at their installed positions; i.e., not being shifted due to strong seabed current, by installing sand bags on top of HFLs, EFLs and flowlines at a predetermined distance apart. Sandbags generally come in a standard size with 20 kg to 40 kg weight. Concrete mattresses may also be used for stabilisation of some sections of the Xena-03 flexible flowline subject to detailed design.

Crossings

Sandbags or concrete mattresses may be installed for crossings over existing umbilicals or flowlines.

Wet Storage of Equipment

Temporary wet storage of installation aids may be required intermittently during Xena-03 Tie-back activities. Installation aids will be recovered at the completion of the Xena-03 Tie-back activities by ROV and project vessels.

ROV Operations

The use of an ROV during drilling and subsea installation activities may result in temporary seabed disturbance and suspension of sediment as a result of working close to, or occasionally on, the seabed. ROV use close to or on the seabed is limited to that required for effective and safe subsea activities. The footprint of a typical ROV is about 2.5 m × 1.7 m (4.25 m²).

Additionally, an ROV may be used to relocate small amounts of sediment material to create a stable, level surface and reduce the potential for scouring from subsea equipment (e.g. BOP).

Marine Growth Removal

Excess marine growth may need to be removed following return to well after a period of suspended drilling. Removing marine growth is undertaken via a high-pressure water and/or brushes or acid, by ROV.

Underwater Transponders

An array of long base line (LBL) transponders may be installed on the seabed as required to support drilling and subsea installation activities. Transponders may be moored to the seabed either by a clump weight or mounted on a seabed frame. The standard clump weights used, made of cement or steel, will likely weigh about 80 kg. A typical seabed frame is 1.5 m × 1.5 m × 1.5 m in dimension and weighs about 40 kg. On completion of the positioning operation, the array transponders moored by clump weight will be recovered by means of a hydrostatic release and the clump weights removed from the seabed. The transponders mounted on seabed frames will be removed by ROV.

Contingency Activities

Woodside may need to intervene or workover the Xena-03 well. Any seabed disturbance would be the same as those described for drilling operations and MODU operations. In addition, in the event of a respud of the Xena-03 well, the base case would be to remove the wellhead. However, if reasonable attempts at wellhead removal are unsuccessful, a wellhead may remain in situ until the end of field life. If this is the case, it will be recorded in a database and monitored and maintained until decommissioned. If a wellhead is left in-situ, there would be localised seabed disturbance at the wellhead location.

Impact Assessment

Drilling, subsea installation, IMMR activities and physical presence of subsea infrastructure can be categorised into two potential impacts:

- direct physical disturbance of benthic habitat
- indirect disturbance to benthic habitats from sedimentation.

ROVs working well above the seabed do not have an impact on the seabed.

Water and Sediment QualitySeabed disturbance may include localised and temporary decline in water quality due to increased suspended sediment concentrations and increased sediment deposition caused by drilling, subsea installation and IMMR activities near the seabed. Similarly, removal of marine growth from the Pluto jacket for structural integrity maintenance, carried out on an as required basis, would cause localised temporary decrease in water quality and suspended sediment from water jetting activities.

Each discrete IMMR activity near the seabed is likely to cause a single brief disturbance resulting in a transient plume of suspended sediment. This plume will subsequently be deposited down current as particles settle out. Such localised and short-term events may affect small areas of the seabed and consequently, impact the associated biota (typically sparsely distributed infauna and sessile fauna). Given the expected nature and scale of resuspension resulting from IMMR activities, impacts such as smothering or burial are not expected. Rather, impacts are likely to be restricted to increased ingestion of sediments by filter feeders. Biota in the region are well adapted to periodic turbidity events caused by cyclones and tidal movements. As such, impacts from turbidity caused by IMMR activities are not expected to have any lasting effect on benthic biota.

Benthic Habitats

The Pluto facility is located within deeper offshore waters (~85 m) approximately 152 km north-west of Dampier and includes the riser platform, hydrocarbon gathering system and export pipeline, extending through shallower waters to the state-waters boundary. The benthic habitat within the PAA is predominantly soft sediment (Section 4.5) with sparsely associated epifauna, which is broadly represented throughout the NWSP and NP Provinces.

Benthic communities in the soft sediment seabed are characterised by burrowing infauna such as polychaetes, with biota such as sessile filter feeders occurring on areas of hard substrate (such as subsea infrastructure).

Direct seabed disturbance, including permanent modification of benthic communities, may result as a consequence of IMMR activities such as span rectification, pipeline protection and stabilisation. These activities typically disturb a small area (typically < 200 m2) of soft sediment habitat, which is broadly represented in the Operational Area and wider NWMR region.

Drilling

Physical impacts from drilling activities (excluding impacts from routine and non-routine discharges such as drill cuttings assessed in Section 6.7.8) are expected to be for the most part confined to sediment burrowing infauna and surface epifauna invertebrates, particularly filter feeders, inhabiting the seabed directly around the Xena-03 well. Impacts from the installation of subsea infrastructure are expected to be confined to sediment burrowing infauna and surface epifauna invertebrates, particularly filter feeders, inhabiting the seabed directly around the installation site. Impacts to these broadly represented communities are expected to be highly localised with no significant impact.

Seabed disturbance will be limited to the wellhead (100 m radial distance), subsea infrastructure and anchoring physical footprint (estimated at up to 0.013 km2); a small proportion of the benthic habitat and associated communities

of the PAA will be affected. Marine life such as deep water benthic communities epifauna and infauna (living on and in the sediment dominated habitat), may be impacted from the placement of project infrastructure (i.e. Xena-03 wellhead, flowline and subsea infrastructure), or placement of temporary supporting infrastructure (anchors, installation aids) and equipment (e.g. mud mats) on the seabed. Potential impacts include; burial or smothering of benthic biota from localised sediment deposition, particularly to sessile epifauna such as sea pens and infauna (polychaetes); and potential clogging or damage to the physiological functioning of certain biota (sea pens, polychaetes) reliant on external respiratory and feeding structures from elevated suspended sediment load (turbidity). Secondary impacts may include highly localised alterations to epifauna and infauna communities (Newell et al., 1998).

Mooring installation activities (MODU) are likely to result in localised physical modification to a small area of the seabed and disturbance to soft sediment. An anchor must travel a certain horizontal distance before penetrating and embedding into the seabed. The drag length of the anchors may be up to a linear distance of 100 m from the drop location (NERA, 2018). The disturbance footprint extends beyond this distance with the anchor chain. The maximum disturbance radius of each anchor drop will therefore not exceed the drag length, plus the additional length of the anchor chain that comes into contact with the sea floor (4000 m). Following recovery of the anchors, impacts from the disturbance (estimated at up to 0.013 km2) are expected to be localised and short-term, with the underlying conditions present to support re-colonisation and recovery after the activity has been completed (Ingole et al. 2005).

ROV activities associated with IMMR and Xena-03 Tie-back operations, near the seafloor and small amounts of sediment relocation may result in slight and short-term impacts to deepwater biota, detailed above, as a result of elevated turbidity and localised sedimentation. However, elevated turbidity and sedimentation would only be expected to be slight and short-term, and is therefore, not expected to have any consequential impact to environment receptors.

Values and Sensitivities

Ancient Coastline at 125 m Depth Contour

The Facility Operational Area overlaps approximately 9 km2 of the 16,190 km2 Ancient Coastline, which is about 0.06% of the KEF. The Facility Operational Area represents a 1500 m2 buffer around the Pluto subsea infrastructure to facilitate vessel operations; the potential for seabed disturbance is much more localised (i.e. within tens of metres of the subsea infrastructure).

Benthic habitat surveys in the region (including within the Ancient Coastline at 125m depth contour KEF) indicate that benthic habitats within the KEF are characterised by sand interspersed with areas of rubble and outcroppings of limestone pavement (AIMS 2014b, RPS 2011). Such habitats are widely distributed in the NWMR. No significant escarpments, species of conservation significance, emergent features or areas of high biological productivity characteristically associated with the Ancient Coastline at 125 m KEF have been observed in the Facility Operational Area. As noted in Section 4.7, the geomorphic feature associated with this KEF is represented worldwide and represents the coastline during a previous glacial period. These impacts are discussed in relation to filter feeders above. Therefore, potential impacts to this regional-scale KEF are expected to be negligible.

Continental Slope Demersal Fish Communities

The Facility Operational Area and the Xena-03 Operational Area overlap the Continental Slope Demersal Fish Communities KEF. Seabed disturbance will have no adverse environmental impact on this KEF and the presence of the riser platform and subsea infrastructure may provide habitat for demersal fish communities potentially having a low level positive environmental impact.

Montebello Australian Marine Park (IUCN IV)

A small portion of the Pluto Export Pipeline Operational Area overlaps the Montebello Marine Park Multiple Use Zone. The Marine Park includes values associated with the shallow shelf environment, however no pinnacle or terrace seafloor features are found within the Operational Areas.

Direct loss of sediments in the Marine Park may be possible if IMMR activities include the placement of materials on the seabed. In addition, indirect impacts may occur as a result of sedimentation. These impacts are discussed in relation to soft sediment benthic habitats above.

Cultural Heritage

As described in Section 4.10, the PAA overlaps the Ancient Coastline at 125 m depth contour KEF. The wider Xena-03 Operational Area overlaps the Ancient Coastline KEF, the targeted well location and installation activities for the Xena-03 well are not within the Ancient Coastline KEF. Therefore, there may be the potential that Indigenous Cultural features may exist, and these may potentially be impacted during seabed disturbance resulting from operations and associated activities. While no cultural features have been identified in the PAA, consultations with First Nations groups have been undertaken for the Petroleum Activities Program.

Cumulative Impacts

Seabed disturbance may arise from the Pluto facility, subsea infrastructure and IMMR activities as well as Xena-03 tie-back activities at a localised level limited to well within the PAA. At a regional scale, cumulative impacts also arise from the presence of the Wheatstone platform and associated subsea infrastructure and activities. The activities are expected to incur localised and temporary declines in water quality and modification of soft sediment habitat where infrastructure has a physical footprint. These impacts are considered to be temporary and, in the case of benthic habitat modification, limited relative to the vast representation of similar habitat in the PAA and surrounds as well as

regionally. Cumulative impacts are considered to be localised and temporary, or in the case of physical footprints, to be slight relative to the presence of similar habitat in the PAA and regionally.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
MODU Mooring systems (chains/ wires and anchors) will be removed.	F: Yes. CS: Additional cost. Standard practice.	In accordance with OPGGS Act Section 572.	Benefits outweigh cost/ sacrifice	Yes C 1.6
A ROV survey will be undertaken post maintenance or repair activity, and post Xena-03 tie-back activities, to confirm all temporary equipment has been removed and to record location of new subsea infrastructure	F: Yes CS: Minimal cost ROV as left survey is standard practice	In accordance with OPGGS Act Section 572 all equipment is removed when no longer in use.	Legislative requirement	Yes C 2.1
Location of subsea infrastructure brought into the PAA, is tracked and recorded.	F: Yes. CS: Minimal cost. Standard Practice.	In accordance with OPGGS Act Section 572 the location of equipment is tracked to enable future removal.	Benefits outweigh cost sacrifice.	Yes C 2.2
Monitoring and maintenance of redundant infrastructure is undertaken in accordance with the IMMR process.	F: Yes. CS: Minimal cost. Standard practice.	Monitoring and maintenance of redundant subsea infrastructure undertaken to enable cost efficient and safe removal and meet Section 572(2) and (3) of the OPGGS Act.	Legislative requirement.	Yes C 2.3
Remove redundant infrastructure as soon as it is no longer used, nor to be used.	F: Yes. CS: Removal of property throughout the operational life where it is incorporated within or located close to live infrastructure introduces additional complexities and HSE risk that can be avoided if removed during EOFL decommissioning.	While subsea equipment is in-situ, risks and impacts to the seabed are considered to be low, so only a minor reduction in sediment /habitat disturbance from less infrastructure in the PAA would be achieved.	Cost of standalone retrieval work scopes are considered disproportionate to the benefit gained when considering the risks of retrieval during current operations versus risk of extending duration in-situ. Wet stored subsea infrastructure is also RBI assessed and managed while preserved to ensure integrity and retrieval	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
			options are maintained for potential full removal.	
For Xena-03 subsea tie-back activities, reasonable attempt(s) at removal of wellhead will be undertaken in the event of a respud and if unable to be removed, is monitored and maintained.	F: Yes CS: Additional cost. Standard practice.	In accordance with OPGGS Act Section 572.	Benefits outweigh cost/ sacrifice.	Yes Refer to C 1.4
Good Practice				
Subsea infrastructure will be positioned within planned footprint to reduce seabed disturbance.	F: Yes. CS: Standard practice.	Ensures risks appropriately addressed for seabed disturbance.	Benefits outweigh cost/sacrifice.	Yes C 2.5
Xena-03 Project-specific Basis of Well Design, which includes an assessment of seabed sensitivity.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of anchoring occurring in areas of high sensitivity.	Benefits outweigh cost/sacrifice.	Yes C 2.7
Project-specific MODU Mooring analysis.	F: Yes. CS: Additional costs associated with upgraded MODU mooring design.	The mooring design analysis determines the number and spread of anchors required based on sediment type and seabed topography, reducing the likelihood of anchor drag leading to seabed disturbance.	Benefits outweigh cost/sacrifice.	Yes C 2.8
Positioning technology used to place seabed infrastructure within the design footprint to reduce seabed disturbance	F: Yes. CS: Minimal cost. Standard practice.	Use of positioning technology to position infrastructure on the seabed with accuracy will reduce seabed disturbance.	Benefits outweigh cost/sacrifice.	Yes C 2.9
Wet parked items will be tracked and removed from the seabed (monitoring and maintenance)	F: Yes CS: Minimal cost. Standard practice.	Ensures inventory of equipment is maintained and no wet parked items are unintentionally left in situ	Benefits outweigh cost/sacrifice.	Yes C 2.10
Review of existing survey data by a suitably qualified maritime archaeologist to inform areas for laydown and/or installation of equipment to avoid or where not possible, minimise physical impacts to	F: Yes. CS: Minimal costs associated with review of data and avoidance or minimisation options.	Review of data by suitably qualified maritime archaeologist will inform potential exclusion or avoidance areas for seabed disturbance. Implementing this process will protect and minimise any physical impacts to underwater cultural heritage. Additionally, this process is not inconsistent	Benefits outweigh cost sacrifice.	Yes C 2.11

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
cultural heritage areas or prospective areas.		with the draft guidelines for working in the near and offshore environment to protect Underwater Cultural Heritage (DCCEEW, 2023).		
Unexpected finds of potential Underwater Cultural Heritage sites/ features, including First Nations UCH are managed in accordance with an Unexpected Finds Procedure set out in Section 7.8.	F: Yes. CS: Cost of implementation.	Allows management of Unexpected Finds in accordance with legislative requirements, (including Underwater Cultural Heritage Guidance for Offshore Developments and the DRAFT Guidelines to Protect Underwater Cultural Heritage under the UCH Act, expert advice and community expectations.	Benefits outweigh cost/ sacrifice.	Yes C 2.12
Report any potential underwater cultural heritage finds to relevant stakeholders and authorities in accordance with the Unexpected Finds Procedure, Underwater Cultural Heritage Act 2018 and the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (ATSIHP Act).	F: Yes. CS: Minimal costs associated with reporting process.	Meets legislative requirements and community expectations.	Benefit outweighs cost/ sacrifice.	Yes C 2.13
Relevant vessel crew and ROV operators will be advised in an induction of the potential to encounter UCH and requirement to follow the Unexpected Finds Procedure	F: Yes. CS: Minimal costs associated with reporting process.	Ensures workforce are suitably aware of legal and process requirements for managing cultural features and heritage values.	Benefits outweigh cost/ sacrifice	Yes C 2.14
Professional Judgement – Eliminate				
Vessels used for IMMR activities will not anchor under routine operations.	F: Yes. CS: Minimal. Subsea support vessels undertaking IMMR activities typically do not anchor	By not anchoring, the potential impacts to benthic habitat are reduced.	Benefits outweigh cost sacrifice.	Yes C 2.15
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	Not assessed, control not feasible.	Not assessed, control not feasible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
	seabed) is critical as the ROV is an integral part of IMMR activities. CS: Not assessed, control not feasible			
Pre-lay survey undertaken prior to installation of flowlines.	F: Yes CS: Minimal cost.	May identify potential environmental sensitivities within subsea infrastructure footprint. Given the relatively small footprint and previous observations in the Operational Area, no particularly sensitive benthic habitats are expected to occur. Pre-lay surveys are routinely undertaken for engineering purposes.	Benefits outweigh cost/sacrifice.	Yes C 2.16
Do not complete anchor hold testing for the MODU	F: No. Anchor hold testing is a requirement for a moored MODU and it is not technically feasible for the MODU to use DP in the water depth of the well location (about 130 m). Woodside has a demonstrated capacity to manage the environmental risks and impacts from mooring to a level that is ALARP and acceptable. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
Monitoring and maintenance of subsea infrastructure to manage scour and flowline	F: Yes, subsea inspection maintenance and integrity	Monitoring and maintenance of subsea infrastructure confirms benthic seabed disturbance is	Control is WMS requirement – must be adopted.	Yes C 2.17

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
movement to within integrity envelope.	monitoring is undertaken which inherently controls extent of scour and flowline movement CS: Minimal cost. Standard practice	limited to design flowline corridor.		Refer also MEE-02
Monitoring of seabed surrounding riser platform and subsea infrastructure.	F: Yes. ROV footage collected as part of subsea integrity surveys could be reviewed to observe and detect changed in benthic habitats. CS: Costs associated with the review of collected footage.	Limited environmental benefit (information) gained from monitoring benthic habitats.	Given the sparsely populated infauna habitat and low sensitivity of the environment surrounding the facility and associated subsea infrastructure, any environmental benefit gained is outweighed by costs associated with implementing control.	No
ALARP Statement: On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the impacts of seabed disturbance from Xena-03 Tie-back activities and subsea IMMR activities. 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, seabed disturbance from subsea activities is unlikely to result in a potential impact greater than slight, short-term impact to benthic habitats and marine sediments and water quality. Further opportunities to reduce the impacts have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. The potential impacts are considered broadly acceptable if the adopted controls are implemented. The inclusion of C2.1, C2.5, C2.9 and C2.17 will confirm the activity is undertaken as described. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of Xena-03 Tie-back activities and subsea IMMR activities to a level that is broadly acceptable; and demonstrate the EPOs are met.				

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 2a Limit adverse impacts to seabed to Slight[40] beyond the physical footprint of the facility infrastructure during the Petroleum Activities Program.	C 2.1 A ROV survey will be undertaken post maintenance or repair activity to confirm temporary equipment has been removed and to record location of new subsea infrastructure.	PS 2.1 Temporary equipment is removed.	MC 2.1.1 As left survey confirms temporary equipment is removed.
	C 2.2 Location of subsea infrastructure, brought into the PAA is tracked and recorded.	PS 2.2 Location of equipment, including infrastructure made redundant by the installation of a replacement, is recorded and updated in an inventory.	MC 2.2.1 Records confirm location of replacement equipment and remaining redundant equipment.
	C 2.3 Monitoring and maintenance of redundant infrastructure is undertaken in accordance with the IMMR process.	PS 2.3 IMMR/RBI process is applied to redundant equipment.	MC 2.3.1 Records demonstrate that the IMMR/RBI process has been applied to redundant infrastructure.
			MC 2.3.2 Inspections and maintenance activities have been completed in accordance with the IMMR/RBI process.
	C 2.15 Vessels used for IMMR will not anchor under routine operations.	PS 2.15 Vessels used for IMMR activities will not anchor under routine operations.	MC 2.15.1 Records demonstrate no anchoring during IMMR activities.
	C 2.17 Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement within integrity envelope.	PS 2.17 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P09 – Pipeline Systems to - maintain the minimum required mechanical integrity to prevent loss of containment due to scour/flowline movement.	MC 2.17.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure.

[40] Defined as 'slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute' as in Table 2-3, Section 2.6.3.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 2b Limit adverse impacts to seabed to Slight[41] beyond the physical footprint of the facility infrastructure during the Petroleum Activities Program.	C 1.6 See Section 6.7.1	PS 1.6 See Section 6.7.1	MC 1.6.1 See Section 6.7.1
	C 2.1 A ROV survey will be undertaken post Xena-03 Tie-back activities to confirm temporary equipment has been removed and to record location of new subsea infrastructure.	PS 2.1 Temporary equipment is removed.	MC 2.1.1 As left survey reports confirm temporary equipment is removed.
	C 2.10 Wet parked items will be tracked and removed from the seabed	PS 2.10 Location of equipment, including infrastructure made redundant by the installation of a replacement, is recorded and updated in an inventory.	MC 2.10.1 Records confirm location of replacement equipment and remaining redundant equipment.
	Refer to C 1.4 and C 2.3 Reasonable attempt(s) at removal of wellhead will be undertaken in the event of a respud, and if unable to be removed, infrastructure is monitored and maintained (C 3.3 above).	PS refer to PS 1.4 and PS 3.3	MC refer to MC 1.4.1 and MC 3.3.1
	C 2.5 Subsea infrastructure will be positioned within planned footprint to reduce seabed disturbance.	PS 2.4 All infrastructure will be placed within the design footprint within the Xena-03 Operational Area.	MC 2.5.1 As built survey reports verify location installation of equipment within the design footprint within the Xena-03 Operational Area.
	C 2.5 Project specific Basis of Well Design, which includes an assessment of seabed sensitivity.	PS 2.5 MODU well site locations consider seabed sensitivities.	MC 2.5.1 Approved Basis of Well Design includes the assessment of seabed sensitivities.
	C 2.7 Project specific MODU Mooring Design Analysis.	PS 2.7 Seabed disturbance from MODU mooring limited to that required to ensure adequate MODU station holding capacity.	MC 2.7.1 Records demonstrate Mooring Design Analysis approved and implemented during anchor deployment.

[41] *Defined as 'slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute' as in Table 2-3, Section 2.6.3.*

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	C 2.9 Positioning technology used to place seabed infrastructure within the design footprint to reduce seabed disturbance.	PS 2.9.1 Infrastructure will be positioned in the planned location where impacts have been assessed.	MC 2.9.1 As-built survey reports verify installation of equipment within acceptable tolerance42.
		PS 2.9.2 Transponder equipment, including clump weights/frames, will be removed at the end of the Petroleum Activity Program.	MC 2.9.2 Records demonstrate removal of transponder As left survey reports confirm temporary equipment is removed.
	C 2.10 Support vessels used for the Xena-03 Tie-back activities will not anchor under routine operations.	PS 2.10 Vessels used for Xena-03 Tie-back activities will not anchor under routine operations.	MC 2.10.1 Records demonstrate no anchoring during Xena-03 Tie-back activities.
	C 2.12 Pre-lay survey undertaken prior to installation of flowlines.	PS 2.12 Pre-lay survey will be undertaken prior to the installation of flowlines.	MC 2.12.1 Pre-lay survey report demonstrates survey was undertaken prior to installation of flowlines.

[42] Acceptable tolerance is considered to be ±150 m, given the homogenous and low sensitivity habitat.

6.7.3 Acoustic Emissions: Generation of Noise for Facility Operations

Context		
Facility Layout and Description – Section 3.4 Facility Operations – Section 3.5 Support Vessel Operations - Section 3.8 Helicopter Operations – Section 3.8.5 Subsea IMMR Activities – Section 3.10	Protected Species – Section 4.6	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Noise generated within the PAA from: • Pluto Facility and associated infrastructure • Vessels (ASV and support vessels) • Helicopters • Subsea IMMR activities						x		A	F	-	-	LCS GP PJ	Broadly Acceptable	EPO 3

Description of Source of Impact

The facility, vessels, IMMR activities and helicopters will generate noise both in the air and underwater, due to normal operation of machinery noise, propeller movement, and infrequent non-routine activities. Typical noise levels for these sources are provided in Table 6-3, with more detailed descriptions provided below. This noise will contribute to and can exceed ambient noise levels which range from around 90 dB re 1 µPa sound pressure level (SPL) under very calm, low wind conditions, to 120 dB re 1 µPa SPL under windy conditions (McCauley, 2005).

Table 6-3: Indicative source characteristics of underwater noise associated with the Petroleum Activities Program as reported in Jiménez-Arranz et al. (2017) and by McCauley (2005) and McCauley (2002)

Acoustic Noise Sources	Estimated SPL (dB re 1 µPa SPL) @1 m unless otherwise stated	Frequency Range (kHz)
Vessels (Continuous)		
Support vessels, ASV using DP	182	Broadband
IMMR Activity Noise (Pulsed)		

Multibeam Echo Sounder (MBES)	210–247	12–675
Side Scan Sonar (SSS)	200–234	9–675
Sub-bottom Profiler (SBP) (Pinger)	167–212	4–12
SBP (Chirp)	161–205	2–23
SBP (Boomer)	205–225	0.3–6
Wellhead, Flowlines and Subsea Infrastructure (Continuous)		
Wellhead	113	Broadband
Choke valve	155	Broadband
Production platforms		
Riser platform	110–130 @100 m	Broadband (mainly < 100 Hz)

** Range provided was not measured at the noise source; therefore, this should be used as an indicative estimate only and cannot be used to estimate exposure thresholds closer to the source.*

Continuous (Non-Impulsive) Noise Sources

Platform Machinery and Flaring

Production platforms have machinery mounted on decks raised above the sea, hence, most noise is transmitted to the marine environment from air (i.e., power generation and operational flaring). Machinery noise on-board the riser platform may be radiated into the underwater environment via the jacket legs and risers, which may act as transducers. Monitoring programs have indicated that underwater noise from platforms is typically very low or not detectable (Jiménez-Arranz et al., 2017; McCauley, 2002).

The flare system will generate noise from combustion. Noise from flaring represents a health and safety risk to personnel, and noise from flaring was considered in the design of the facility to manage the occupational health and safety risks associated with noise (e.g. height specification of flare tower). Noise from flaring is emitted at the top of the flare tower, which has a flare boom length of 87 m. Noise from the tip of the flare is not constrained and will spread spherically in all directions.

Gales (1982) assessed noise from 18 oil and gas platforms, including 11 bottom-standing fixed platforms during production operations (i.e. consistent with the Pluto riser platform). The study found the strongest noise levels were relatively low frequency (< 100 Hz, and mostly between 4 and 38 Hz), with sound levels of 110 to 130 dB re 1 µPa @100 m (Gales, 1982). Noise from the platforms was found to be lower than levels recorded from support vessels, with a cumulative increase in overall underwater noise of 20–30 dB from the noise produced by a support vessel operating in the vicinity of an operations platform (Gales, 1982).

Noise emitted from machinery on the riser platform is limited relative to other operating facilities due to its NNC status, smaller size and the lack of processing facilities on the riser platform. Therefore, it is likely that the range provided by Gales (1982) is a conservative estimate. Noise from the riser platform is not expected to significantly increase from operation of the water handling unit given the nature and duration of the installation and commissioning activities. In summary, noise emissions generated by the facility are expected to be minimal.

Wellheads, Pipelines and Subsea Infrastructure

The noise produced by an operational wellhead was measured by McCauley (2002). The broadband noise level was very low, 113 dB re 1 µPa, which is only marginally above rough sea condition ambient noise. For a number of nearby wellheads, the sources would have to be in very close proximity (< 50 m apart) before their signals summed to increase the total noise field (with two adjacent sources only increasing the total noise field by 3 dB). Hence, for multiple wellheads in an area, the broadband noise level in the vicinity of the wellheads would be expected to be of the order of 113 dB re 1 µPa and this would drop very quickly to ambient conditions on moving away from the wellhead, falling to background levels within < 200 m from the wellhead.

Based on the measurements of wellhead noise discussed in McCauley (2002), which included flow noise in flowlines, noise produced along a flowline or the export pipeline may be expected to be similar to that described for wellheads, with the radiated noise field falling to ambient levels within a hundred metres of the flowline. Woodside has undertaken acoustic measurements on noise generated by the operation of choke valves associated with the Angel facility (JASCO 2015) similar to the design employed across Pluto subsea valves. These measurements indicated choke valve noise is continuous, and the frequency and intensity of noise emitted is dependent on the rate of production from the well. Noise intensity at low production rates (16% and 30% choke positions) were approximately 154–155 dB re 1 µPa, with higher production rates (85% and 74% choke positions) resulting in lower noise levels (141–144 dB re 1 µPa). Noise from choke valve operation was broadband in nature, with the majority of noise energy concentrated above 1 kHz.

Vessels and operations of Dynamic Positioning Systems

The main source of noise from vessels (platform support, subsea support, ASV) relates to the use of DP thrusters (i.e. cavitation from thruster propellers). Thruster noise is typically high intensity and broadband in nature, with sound pressure levels of 137 dB re 1 µPa at 405 m from a typical offshore support vessel holding station in strong currents (McCauley 1998). McCauley (2005) measured underwater broadband noise up to approximately 182 dB re 1 µPa at 1 m (SPL) from a support vessel holding station in the Timor Sea; it is expected that noise levels up to this level may be generated by vessels using DP during the Petroleum Activities Program. Thruster noise from vessels holding station is typically the most intense underwater noise source from vessel activities; other sources of underwater noise from vessels (e.g. main engines when underway, machinery noise transmitted through the hull, etc.) are typically considerably lower intensity noise (McCauley 1998). Note that vessels undertaking the Petroleum Activities Program inherently minimise the use of DP, and there is little potential to reduce DP use further.

For planned operations and maintenance activities, vessels are expected to be in the field operating 24 hours per day for approximately 14 days, approximately 10 times per year. However, vessels will be present for longer durations or at a higher frequency during pigging operations, corrective maintenance and interventions, major/shutdown maintenance, contingent manning (refer to Section 3.5.3). For example, the ASV may be utilised for campaigns of approximately 90 days duration (Section 3.8.3).

Helicopter Transfers

Helicopter activities occur in the PAA, including landing and take-off on the facility or vessel helidecks. Helicopters land and take-off on the riser platform (which occurs typically twice every 10 weeks during normal operations but may occur more often during unplanned maintenance activities) and potentially on subsea support vessels. 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 (SPL) and for Sikorsky-61 is 108 dB re 1 µPa (SPL) at 305 m (Simmonds et al. 2004). 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) – the majority of the noise energy 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 being almost entirely reflected (Richardson et al., 1995). Given this, and the typical characteristics of helicopter flights within the PAA (duration, frequency, altitude and air speed), the opportunity for underwater noise levels to exceed the behavioural thresholds is not considered credible and is not assessed further.

Impulsive Noise Sources

Subsea Inspection, Monitoring, Maintenance and Repair Activities

MBES and SSS are low-energy, high-resolution geophysical survey instruments that may be required for IMMR every 1-6 years to identify buckling, movement, scour and seabed features. MBES have operating frequencies ranging from 12 kHz to 700 kHz (Jimenez-Arranz et al. 2017) with peak pressure (PK) source levels between approximately 210 and 245 dB re 1 µPa at 1 m (Jimenez-Arranz et al. 2017; Zykov 2013; MacGillivray et al. 2013). MBES generate micro-pulses of high frequency sound in a highly focused beam directed towards the seabed, which attenuates rapidly underwater compared to lower frequency sound sources. Due to this directionality and short pulse duration, there is relatively low sound energy and very limited horizontal sound propagation. The high operating frequencies of many MBES are typically above the hearing range of the low frequency (LF) cetacean (7 Hz to 35 kHz; Southall et al. 2019) and high frequency (HF) cetacean (150 Hz to 160 kHz; Southall et al. 2019) species that may occur in the Petroleum Activities Area. The high operating frequencies of MBES are also above the hearing ranges of marine turtles (<2 kHz, Finneran et al. 2017) and the majority of fish species (100 Hz to several kHz; Ladich 2000, Popper et al. 2014). Additionally, sound sources generated closer to the seabed have a lower received noise level in the horizontal direction due to seafloor scattering and absorption.

Similar to MBES, SSS produce micro-pulses of sound in a focussed swath directed at the seabed. SSS operating frequencies may range between 75 kHz and 900 kHz, with sound energy attenuating rapidly with horizontal distance from the main swath (Jimenez-Arranz et al. 2017; Zykov 2013). Representative source levels range between 200 and 235 dB re 1 µPa PK at 1 m (Jimenez-Arranz et al. 2017; Zykov 2013). The high operating frequencies of SSS places the dominant sound frequencies above the hearing range of most marine fauna species, including LF cetaceans, turtles and fish, although some of the lower frequency devices may be audible to HF cetaceans (MacGillivray et al. 2013; Zykov 2013).

Sub-bottom profiling may also be undertaken every 1-6 years to identify features under the seabed. Most commercial SBPs are small, low-powered, high-resolution and shallow-penetrating systems, producing electrical pulses across a range of frequencies (Salgado Kent et al., 2016; Jiménez-Arranz et al., 2017). The instruments proposed for the survey produce pulses of sound between approximately 2 kHz and 30 kHz with source levels between approximately 170 and 230 dB re 1µPa PK at 1 m. Indicative source characteristics for typical acoustic survey equipment are provided in Table 6-3.

Positioning Equipment

An array of long baseline (LBL) and/or ultra-short baseline (USBL) transponders may be used for positioning during IMMR activities. Transponders typically emit pulses of medium frequency sound, generally within the range 21 to 31 kHz. The estimated SPL at source ranges from 180 to 202 dB re 1 µPa SPL at 1 m (Jiménez-Arranz et al. 2017).

Impact Assessment

Receptors

Fauna associated with the PAA is predominantly pelagic species of fish, with migratory species such as turtles, whale sharks and cetaceans potentially present in the area seasonally. Noise interference is a key threat to a number of migratory and threatened cetaceans and marine turtles identified as occurring within the PAA (Section 4.6).

The PAA overlaps BIAs for whale sharks (foraging), pygmy blue whale (migration and distribution), humpback whale (migration), roseate tern (breeding), fairy tern (breeding) and wedge-tailed shearwaters (breeding). Whale sharks are present between March and November. Marine turtle species may also be present within the PAA seasonally; however, no BIAs or other important areas for these species overlap the PAA.

Two key ecological features feature within the PAA. The Pluto Offshore Facility Operational Area overlaps the Continental Slope Demersal Fish Communities KEF, and the export pipeline route within the Pluto Offshore Facility Operational Area; overlaps the Ancient Coastline at 125 m KEF. This indicates that operational activities at the Pluto Facility have the potential for impact on the Continental Slope Demersal Fish Communities KEF and operational activities relevant to the export pipeline may have the potential for impact on the Ancient Coastline at 125 m KEF (Figure 4-10).

Demersal fish from these KEFs may be impacted by noise emissions. While the Ancient Coastline at 125 m KEF may be associated with outcroppings of hard substrate, no evidence of significant reefs has been found in the Pluto Offshore Facility Operational Area. Note some demersal fish are also likely to be associated with subsea infrastructure such as the export pipeline (McLean et al., 2017).

Potential Impacts 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); and

through disturbance leading to behavioural changes or displacement from important areas (e.g., BIAs). The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation.

Increasing the distance from the noise source usually 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) depends upon several factors such as water column depth, pressure, temperature gradients, and salinity, as well as surface and bottom conditions.

Cetaceans

Species Sensitivity and Exposure Thresholds

Marine mammals and especially cetaceans rely on sound for important life functions including individual recognition, socialising, detecting predators and prey, navigation and reproduction (Weilgart. 2007; Erbe et al. 2015; Erbe et al. 2018). Underwater noise can affect marine mammals in various ways including interfering with communication (masking), behavioural changes, a shift in the hearing threshold (PTS and TTS), physical damage and stress (Erbe, 2012; Rolland et al. 2012). Frequency-specific hearing sensitivity differs among marine mammals, influencing how they are affected by noise exposure. For the purposes of predicting the effects of noise exposure on different groups of cetaceans, blue whales, humpback whales and other large mysticete (baleen) whales are categorised as low frequency (LF) cetaceans, while odontocetes (toothed whales and dolphins) are categorised as high frequency (HF) or very high frequency (VHF) cetaceans (Southall et al. 2019).

The thresholds that could result in behavioural response for cetaceans is expected to be 120 dB re 1 µPa (SPL) for continuous noise sources, and 160 dB re 1 µPa (SPL) for impulsive noise sources (Table 6-4). These thresholds have been adopted by the United States National Oceanic and Atmospheric Administration (NOAA) (National Marine Fisheries Service [NMFS], 2014, 2018; Southall et al. 2019; NOAA, 2019). The adopted thresholds are based on best data available and published in peer-reviewed literature and represent conservative internationally accepted and applied impact evaluation thresholds.

Table 6-4: Thresholds for PTS, TTS and behavioural response onset for low-frequency (LF), high-frequency (HF) and very high frequency (VHF) cetaceans for continuous and impulsive noise.

Hearing group	Impulsive					Continuous		
	PTS onset		TTS onset		Behavioural response	PTS onset	TTS onset	Behavioural response
	SEL24h	PK	SEL24h	PK	SPL	SEL24h	SEL24h	SPL
LF cetaceans	183	219	168	213	160	199	179	120
HF cetaceans	185	230	170	224	160	198	178	120
VHF cetaceans	155	202	140	196	160	173	153	120

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

SEL24h expressed as dB re 1 µPa².s; Peak pressure (PK) and SPL expressed as dB re 1 µPa.

The Conservation Management Plan for the Blue Whale (BWCMP) (Commonwealth of Australia, 2015a), a recovery plan made under the EPBC Act, defines important areas for pygmy blue whales and these are also described with reference to BIAs in the National Conservation Values Atlas (NCVA), with particular emphasis placed on foraging areas and migration corridors. As noted above and in Section 4.6.3, the PAA overlaps the pygmy blue whale migration BIA, with the nearest foraging BIA (Ningaloo possible foraging area) approximately 232 km to the south of the PAA. Action Area A.2.3 of the BWCMP states: "Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury, and is not displaced from a foraging area". Furthermore, the Guidance on Key Terms within the Blue Whale Conservation Management Plan (DAWE, 2021), underwater noise emissions from the petroleum activities program must not:

- Result in injury[43] (TTS or PTS) to any pygmy blue whale in BIAs; or
- Displace a pygmy blue whale from a foraging BIA.

The following assessment of impacts to cetaceans includes consideration of the requirements of the BWCMP with respect to pygmy blue whales.

The National Recovery Plan for the Southern Right Whale (DCCEEW, 2024b) also identified anthropogenic noise as a threat, however the BIAs and habitat critical to the survival are over 250km away, well outside the area where behavioural responses are expected to extend from the Operational Area and as such, there is not expected to be any anthropogenic noise from the petroleum activity that could displace or interfere with life cycle activities within, or near, the reproduction or migration BIAs and habitat critical to the survival.

Predicted Underwater Noise Impacts to Cetaceans

Facility and Support Vessel Noise Impacts

Vessels holding station are considered to be the predominant noise source related to the Petroleum Activities Program. Using thruster noise, McCauley (1998) measured underwater broadband noise equivalent to about 182 dB re 1 µPa SPL (SPL) at 1 m from a support vessel holding station in the Timor Sea. Similar noise levels are expected to be generated by vessels used for the Petroleum Activities Program.

PTS and TTS thresholds for LF cetaceans are 199 dB re 1 µPa2 s (SEL weighted) and 179 dB re 1 µPa2 s (SEL weighted), respectively for continuous noise sources (refer Table 6-4). Typical sound exposures generated by the facility and a support vessel using DP would not exceed these levels (except at extremely close ranges to the source), so PTS and TTS in LF cetaceans, such as large baleen whales, is not anticipated.

Potential impacts to cetaceans may instead include behavioural disturbance from vessels. The thresholds that could result in behavioural response for cetaceans is expected to be 120 dB re 1 µPa (SPL) for continuous noise sources such as vessels (refer Table 6-4).

Acoustic modelling undertaken for an operating FPU and support vessel on DP predicted that sound from each sound source individually would exceed the 120 dB threshold up to a maximum distance of 670 m, while combined sound sources exceeded the threshold to a distance of 1.07 km (McPherson et al. 2019). Although some site and facility-specific differences may exist, 1 km is considered broadly indicative of the range at which underwater sound propagating from the Pluto facility and support vessels may cause a behavioural response in cetaceans.

The Pluto facility is located in ~85 m water depth and is located outside of the pygmy blue whale (PBW) migration biologically important area (BIA) (platform is ~17 km south-east of the boundary and outside of the humpback whale migration BIA (platform is ~24 km north-west of the boundary, see Figure 4-8).

Based on underwater noise modelling and monitoring results for a similar DP-3 thruster system44 (the West Aquarius MODU), sound levels would drop below permanent threshold shift (PTS) and temporary threshold shift (TTS) (i.e., injury) exposure thresholds for low frequency cetaceans (including PBW and humpback whales) within a few hundred metres of the thrusters. Therefore, there is no possibility of underwater noise emissions from the ASV resulting in TTS onset within the PBW migration BIA or humpback whale migration BIA, even with additional cumulative noise from the presence of additional Production Support Vessels on DP adjacent to the ASV and Pluto facility.

Cetaceans are capable of moving away from potential noise sources, and there are no constraints to their movement within the PAA. LF cetaceans such as humpback whales and pygmy blue whales may be seasonally present in the PAA, though limited to individuals infrequently transiting through the area. Interactions between pygmy blue whales or humpback whales with vessels typically result in avoidance behaviour, with whales generally moving away from vessels (Bauer 1986; Stamation et al. 2010).

Given the migration corridor BIAs for pygmy blue whales and humpback whales overlap the PAA (pygmy blue whale BIA overlaps the Facility Operational Area and humpback whales BIA overlaps the Export Pipeline Operational Area), there is the potential for these species to be exposed to underwater noise from vessels associated with the Petroleum Activities Program when they are present in the region during seasonal migrations. However, as the underwater noise levels that may be generated by DP vessels and IMMR activities are below those resulting impairment or mortality, only behavioural impacts are credible. Impacts are expected to be limited to localised avoidance of the noise source as there are no physical barriers in or near the operational areas that may prevent cetaceans from moving away from vessels.

Aerial surveys of humpback whales show the majority of humpback whales migrate within continental shelf waters along Western Australia (Double et al., 2010, 2012; Jenner et al., 2001). Humpback whales are expected to transit the Export Pipeline Operational Area during their annual north and south migrations between May and November, where vessel activity will be limited to during intermittent IMMR activities. These activities are relatively short-term and occur relatively infrequently and, therefore, are unlikely to impact humpback whales.

Pygmy blue whales are likely to be present when migrating north between April and August and south between October and December. Tagging studies of pygmy blue whales showed tagged animals were typically in water depths of > 1000 m. Pygmy blue whales are expected to transit the subsea hydrocarbon gathering system section of the facility and are unlikely to occur within proximity to the riser platform.

Mid and high frequency cetaceans are known to show behavioural disturbance at a range of received noise levels (Southall et al., 2007a). Mid- and high frequency cetaceans may exhibit short-term behavioural responses to increased levels of underwater noise, such as avoidance or attraction. This is expected to occur mainly within the Export Pipeline Operational Area during IMMR activities, but is unlikely to significantly impact these species (e.g., spotted bottlenose dolphins). In summary, potential impacts to blue whales, humpback whales and other cetaceans from predicted noise levels are expected to be limited to behavioural impacts within a localised area around vessels with no lasting effect.

IMMR Activities

Zykov (2013) conducted acoustic modelling for five low energy survey instruments off the coast of California, including MBES, SSS and sub-bottom profiler. All equipment types were modelled in the sandy bottom environment, similar to that of the PAA. 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 IMMR survey equipment.

The high operating frequencies of MBES and SSS places the majority of sound frequencies above the auditory range of LF cetaceans. Dolphins and other HF cetaceans, which have peak hearing sensitivity up to 110 kHz, with potential for some limited hearing ability up to approximately 160 kHz (NMFS 2018, Southall et al. 2019), may be able to detect a small amount of the sound energy from some instruments in the lower operating frequency ranges available for MBES and SSS (MacGillivray et al., 2013; Zykov, 2013).

The modelling by Zykov (2013) indicates that the sound emissions from MBES and SSS do not exceed PTS and TTS accumulated sound exposure criteria for LF cetaceans at any distance, and do no– exceed criteria for HF cetaceans beyond 2 - 3 m horizontal distance from the source, which is not considered to be a credible exposure scenario for mobile marine fauna. Zykov (2013) also estimated the maximum distance at which the unweighted 160 dB re 1 µPa (SPL) behavioural disturbance threshold for impulsive sound was reached was 290 m for MBES and 690 m for SSS. Again, it is emphasised that many MBES and SSS instruments may operate at frequencies outside of the hearing range of cetaceans and so these would not be audible or result in behavioural disturbance. For instruments with frequencies that overlap with the hearing ranges of cetaceans, a significant proportion of the sound energy may still be outside of their hearing ranges, therefore, the perceived sound levels are reduced and the horizontal distances at which

[44] The Floatel Triumph uses a DP-3 system for station keeping that comprises six azimuth thrusters, each 3200 kW. Therefore, the ASV has 19,200 kW total installed thruster power, which is similar thruster configuration and power to the West Aquarius (eight azimuth thrusters with a total of 28,002 kW installed power)

behavioural disturbances may occur are less than those inferred by the unweighted 160 dB re 1 µPa (SPL) behavioural disturbance threshold. For example, modelling of weighted SPLs by Zykov (2013) for MBES indicated that the 160 dB re 1 µPa (SPL) behavioural threshold was not exceeded for LF cetaceans at any distance and was limited to approximately 205 m horizontal distance for HF cetaceans. For SSS, the modelling of weighted SPLs indicated that the 160 dB re 1 µPa (SPL) behavioural threshold was exceeded at horizontal distances of 110 m for LF cetaceans and 611 m for HF cetaceans.

Acoustic modelling of sub-bottom profilers by Zykov (2013) and McPherson and Wood (2017), indicates limited horizontal sound propagation outside of the main directional field of sound. The modelling studies also indicate that PK and SEL24h thresholds for PTS are not exceeded. The potential for TTS resulting from SEL24h is limited to within a few metres from the moving sound source (Zykov, 2013; McPherson and Wood 2017), which is not considered to be a credible exposure for mobile marine fauna. Exceedance of the 160 dB re 1 µPa SPL behavioural response threshold for impulsive sound is limited to within a few metres in most instances, or up to a maximum of 50 m depending upon which SBP instrument is used, water depth and the seabed sediment characteristics (Zykov, 2013; McPherson and Wood 2017).

Potential impacts to cetaceans from MBES, SSS and sub-bottom profiler may, therefore, include behavioural disturbance if in close proximity to the survey instruments, but ranges to disturbance are less than or equivalent to disturbance ranges for the IMMR vessel itself. PTS or TTS are not considered credible, given individuals would need to be directly next to the noise sources for prolonged duration.

Transponders used for positioning during IMMR activities have the potential to cause some temporary behavioural disturbance to cetaceans. The typical frequencies of 21 to 31 kHz produced by the transponders are most audible to HF cetaceans such as toothed whales and dolphins rather than LF cetaceans, and the source levels (180 to 202 dB re 1 µPa at 1 m SPL) rapidly attenuate within a very short distance from the source, such that PTS or TTS are not considered credible. Based on empirical spreading loss estimates measured by Warner and McCrodan (2011), received levels from USBL transponders are expected to exceed the cetacean behavioural response threshold for impulsive sources out to about 42 m.

Transmissions are not continuous but consist of short ‘chirps’ with a duration that ranges from three to 40 milliseconds. Transponders do not emit sound when on standby. When required for general positioning, they emit one chirp every five seconds (estimated to be required for 4 hrs at a time). When required for precise positioning, they emit one chirp every second (estimated to be required for 2 hrs at a time). Due to the short duration chirps, the temporary and intermittent use and the mid frequencies used by positioning equipment, the acoustic noise from the transponders is unlikely to have a substantive effect on the behavioural patterns of cetaceans.

Potential impacts from predicted noise levels from the operating facility, project vessels, and IMMR survey activities are not considered to be ecologically significant at a population level for cetaceans.

Marine Turtles

Species Sensitivity and Exposure Thresholds

The Recovery Plan for Marine Turtles (Commonwealth of Australia, 2017) notes there is limited information available on the impact of noise on marine turtles and that the impact of noise on turtle stocks may vary depending on whether exposure is short (acute) or long-term (chronic). However, 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).

McCauley et al. (2000) observed the behavioural response of caged green and loggerhead turtles to impulsive sound (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 they began to behave erratically, which was interpreted as an agitated state. The 166 dB re 1 µPa SPL has been used as the threshold level for a behavioural disturbance response by the US NMFS (NSF, 2011) and is applied to this impact assessment. No quantitative (numerical) thresholds have been developed for behavioural effects from continuous sources (e.g., vessel noise) on marine turtles. However, Popper et al. (2014) propose qualitative impact criteria for near-field, intermediate and far-field exposures (Popper et al. 2014). Finneran et al., (2017) presents thresholds for turtle PTS and TTS for both impulsive and continuous sound exposures.

The thresholds listed in Table 6-5 are considered appropriate for the assessment of effects from impulsive and continuous sound sources during the Petroleum Activities Program.

Table 6-5: Thresholds for PTS, TTS and behavioural response onset in marine turtles for continuous and impulsive noise

Hearing group	Impulsive			Continuous		
	PTS onset thresholds: SEL24h (dB re 1 µPa².s)	TTS onset thresholds: SEL24h (dB re 1 µPa².s)	Behavioural response (dB re 1 µPa)	PTS onset thresholds: SEL24h (dB re 1 µPa².s)	TTS onset thresholds: SEL24h (dB re 1 µPa².s)	Behavioural response (dB re 1 µPa)

Marine turtles	204	189	166* 175+	220	200	(N) High (I) Moderate (F) Low#

*Source: PTS and TTS thresholds (Finneran et al., 2017), * behavioural response threshold (impulsive) (NSF 2011), + behavioural disturbance threshold (impulsive) (McCauley et al. 2000), # behavioural response threshold (continuous) (Popper et al. 2014).*

Note: The sound units provided in the table above for continuous noise include: relative risk (high, medium and low) is given for marine turtles at three distances from the source defined in relative terms as near (N – tens of metres), intermediate (I – hundreds of metres) and far (F – thousands of metres) (after Popper et al. 2014).

Predicted Underwater Noise Impacts to Turtles

Facility and Support Vessel Noise Impacts

As noted above, vessels holding station are considered to be the predominant noise source related to the Petroleum Activities Program, with source levels of approximately 182 dB re 1 µPa SPL at 1 m from a support vessel holding station considered to be representative of noise levels generated by vessels used for the Petroleum Activities Program.

Although there are no quantitative sound exposure thresholds for impacts on marine turtles resulting from continuous noise sources, the relative risk for behavioural response is expected to be high within tens of metres of the source, medium within hundreds of metres and low within kilometres from the source (refer Table 6-5). PTS and TTS thresholds for turtles are 220 dB re 1 µPa2 s (SEL weighted) and 200 dB re 1 µPa2 s (SEL weighted), respectively (refer Table 6-5). Typical noise levels generated by the facility and a support vessel using DP would not exceed these levels (except at extremely close ranges to the source), and prolonged exposure of transient marine turtles at close range is not considered a credible scenario.

As outlined above, marine turtles are not expected to be in the area in high numbers even during nesting and internesting periods. Marine turtles are also capable of moving away from potential noise sources, and there are no constraints to their movement within the PAA. Therefore, impacts to marine turtles from project vessels or the platform are expected to be of no lasting effect.

IMMR Activities

As outlined above for cetaceans, Zykov (2013) conducted noise modelling for low energy survey instruments, with the modelling for MBES, SSS and sub-bottom profiler considered comparable for the nature and scale of the low energy IMMR survey equipment. The operating fr–quencies of MBES (12 -700 kHz) and SSS (75 - 900 kHz) are w–ll above the hearing range of turtles (0.1 - 2 kHz) and so no disturbance is expected. It is possible that some of the lower frequen–y sound emitted by sub-bottom profilers (2 - 30 kHz) may be audible to turtles, but again, a large proportion of the sound energy may be at frequencies that are outside of their normal auditory range. Modelling of impulsive sub-bottom profiler sound emissions by Zykov (2013) and McPherson and Wood (2017) indicates that the 166 dB re 1 µPa (SPL) behavioural disturbance threshold for turtles may only be exceeded within metres or tens of metres of the survey instruments. Therefore, behavioural impacts would be highly localised. PTS or TTS is not considered to be credible given the rapid attenuation of sound close to the source and a large proportion of the sound energy is produced at frequencies outside the peak hearing frequency range of turtles.

Transponders used for positioning during IMMR activities typical operate at frequencies of 21 to 31 kHz which is well outside the p–ak hearing frequency range of turtles (0.1 - 2 kHz). Therefore, no impacts are considered credible.

Potential impacts from predicted noise levels from the operating facility, project vessels, and IMMR survey activities are not considered to be ecologically significant at a population level for turtles.

Fish, Sharks and Rays

Species Sensitivity and Exposure Thresholds

Fishes are primarily sensitive to the particle motion component of sound at close range to a sound source, while the presence of the swim bladder results in a varying degree of sensitivity of some fishes to sound pressure (Popper & Hawkins, 2018; Popper et al., 2019). Consequently, fishes are broadly categorised into three groups with respect to their hearing capabilities that are relevant to the types of fishes and sharks that may be present in the Operational Area (Popper et al., 2014):

- Fishes with no swim bladder or other gas chamber (e.g., sharks, mackerels) – Sensitive only to particle motion, not sound pressure changes.
- Fishes with swim bladders, but without a direct connection between the swim bladder and the inner ear (e.g., demersal snappers and emperors) – Hearing primarily involves particle motion with some limited ability to indirectly detect changes in sound pressure.

Fishes with a swim bladder or other gas volume connected directly to the inner ear (e.g. herrings, sardines, pilchards, shads) – These fishes are able to detect both sound pressure as well as particle motion.

Sound exposure criteria applicable to continuous sound sources are presented in Table 6-6. Popper et al. (2014) propose relative risk criteria (high, moderate, low) for injury, impairment and behavioural effects to fishes at three distance categories, near (N) (tens of metres from the source), intermediate (I) (hundreds of metres from the source), and far (F) (kilometres from the source).

Table 6-6: Impact thresholds to fish, sharks and rays for continuous noise

Receptor	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable Injury	TTS	Masking	
Fish: no swim bladder	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder not involved in hearing	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder involving hearing	(N) Low (I) Low (F) Low	170 dB SPL for 48-hours	158 dB SPL for 12-hours	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Note: The sound units provided in the table above include relative risk (high, medium and low) is given for fish (all types) at three distances from the source defined in relative terms as near (N – tens of metres), intermediate (I – hundreds of metres) and far (F – thousands of metres) (after Popper et al. 2014).

Predicted Underwater Noise Impacts to Fish

Facility and Support Vessel Noise Impacts

Vessels holding station using DP are expected to produce sound equivalent to about 182 dB re 1 µPa SPL at 1 m. Modelling undertaken by McPherson et al. (2019) of sound produced by facility and vessel operations found that recoverable injury to some types of fish would only be possible if they remained within a distance of less than 10 m for 48 hours, and TTS if fishes remained within 10 m for at least 12 hours. Pelagic fish are highly mobile, and the types of demersal fishes known to occur in the vicinity of the Pluto facility (e.g. snappers, emperors, cods and groupers) will exhibit some fidelity to the area but are still relatively free-swimming and are not constrained to such close ranges (i.e. 10 m). Therefore, free-swimming fish remaining in close range to sound sources for periods that subject themselves to TTS and injury is not considered to be a credible scenario.

There are no quantitative sound exposure thresholds for impacts on fish, sharks and rays resulting from continuous noise sources. The relative risk for behavioural response is expected to be high within tens of metres of the source, medium within hundreds of metres and low within kilometres from the source (refer Table 6-5). In the context of the riser platform, the largest contribution to operational noise is from the topside and near the surface, with lower sound levels produced from subsea infrastructure such as choke valves. Similarly, sound from the PSV would be at the surface. While some localised behavioural avoidance and masking in the vicinity of the loudest sound sources from the riser platform, choke valves and PSV may occur in some fishes, no lasting effect is anticipated. Fish are also known to habituate to continuous noise sources, which is consistent with fish congregating around operating offshore oil and gas structures.

Considering the overlap of the whale shark foraging BIA with the PAA, it is likely there may be increased numbers of individuals during migratory periods. Currently, there are no quantitative sound exposure thresholds relevant to whale sharks. It is expected that the potential effects of noise on whale sharks are the same as for other fish species, resulting in minor, localised and temporary behavioural change such as avoidance. Therefore, impacts to whale sharks from project vessels or the platform are expected to have no lasting effect. Other fauna associated with the PAA includes predominantly pelagic species of fish, with migratory species such as rays transiting through the PAA; these species may be similarly affected by noise from project vessels/facility. Potential impacts from predicted noise levels from the operating facility, project vessels, and IMMR survey activities are not considered to be ecologically significant at a population level for fish, sharks and rays.

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Legislation, Codes and Standards				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures45: Support vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. Support vessels will not approach closer than 50 m for a dolphin or turtle and/or 100 m for a whale (with the exception of animals bow riding). If the cetacean or turtle shows signs of being disturbed, support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots. Support vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	F: Yes. CS: Minimal cost. Standard practice.	Implementation of these controls is primarily intended to reduce the likelihood of a collision between a cetacean, whale shark or turtle occurring. However, implementation may also provide some reduction in the potential for exposure of these fauna to sound levels in direct proximity to vessels.	Controls based on legislative requirements – must be adopted.	Yes C 3.1
Good Practice				
Vary the timing of the Petroleum Activities Program to avoid migration periods.	F: No. The Petroleum Activities Program occurs continuously over a five year period, modifying the timing of the Petroleum Activities Program is not feasible. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Implement a shutdown zone around MBES, SSS and sub-bottom profiler for the following fauna: whales marine turtles whale sharks.	F: Yes. However, as equipment is underwater, effective	Limited. The areas of disturbance for these devices are limited and injury /	Acoustic MBES, SSS and sub-bottom profiler surveys are infrequently	No

[45] For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
	implementation of zones is challenging from topside observation. CS: Moderate. Requires the provision of a dedicated suitably trained crew member to undertake Marine Fauna Observations.	PTS / TTS is not expected to occur. In addition, it is noted that for many MBES and SSS, the frequency range of these devices are outside the estimated frequency hearing range of identified protected species (whales, turtles and whale sharks).	conducted (every 1- 6 years) as part of the Petroleum Activities Program. The source levels and frequency range of these devices are mostly outside the estimated frequency hearing range of identified protected species (whales, turtles and whale sharks), so costs are considered disproportionate to benefits.	
Professional Judgement – Eliminate				
Eliminate the use of DP on vessels during the Petroleum Activities Program.	F: No. Both platform and subsea support vessels are required to reliably hold station during the Petroleum Activities Program. Failure to do so may lead to loss of separation between vessels and infrastructure. This would result in unacceptable safety and environmental risk (loss of vessel separation has been identified as an MEE) 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				

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Application of bubble curtains to reduce noise propagation.	F: No, Bubble curtain installation and operation in offshore open water not feasible due to technical operation constraints i.e. water depth/current.	Not considered, control not feasible.	Not considered, control not feasible.	No
ALARP Statement: On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the potential impacts from acoustic emissions from vessels, helicopters, wellheads, pipelines and the Pluto platform (including machinery). 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.				

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 3 Limit adverse impacts on fauna from noise emissions during the Petroleum Activities Program to those with No lasting effect	C 3.1 EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, which include the following measures : vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale; 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, activity support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots; and vessels will not travel greater than 8 knots within 250 m of a whale shark	PS 3.1 Vessels will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to manage the risk of fauna collision.	MC 3.1.1 Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans and Woodside Marine Charterers Instructions. MC 3.1.2 Records demonstrate reporting cetacean ship strike incidents to DCCEEW.

	and not allow the vessel to approach closer than 30 m of a whale shark.		

Demonstration of Acceptability
Acceptability Statement:
The impact assessment has determined that, given the adopted controls, impacts from acoustic emissions from vessels, helicopters, wellheads, pipelines and the Pluto platform represent a negligible impact /disturbance to marine fauna within the Export Pipeline and Pluto Facility Operational Areas. Further opportunities to reduce the impacts and risks have been investigated above. The impacts are consistent with good oil-field practice/industry best practice.
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 of acoustic emissions to a level that is broadly acceptable and demonstrate the EPOs are met.

6.7.4 Acoustic Emissions: Generation of Noise during Xena-03 Tie-Back Activities

Context		
Xena-03 Drilling &Tie-back Activities – Section 3.11 Vessel-based Activities for the Xena-03 Tie-back – Section 3.12	Protected Species – Section 4.6	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
Generation of noise from project vessels (MODU, installation vessels, AHVs and support vessels) during Xena-03 Tie-back activities.					x		A	F	-	-	LCS GP PJ	Broadly Acceptable	EPO 4
Generation of noise from DP systems on project vessels.					x			F					
Generation of noise from cutting of well infrastructure and contingency activities.					x			F					

Description of Source of Impact

During Xena-03 Tie-back activities, sound will be generated from a number of sources including from vessels involved with installation of the mooring system, the MODU during drilling operations, support vessels, and retrieval of anchors. Noise may also be generated from contingency activities such as respud, sidetrack, well removal and associated underwater acoustic positioning systems. These noise sources will contribute to and have the potential to exceed ambient noise levels which range from around 90 dB re 1 µPa (sound pressure level [SPL]) under very calm, low wind conditions, to 120 dB re 1µPa (SPL) under windy conditions (McCauley, 2005).

Vessel Noise

A range of vessels may be used to complete the Xena-03 Tie-back activities, including AHVs, MODU, subsea installation vessels and other support vessels (Section 3.12).

The MODU (hybrid or moored) is expected to be on location for drilling operations for approximately 60 days including mobilisation, demobilisation and contingency. Vessels associated with installation of the mooring system will be on location for up to 10 days prior to arrival of the MODU. Subsea installation and commissioning activities may be on location for up to 3 weeks. Mooring system anchor retrieval may also take up to 10 days once the MODU departs.

The vessels will generate noise both in the air and underwater, due to the operation of thrusters, engines, propeller movement, etc. Vessels, including the MODU (unless moored/ hybrid), installation vessels, AHVs, general support vessels will use DP where propellers and thrusters are used to hold position, rather than anchoring, unless in an emergency.

MODU Drilling Operations (moored)

During drilling operations, a moored MODU will produce low-intensity continuous sound. Sound produced from an active MODU is predominantly below 2 kHz, with peak frequencies below 500 Hz.

A range of broadband values, 59 to 185 dB re 1 µPa at 1 m (SPL), have been quoted for various MODUs (Simmonds et al., 2004). McPherson et al. (2021) recorded the source level spectrum of the Ocean Onyx, which is considered representative of a moored MODU considered for the tie-back campaign. The Ocean Onyx was measured to have a broadband (10 Hz to 31 kHz) source level of 175.4 dB re 1 µPa m whilst anchored and drilling and is considered representative drilling activity for this EP. The measured source level for the Ocean Onyx is consistent with or slightly higher than levels recorded for other moored MODUs during drilling operations. For example, McCauley (1998) recorded source noise levels for moored MODUs from 149-154 dB re 1 µPa at 1 m while actively drilling (with support vessel on anchor) and Greene (1987) recorded source levels of two moored drillships from 145-158 dB re 1 µPa at 1 m during drilling (with support vessels idling nearby). Austin et al. (2018) recorded broadband source levels from MODU operations (excluding DP thrusters) to be 170.7 dB re 1 µPa.

Project Vessels and MODU Operation of DP

Vessels used for the Xena-03 Tie-back activities are detailed in Section 3.12, and are DP capable, as required. As discussed in Section 6.7.3, sound levels and frequencies generated by vessels varies with the size of the vessel, speed, engine type and the activity being undertaken.

Indicative MODU underwater noise measurements were taken for the West Aquarius MODU by JASCO on the Scotian Shelf in Canada (Wecker et al., 2022). The 90th percentile of the broadband radiated sound levels was 186.3 dB re 1 µPa (Martin et al., 2019). This is similar to measurements taken for the Maersk Discoverer drill rig on the North West Shelf (Woodside Energy Limited, 2011), where the system emitted tonal signals between 200 Hz to 1.2 kHz, at a source level between 176 and 185 dB re 1 µPa SPL at 1 m.

Noise levels generated by support vessels on standby is expected to be similar to levels discussed in Section 6.7.3.

Sound Transmission Loss Modelling

Noise modelling was commissioned from JASCO by Woodside for the Julimar Appraisal Drilling and Surveys activities (Julimar South-1 well) (Stroot et al., 2022) and Pyxis Drilling and Subsea Installation activities (Xena-02 well) (Wecker, et al., 2022), which are considered broadly comparable in terms of MODU and vessel activities, and the water depths and seabed substrates at the Xena-03 well location.

For moored MODU scenarios, noise modelling for the Julimar Appraisal Drilling and Surveys activities (Stroot et al., 2022) provides a suitable analogue to the size and type of moored MODU and support vessels planned for use during Xena-03 tie-back activities. A number of moored MODU scenarios were modelled including with an offshore supply vessel (OSV) in ~166 m at the Julimar South-1 well location. Given water depth at the Xena-03 location is 177 m and similar seabed substrate, the modelling of the moored MODU and OSV are regarded as a suitable analogue for similar vessels and activities at the Xena-03 location.

For DP vessel activities, noise modelling for Pyxis Drilling and Subsea Installation activities (Wecker, et al., 2022) provides a similar analogue to the size and type of hybrid MODU and support vessels planned for use during the Xena-03 Tie-back activities. Several DP MODU scenarios were modelled, including with an OSV in ~172 m at the Xena-02 well location. As above, this modelling is considered a suitable analogue for similar vessels and activities at the Xena-03 location.

These scenarios included several permutations of support vessels and the MODU undertaking drilling activities, used to inform the worst-case credible noise propagation scenarios (including concurrent activities).

Table 6-7: Summary of modelled scenarios for drilling activities at the Julimar South-1 well location as an analogue for moored operations (source: Stroot et al., 2022).

Scenario Number	Description
1	Anchored MODU Drilling (24h)
2	Anchored MODU Drilling (24h) + OSV on standby (24h)
3	Anchored MODU Drilling + OSV resupply, under DP (2h)
4	Anchored MODU Drilling (24h) + OSV resupply, under DP (8h)
5	Anchored MODU Drilling (24h) + OSV resupply, under DP (8h) + OSV on standby (24h)

Table 6-8: Summary of modelled scenarios at the Xena (Xena-02) field as an analogue for DP operations (source: Wecker et al., 2022).

Scenario Number	Description
6	MODU under DP, drilling at Xena-02 (24 hr)
7	MODU under DP, drilling at Xena-02 (24 hr) + support vessel resupply, under DP (2 hr)
8	MODU under DP, drilling at Xena-02 (24 hr) + support vessel resupply, under DP (8 hr)
9	MODU under DP, drilling at Xena-02 (24 hr) + support vessel on standby (24 hr)
10	MODU under DP, drilling at Xena-02 (24 hr) + support vessel resupply, under DP (8 hr) + support vessel resupply on standby (24 hr)

Source levels representative of drilling and subsea installation scenarios

Source levels for relevant vessels that were used to inform the sound transmission loss modelling (Stroot et al., 2022; Wecker et al., 2022) are presented in Table 6-10. The source sounds were applied to the modelling scenarios for drilling and subsea installation activities.

Table 6-9: Vessel source levels used in the acoustic modelling for the Xena-03 Tie-back activities.

Vessel	Sound Level (dB re 1 µPa².m2.s)	Reference
Moored MODU	175.4	(Stroot et al., 2022)
MODU under DP	187.7	(Wecker et al., 2022)
OSV stationary under DP (resupply scenario)	187.6	(Stroot et al., 2022)
OSV slow transit	177.8	(Stroot et al., 2022)

Sound Transmission Loss Modelling Scenarios

The acoustic modelling scenarios used in this assessment are presented in Table 6-8 and Table 6-9. Vessel scenarios during Xena-03 tie-back activities may differ slightly from those modelled from time to time in terms of precise vessel types, proximity and number. However, the magnitude and extent of potential sound propagation and the resultant effects on marine fauna from the modelled worst-case scenario are expected to be comparable to the worst-case scenario or are conservative.

The acoustic modelling studies assessed distances from operations where underwater sound levels were predicted to drop below thresholds corresponding to behavioural response and injury (temporary reduction in hearing sensitivity or TTS and permanent threshold shift or PTS) for marine fauna. The animals considered included marine mammals, turtles, and fish. Due to the variety of species considered, several different thresholds were used for evaluating effects.

The modelling methodologies considered scenario specific source levels and range-dependent environmental properties. Estimated underwater acoustic levels for non-impulsive (continuous) noise sources presented as sound pressure levels (SPL, Lp), and as accumulated sound exposure levels (SEL, LE) as appropriate for different noise effect criteria, behavioural response and injury (TTS and TPS), respectively. In this report, the duration of the SEL accumulation is defined as integrated over a 24-hour period.

The SEL24h is a cumulative metric that reflects the dosimetric impact of noise levels within 24 hours based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. The corresponding SEL24h radii represent an unlikely worst-case scenario. More realistically, marine mammals (as well as pelagic fish and turtles) would not stay in the same location for 24 hours. Therefore, a reported radius for SEL24h criteria does not mean that marine fauna travelling within this radius of the source will be injured, but rather that an animal could be exposed to the sound level associated with injury (TTS or PTS) if it remained in that location for 24 hours.

Contingency Activities (Respud, Sidetrack, Well Removal)

Contingency activities include a well respud or sidetrack and will involve the use of a MODU and vessels, plus drilling operations. Any acoustic emissions generated will be the same as those expected from the planned activities described above.

In the event the wellhead is removed under this EP scope, additional noise from the cutting of the surface casing and conductors is likely to be generated. Underwater noise associated with cutting (diamond wire) of subsea infrastructure 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. The casings and conductors will be cut below the mudline to enable wellhead recovery using either abrasive water jet cutting method, or mechanical cutting method.

Twachtman et al. (2004) concluded that mechanical cutting and abrasive water jetting, as well as diamond wire cutting methods, are generally considered harmless to marine life and the environment. Similarly, Pangerc et al. (2016) 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. Any noise propagating at seabed from either abrasive water jet cutting or mechanical cutting of the wellhead casing and conductors 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 a DP vessel immediately above the wellhead location. As such, noise from the cutting of the casing and conductors will not add to significantly to noise levels for the Xena-03 Tie-back activities and are not assessed further.

Generation of Underwater Noise from Positioning Equipment

An array of long baseline (LBL) and/or ultra-short baseline (USBL) transponders may be installed on the seabed for metrology and positioning. An array of transponders is proposed within a radius of 500 m from the proposed location of the well and will be in place for a period of about three months. During xmas tree installation, ultra-short baseline transponders (USBL) may be installed on the seabed or mounted to the wellhead as required by the subsea installation activities. Transmissions from USBL transponders are similar to LBL transponders.

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., 2017). Transmissions are not continuous but consist of short ‘chirps’ with a duration that ranges from 3 to 40 milliseconds. Transponders will not emit any sound when on standby and are planned to only actively emit sound for about six hours per well. When required for general positioning they will emit one chirp every five seconds (estimated to be required for four hours at a time). When required for precise positioning they will emit one chirp every second (estimated to be required for two hours at a time). An array of transponders will be active whilst the DP MODU is on location.

Rig Anchor Release system

Should a hybrid MODU be utilised, Rig Anchor Release (RAR) moorings may be installed to allow the DP capable rig rapidly disengage from a mooring system. An RAR device will couple each of the moorings to the MODU (8 – 12 devices depending on mooring spread).

RAR devices typically emit pulses (impulsive noise) of low frequency, in the range of 9-11 kHz. Transmissions are expected to be limited to short pulses with a duration of minutes, during weekly testing. When activated to release moorings, they are expected to emit pulses of ~two minutes duration for each RAR.

Cumulative noise sources

Underwater noise generated during Xena-03 Tie-back activities (~12 weeks) havethe potential for cumulative impacts with routine Pluto Facility Operations (Section 6.7.3) with acoustic emissions from routine operations (e.g. machinery, flaring, IMMR activities etc), which may result in slightly elevated acoustic levels.

As described above, Xena-03 Tie-back activities are likely to include AHVs, a MODU and PIV as well as installation and support vessels. SIMOPS with drilling and installation are not planned but are considered as a contingency. During concurrent activities, a number of vessels may be operating. The worst-case credible scenario is considered to be if the MODU, support vessel and installation vessel are required to be in proximity. This is the case used for the following cumulative assessment of potential impacts.

Table 6-10: Concurrent activities considered in the assessment of cumulative underwater vessel noise

Concurrent Activities	Approx. Duration1	Vessels	Approximate distance between vessels
MODU drilling. Subsea tree installation from installation vessel (or similar activity)	2 days	MODU + supply vessel Installation or IMMR vessel (DP)	<3 km
Pre-Commissioning and start-up of Xena-03 tie back Platform operations and supply	5 days	Commissioning (IMMR class) vessel (DP) Platform + DP supply vessel	~11 km

Notes:

Relates to period of overlap, not entire duration of activity.

Impact Assessment

Potential impacts to environmental values

Receptors

The Xena-03 Operational Area is located in waters at ~177m depth (Section 3.2). The fauna associated with this area will be predominantly pelagic species of fish and cetaceans, with migratory species such as cetaceans, marine turtles and whale sharks occurring in the area seasonally (Section 4.6). Anthropogenic noise interference is a key threat to a number of migratory and threatened cetaceans, marine turtles and whale sharks identified as potentially occurring within the Xena-03 Operational Area.

The migration and distribution BIA for the pygmy blue whale partially overlaps the Xena-03 Operational Area (Section 4.6.3). Migration periods for pygmy blue whales are April to July and October to January, and some whales can be expected to pass by the Xena-03 Tieback activities.

The migration BIA for the humpback whale is ~30 km east of the Xena-03 Operational Area with no overlap. The migration period for humpback whale is June to November and the majority of the migrating population will be found further inshore than the Xena-03 Tie-back activities, inside the BIA.

The internesting buffer BIA for the flatback turtle overlaps the Xena-03 Operational Area. Habitat Critical for the flatback turtle is ~10 kms from the Xena-03 Operational Area (~12 kms from the Xena-03 well location). Given the water depths and distance from shore, the Xena-03 Operational Area, does not represent suitable foraging or internesting habitat. Satellite tracking of flatback turtle nesting populations (Barrow Island and mainland sites) indicates this species travels to the east of Barrow Island between nesting events, within WA mainland coastal waters less than 70 m deep (Chevron Australia Pty Ltd, 2015).

The whale shark foraging BIA overlaps with the Xena-03 Operational Area. Peak whale shark numbers are expected in the region from March to July.

The Continental Slope Demersal Fish Communities KEF overlaps the wider Xena-03 Operational Area (Section 4.7) and is recognised for its biodiversity values, including high levels of species endemism (DCCEEW 2023b). The targeted well location is not within the Continental Slope Demersal Fish Communities KEF (Figure 4-10).

Potential Impacts 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); and

through disturbance leading to behavioural changes or displacement from important areas (e.g. BIAs). The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation.

Sound Propagation

Increasing the distance from the noise source usually 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) depends upon several factors such as water column depth, pressure, temperature gradients, and salinity, as well as surface and bottom conditions.

Cetaceans

Species Sensitivity and Thresholds

Protected species including migratory pygmy blue whales may be encountered near the Xena-03 Operational Area and therefore could be impacted by acoustic emissions associated with Xena-03 Tie-back activities. Thresholds that could result in a behavioural response, TTS and PTS for cetaceans as a result of continuous and impulsive noise sources are presented in Table 6-6.

Predicted Underwater Noise Impacts to Cetaceans

Results - Modelling of a Moored MODU

A sound transmission loss modelling study was conducted by JASCO for several scenarios at the analogous Julimar South-1 well location (water depth – 166.6 m) as well as a nominated OSV standby location (water depth – 150.2 m), (Stroot et al., 2022). The modelling study indicated that exceedances of the PTS and TTS thresholds for low frequency (LF) cetaceans, such as humpback whale and pygmy blue whale, may occur out to a maximum of 0.07 km and 0.92 km respectively. For HF and VHF cetaceans (toothed whales and dolphins), the maximum distances at which sound levels dropped below PTS and TTS thresholds were 0.21 km and 2.76 km respectively.

During normal operations (the moored MODU drilling with an OSV on standby – Scenario 2), the minimum distance to the TTS threshold is 0.23 km, 0.09 km and 2.57 km for LF, HF and VHF cetaceans respectively. The PTS threshold was only exceeded for VHF for Scenario 2, at a maximum distance of 0.15 kmTable 6-11.

As described above, the PTS and TTS thresholds are based on a cumulative metric that that reflects the dosimetric impact of noise levels over a 24 hours period based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. It is not considered credible that individual LF and HF cetaceans that may pass through the Xena-03 Operational Area during the drilling program would experience PTS or TTS, given individuals would need to remain within 70 m (PTS) and <1 km (TTS) of the drilling activity for a period of 24 hours. It is also considered highly unlikely that any VHF cetaceans would experience PTS or TTS.

The behavioural response threshold may be exceeded at a maximum of 3.57 km during normal drilling operations, and at a maximum of 8.85 km at times when an additional OSV is present and operating DP.

Table 6-11: Thresholds for PTS, TTS and behavioural response onset thresholds for cetaceans and marine turtles based on Southall et al. (2019) and Finneran et al. (2017).

Hearing group	Frequency-weighted SEL24h threshold (LE,24h; dB re 1 µPa²·s)	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
		Rmax (km)	Rmax (km)	Rmax (km)	Rmax (km)	Rmax (km)
PTS						
Low-Frequency (LF) cetaceans	199	–	–	0.05	0.07	0.07
High-frequency (HF) cetaceans	198	–	–	0.04	0.05	0.02
Very High-frequency (VHF) cetaceans	173	0.15	0.15	0.19	0.21	0.19
Marine Turtles	220	-	-	0.03	0.01	-
TTS						
Low-Frequency (LF) cetaceans	179	0.23	0.23	0.42	0.84	0.92
High-frequency (HF) cetaceans	178	0.09	0.09	0.12	0.15	0.13
Very High-frequency (VHF) cetaceans	153	1.42	2.57	1.50	1.73	2.76
Marine Turtles	200	-	-	0.05	0.05	0.07
Behavioural response						
Cetaceans	120	1.07	3.57	8.25*		8.85

**Scenario 4 has been omitted from Table 6-12 because Scenario 4 differs to Scenario 3 only by the time duration, and the SPL sound footprints represent the instantaneous sound field, independent on accumulation time. A dash indicates the level was not reached within the limits of the modelled resolution–(20 m).Source: Stroot et al (2022)*

Results - Modelling of a DP MODU

The analogous sound transmission loss modelling study by JASCO for a MODU on DP (Wecker et al., 2022) indicated that the PTS and TTS thresholds for low frequency (LF) cetaceans, such as humpback whale and pygmy blue whale, may be exceeded out to a maximum of 0.13 km and 2.66 km respectively across the scenarios modelled. For HF and VHF cetaceans, the maximum distances at which sound levels dropped below PTS and TTS thresholds were 0.15 km (PTS) and 2.63 km respectively. During normal operations (MODU on DP with a support vessel on standby - Scenario 9), the maximum distance at which the TTS threshold is exceeded is 2.17 km, 0.09 km and 2.44 km for LF, HF and VHF cetaceans respectively. For PTS, the maximum distance at which the threshold is exceeded is 0.08 km, 0.02 km and 0.11 km for LF, HF and VHF cetaceans respectively.

As described above, the radii that represent potential for PTS and TTS onset are based on a 24-hour period of exposure and therefore represent an unlikely worst-case scenario since, more realistically, cetaceans would not stay in the same location or at the same range for 24-hours. It is not considered credible that individual LF, HF and VHF cetaceans that may pass through the Xena-03 Operational Area during DP vessel operations, would experience PTS, given individuals would need to remain within 150 m of the drilling activity for a period of 24 hours. TTS onset is also considered highly unlikely given the known movement behaviour of cetaceans including key migrating LF whale species such as the pygmy blue whale transiting through the Xena-03 Operational Area. The Xena-03 Operational

Area is not known to represent significant foraging/aggregation habitat for cetaceans and individuals are not expected to dwell within the area for extended periods.

The behavioural response threshold may be exceeded at a maximum of 17.2 km during normal drilling operations and a maximum of 20.7 km at times when an additional support vessel is present and operating DP.

Table 6-12: Thresholds for PTS, TTS and behavioural response onset thresholds for cetaceans and marine turtles based on Southall et al. (2019) and Finneran et al. (2017).

Hearing group	Frequency-weighted SEL24h threshold (LE,24h; dB re 1 µPa²·s)	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10
		Rmax (km)	Rmax (km)	Rmax (km)	Rmax (km)	Rmax (km)
PTS						
Low-Frequency (LF) cetaceans	199	0.08	0.11	0.13	0.08	0.13
High-frequency (HF) cetaceans	198	0.02	0.07	0.09	0.02	0.09
Very High-frequency (VHF) cetaceans	173	0.11	0.13	0.15	0.11	0.15
Marine Turtles	220	0.02	0.07	0.09	0.02	0.09
TTS						
Low-Frequency (LF) cetaceans	179	1.87	2.12	2.57	2.17	2.66
High-frequency (HF) cetaceans	178	0.09	0.11	0.13	0.09	0.13
Very High-frequency (VHF) cetaceans	153	2.31	2.35	2.51	2.44	2.63
Marine Turtles	200	0.1	0.11	0.14	0.10	0.14
Behavioural response						
Cetaceans	120	17.1	20.5	17.2	20.7	

Source: Wecker et al. (2022)

Impact Assessment

Potential behavioural disturbance to pygmy blue whales within the distribution range is limited to any overlap with the northbound (April to July) and southbound (October to January) migratory seasons. Migrating humpback whales have shown avoidance behaviours (increased movement rate and dive frequency) when exposed to underwater noise generated by a vessel (Dunlop et al., 2015), and pygmy blue whales may exhibit similar responses.

There is limited data to indicate that the Xena-03 Operational Area represents an area where opportunistic foraging by pygmy blue whales occurs. Based on an overlap of three different metrics (occupancy, number of whales in a cell and move persistence), Thums et al. (2022) identified the most important foraging areas for pygmy blue whales offshore from Western Australia but also recognised such areas are not static but dependent on the interplay of oceanographic and prey dynamics. The included areas encompassed the shelf edge from Ningaloo Reef to the Rowley Shoals, but none of the important foraging areas identified were on the shelf edge or slope offshore from where the Xena-03 Operational Area is located. Hence, it cannot be reasonably predicted that pygmy blue whale foraging is probable in the Xena-03 Operational Area. Furthermore, all of the identified important pygmy blue whale foraging areas identified by Thums et al. (2022) in offshore NW Australian waters are located beyond the maximum range (km) at which the TTS and behavioural impact thresholds for cetaceans are predicted to be exceeded based on modelling presented above.

Humpback whales occur in the region, with the migration BIA ~30 km east of the Xena-03 Operational Area. Aerial surveys of migrating humpback whales in the region showed that the majority of migrating humpbacks occur in the mid- and inner-continental shelf waters, rather than the outer part of the migration BIA (RPS Environment and Planning, 2010). The Xena-03 Operational Area is surrounded by open water, with no restrictions (e.g., shallow waters, embayments) to an animal's ability to avoid the activities. Behavioural responses by cetaceans (such as pygmy blue whales and humpback whales) may result in a deviation in course during migration, which is expected to be insignificant in the context of the long distances over which individuals migrate (thousands of kilometres). Cetaceans that are frequently exposed to sounds such as vessel noise may also habituate and adapt to this noise (Richardson et al. 1995; NRCC, 2003). This may be the case for the humpback whale population that regularly passes

through areas of significant shipping traffic during their migrations. Furthermore, MODU activities are expected to occur over approximately 50-60 days.

Transponders used for positioning have the potential to cause some temporary behavioural disturbance to cetaceans; however, noise levels will be well below injury thresholds. Based on empirical spreading loss estimates measured by Warner and McCrodan (2011), received levels from USBL transponders are expected to exceed the cetacean behavioural response threshold for impulsive sources out to about 42 m. Given the short-duration chirps and the mid frequencies used by positioning equipment, the acoustic noise from a single transponder is unlikely to have any substantial effect on the behavioural patterns of marine fauna. Therefore, potential impacts from transponder noise are likely to be restricted to temporary and localised avoidance behaviour of individuals transiting through the PAA, and therefore are considered localised with no lasting effect.

Potential impacts from predicted noise levels from the MODU, project vessels and transponders are not considered to be ecologically significant at a population level.

The National Recovery Plan for the Southern Right Whale (DCCEEW, 2024) also identified anthropogenic noise as a threat, however the BIAs and habitat critical to the survival are over 250km away, well outside the area where behavioural responses are expected to extend from the Operational Area and as such, there is not expected to be any anthropogenic noise from the petroleum activity that could displace or interfere with life cycle activities within, or near, the reproduction or migration BIAs and habitat critical to the survival.

Marine Turtles

Species Sensitivity and Thresholds

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, 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. No numerical thresholds have been developed for behavioural impacts of continuous sources (e.g. vessel noise) on marine turtles. A Popper et al. (2014) review assessed thresholds for marine turtles and found qualitative results that the risk of behavioural disturbance was high for near field exposure, moderate for intermediate exposure and low for far field exposure (Popper et al., 2014).

Sound exposure thresholds and criteria for continuous sound sources (e.g. vessel noise) and impulsive sources (e.g. transponders) applicable to marine turtles are summarised in Table 6-5.

Impact Assessment

Marine turtles may be present in the region, with a flatback turtle internesting BIA, overlapping the Xena-03 Operational Area. Habitat Critical for the flatback turtle is present ~10 km south west of the Xena-03 Operational Area. The Recovery Plan for Marine Turtles (Commonwealth of Australia, 2017) notes there is limited information available on the impact of noise on marine turtles and that the impact of noise on turtle stocks may vary depending on whether exposure is short (acute) or long-term (chronic). However, given the thresholds outlined it is reasonable to expect that marine turtles may demonstrate avoidance or attraction behaviour to the noise generated by the Xena-03 Tie-back activities. Sound transmission loss modelling indicated that the potential for PTS and TTS onset would be limited to within tens of meters of drilling activity, and up to 140 m (TTS) during DP vessel activities. However, marine turtles within the Xena-03 Operational Area are expected to be transient individuals, and unlikely to remain within 140 m of the vessels for 24-hours, and therefore PTS and TTS thresholds are not expected to be reached. Behavioural impacts to marine turtles from continuous noise sources generated by the Xena-03 Tie-back activities are expected to be short-term and localised.

Given the water depths and distance from shore, the Xena-03 Operational Area does not represent suitable foraging or internesting habitat. The defined BIA and Habitat Critical are considered very conservative as they are based on the maximum range of internesting females rather than direct studies that show marine turtles are more likely to remain near their nesting beaches. For example, tracking studies at Barrow and Thevenard islands suggest the majority of internesting flatback turtles remain in shallow water, close (< 3 km) to nesting beaches (Whittock et al., 2014). Studies of flatback turtle nesting in the Pilbara region also found that the average distance travelled at each of the beaches ranged between approximately 10 km and 27 km, and typically in water depths of less than 25 m (RPS 2010; Whittock et al. 2014; Whittock et al. 2016; Waayers and Stubbs, 2016). Hence it is considered highly unlikely that the Xena-03 Operational Area is utilised by internesting flatback turtles.

Marine turtle presence in general is expected to be infrequent, and potential impacts from predicted noise levels from the project vessels (including MODU and support vessels) are expected to be short-term, intermittent and localised, if they occur and are not considered to be ecologically significant at a population level.

Fish, Sharks and Rays

Species Sensitivity and Thresholds

Fish perceive sound through the ears and the lateral line, which are sensitive to vibration. Some species of teleost or bony fish (e.g., herring) have a structure linking the gas-filled swim bladder and ear, and these species usually have increased hearing sensitivity. These species are considered to be more sensitive to anthropogenic underwater noise sources than species such as cod (Gadus sp.), which do not possess a structure linking the swim bladder and inner ear. Fish species that either do not have a swim bladder (e.g., elasmobranchs (sharks and rays) and scombrid fish (mackerel and tunas)) or have a much-reduced swim bladder (e.g. flat fish) tend to have a relatively low auditory sensitivity.

Considering these differences in fish physiology, Popper et al. (2014) developed sound exposure guidelines for fish; these are presented in Table 6-13 and are considered appropriate to assess continuous acoustic discharges to fish from the Petroleum Activities Program.

Table 6-13: Impact thresholds to fish, sharks and rays for continuous noise

Receptor	Mortality and potential mortal injury	PTS	TTS	Masking	Behaviour
Fish: no swim bladder	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder not involved in hearing	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: swim bladder involving hearing	(N) Low (I) Low (F) Low	170 dB rms SPL for 48-hours	158 dB rms SPL for 12-hours	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Note: The sound units provided in the table above include relative risk (high, moderate and low) is given for fish (all types) at three distances from the source defined in relative terms as near (N – tens of metres), intermediate (I – hundreds of metres) and far (F – thousands of metres) (after Popper et al. 2014).

Impact Assessment

Given the thresholds outlined in Table 6-13, it is reasonable to expect that fish, sharks and rays may demonstrate avoidance or attraction behaviour to the noise generated by the Xena-03 Tie-back activities.. However, potential impacts from predicted noise levels from the project vessels (including MODU and support vessels) are not considered to be ecologically significant at a population level.

A number of demersal and pelagic fish species will be present within the Xena-03 Operational Area which overlaps the Continental Slope Demersal Fish Communities KEF. However, given species richness has been shown to correlate with habitat complexity (Gratwicke and Speight, 2005), it is unlikely that the sand/silt sediments that comprise the largest proportion of the Xena-03 Operational Area will support a wide diversity of species.

Maximum-over-depth horizontal distances to PTS and TTS thresholds for fish with a swim bladder involved in hearing as a result of underwater noise from a support vessel are approximately 10 m or less from the source based on modelling from JASCO for the Scarborough field (McPherson et al. 2019). For fish with a swim bladder not involved in hearing, and fish without a swim bladder (including whale sharks) the likelihood of PTS or TTS is low. Based on an intermediate spreading equation to estimate sound propagation loss from the MODU (15Log(R)), noise levels would drop below PTS and TTS thresholds for fish with a swim bladder involved in hearing within 15 m and 78 m respectively. It is expected that potential impact to demersal and pelagic fish and sharks/rays will be limited to a behavioural response. Behavioural responses are expected to be short-lived, with duration of effect less than or equal to the duration of exposure.

Whale sharks do frequent the wider NWS outside their seasonal aggregation period (peak: April and May) within the high-density prey foraging BIA at Ningaloo. The Xena-03 Operational Area overlaps a foraging BIA for whale sharks (Section 0), however it is over 200 km from the Ningaloo high density prey foraging BIA and therefore likelihood of whale shark encounters is not considered high but is possible. Acoustic detections of tagged whale sharks at the North Rankin A and GWA platforms during two periods—June to July and October to January were recorded

(Thomson et al. 2021) and supported anecdotal evidence of whale shark presence on NWS. Behavioural disturbance to whale sharks as a result of vessel noise may result in a temporary deviation on their migration route. However, any deviation is considered to be insignificant in the context of the long distances over which whale sharks migrate and normal variation in their movements in the region.

It is reasonable to expect that fish, sharks and rays may demonstrate avoidance or attraction behaviour to the noise generated by the Xena-03 Tie-back activities. However, potential impacts from predicted noise levels from the project vessels (including MODU and support vessels) are not considered to be ecologically significant at a population level.

Cumulative Impacts

As identified above, Xena-03 Tie-back activities will coincide with routine operations of the Pluto facility and may result in cumulative impacts from underwater noise emissions. The combined sound fields are likely to result in an increase in the maximum range to the behavioural response threshold for LF cetaceans described above (i.e. ~20 km). However, as described above, the Xena-03 Operational Area is surrounded by open water, with no restrictions (e.g. shallow waters, embayments) to an animal's ability to avoid the activities. Consequently, if concurrent activities occur and coincide with seasonal migrations, any pygmy blue whales, humpback whales or whale sharks transiting through the area, may deviate, but can continue on their pathway. Biologically significant impacts at a population level are not anticipated. Modelling outlined above predicted PTS onset in LF cetaceans within a maximum of 150 m and TTS onset within a maximum of 2.66 km for a combination of three vessels in close proximity. Any cumulative impacts arising from the Pluto Facility Operations will be limited to the duration of Xena-03 Tie-back activities (~12 weeks) and would be discontinuous over this time.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[46]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, including the following measures[47]: Project vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale. 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 6 knots. Vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the	F: Yes. CS: Minimal cost. Standard practice.	Implementation of controls for reduced vessel speed around cetaceans can potentially reduce the underwater noise footprint of a vessel and lower the likelihood of interaction above significant thresholds	Controls based on legislative requirements – must be adopted.	Yes C 3.1

[46] *Qualitative measure*

[47] *For safety reasons, the distance requirements below are not applied for a vessel holding station or with limited manoeuvrability e.g. anchor handling, loading, back-loading, bunkering, close standby cover for overside working and emergency situations.*

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[46]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
vessel to approach closer than 30 m of a whale shark.				
Good Practice				
Develop a SIMOPS Plan to manage rig interactions with other facilities/vessels, where multiple campaigns occur within the PAA (i.e. during xmas tree installation).	F: yes CS: Minimal cost. Standard practice.	SIMOPS management plans between Woodside operated vessels in the PAA will reduce the acoustic emissions from concurrent vessels.	Benefits outweigh cost/sacrifice.	Yes C 1.16
Implement adaptive management procedure prior to: resupply vessel moving alongside the MODU with PIV within the PAA, during daylight hours MODU departing well location (excludes kedging).	F: Yes CS: Time / Cost associated with person used for observations. Schedule delays associated with waiting on pygmy blue whale activity to cease / move on.	Implementation of adaptive management where pygmy blue whales (or large unidentified whales) are observed means a new noise source (vessel) is not introduced while pygmy blue whales are sighted. Restricting the introduction of new noise sources when pygmy blue whale presence is detected could lower likelihood of disturbance to pygmy blue whales so as to not be inconsistent with the Blue Whale Conservation Management Plan.	Benefits outweigh cost/sacrifice	Yes C 4.1
Collect data on opportunistic sightings of pygmy blue whales to gauge presence and behaviour.	F: Yes CS: Time / Cost associated with person used for observations and in data collection.	Collecting data on pygmy blue whale presence and behaviour may assist in increasing understanding of their activity in the PAA to inform future activities and support environmental knowledge.	Benefits outweigh cost/sacrifice.	Yes C 4.2
Implement speed limitations when safe[48] to do so for MODU and PIV within the Xena-03 Operational Area.	F: Yes, within the limits of navigational safety. CS: Time / Cost associated with slower transit speed.	Given the Xena-03 Operational Area overlaps the pygmy blue whale migration BIA and introduction of vessel noise may present behavioural disturbance risk to migrating pygmy blue whales, reducing vessel speed can result in reduced underwater noise emissions and overall	Benefit outweighs cost/sacrifice.	Yes C 4.3

[48] Vessel speeds are at the ultimate discretion of the vessel master, noting speed limitations may be exceeded from time to time to maintain safe navigation.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[46]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		reduction in potential behavioural disturbance. Additionally, reducing speed to 6 knots is consistent with the EPBC Regs 2000 – Part 8 Division 8.1, interacting with cetaceans, under which project vessels are not to travel greater than 6 knots within 300 m of a cetacean. Application of this speed restriction for the MODU and PIV within the Xena-03 Operational Area is considered to be a precautionary approach to reducing vessel noise and potential disturbance to cetaceans.		
Stop or deviate from course[49] if pygmy blue whale (or large unidentified whale) observed during entry of a hybrid MODU and PIV to the Xena-03 Operational Area.	F: Yes. If a whale is observed during mobilisation into the Xena-03 Operational Area, the MODU (if under own propulsion) and PIV could deviate course away from the whale and delay mobilisation. CS: Time/ cost associated with deviating and delay to mobilisation into the Xena-03 Operational Area.	Deviating course may reduce potential behavioural disturbance associated with vessel noise.	Benefit outweighs cost/sacrifice.	Yes C 4.4
Stop or deviate from course if pygmy blue whale (or large unidentified whale) observed during entry of a moored MODU into the Xena-03 Operational Area.	F: No. Stopping or deviating the MODU in an unplanned manner if a pygmy blue whale or large unidentified whale is observed may reduce potential behavioural disturbance associated with vessel noise. However, the action would significantly increase the safety risk profile of the mobilisation activity through reactive interruption of planned course by vessels towing MODU into field. CS: Introduces unacceptable safety risk.	Not considered – introduces unacceptable safety risk.	Not considered – introduces unacceptable safety risk.	No

[49] Unless deemed navigationally unsafe by the vessel master.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[46]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
The use of dedicated Marine Fauna Observers (MFOs) on project vessels for the duration of the PAP to watch for whales and provide direction on and monitor compliance with Part 8 of the EPBC Regulations.	F: Yes. However, support vessel bridge crews already maintain a constant watch during operations. CS: Additional cost of MFOs.	Given that support vessel bridge crews already maintain a constant watch during operations and trained crew as MFOs will monitor for pygmy blue whale presence prior to resupply/support vessel moves alongside the MODU and PIV, additional MFOs would not further reduce the likelihood of an individual being within close proximity of the acoustic source during introduction of sounds related to DP or during operations.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
Implement adaptive management procedure prior to: Hybrid MODU energising (turning on) DP system within the Xena-03 Operational Area.	F: No, a DP assist, or thruster assist rig is held into position by a mooring spread and may be supplemented by a thruster assisted mooring system. the DP system will be energised and available for emergency use but not planned for use in regular operations. The system operates such that thrusters engage automatically in response to metocean conditions using feedback (signals) from the mooring system. Therefore, it is not feasible to predict when this will occur and hence, pre-emptively apply adaptive management procedures. CS: N/A	Not considered – control not feasible.	Not considered – control not feasible.	No
Use professional MFOs in lieu of trained crew to observe for pygmy blue whales.	F: Yes CS: The cost of implementing dedicated MFOs during vessel activities would be tens of thousands of dollars and expose additional personnel to the health and safety risks of working at sea. The cost is grossly disproportionate to the environmental benefit.	The environmental benefit of having dedicated professional MFOs is a potential increase in the likelihood of detecting pygmy blue whales at the species level, which then permits actions to maintain separation as per the adaptive management procedure. Trained crew will watch for marine fauna during the petroleum activity. Trained	Disproportionate. The cost/ sacrifice outweighs the benefit gained.	No.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[46]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		crew will implement adaptive management measures if a pygmy blue whale or large unidentified whale is observed. Therefore whilst there is an increased likelihood for professional MFO's to detect pygmy blue whales from other large whale species, the ability to identify marine fauna in comparison with trained crew is negligible.		
Professional Judgement – Eliminate				
Remove support vessel on standby at the Petroleum Activities Program location.	F: No. Activity support vessel required as per MODU Safety Case, particularly for maintaining the 500 m petroleum safety zone around the MODU/ installation vessel. CS: Introduces unacceptable safety risk.	Not considered – control not feasible.	Not considered – control not feasible.	No
Eliminate generation of noise from the MODU, installation vessel, support vessels or positioning equipment.	F: No. The generation of noise from these sources cannot be eliminated due to operating requirements. Note that vessels operating on DP may be a safety critical requirement. 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				
Management of vessel noise by varying the timing of the Petroleum Activities Program to avoid migration periods.	F: Yes. Migration periods for cetaceans that may occur in the PAA (pygmy blue and humpback whales) are well known. CS: Significant cost and schedule impacts if activities avoid specific timeframes	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				
Use of additional detection controls (e.g., drones for aerial observations, Passive Acoustic Monitoring for	F: Yes CS: Time / cost associated with additional personnel and	May increase likelihood of detection of whales, particularly during periods of poor visibility. Additional detection technologies can	Disproportionate. The cost/ sacrifice outweighs the benefit gained.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[46]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
use at night, thermal imaging for use at night) to Identify cetacean presence.	technology onboard vessels. Due to distance offshore actual obse–vation times are limited by fuel availability - larger fuel capacity associated with larger aircraft increases cost of the exercise.	be degraded by metocean conditions (e.g., sea state). Additional detection methods would not result in a reduction in the potential consequence level.	Adequate observations are able to be made from the MODU bridge due to the height and surveillance by trained crew. It is not expected that additional technologies would add significantly more value than this to warrant deployment.	
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 noise emissions from Xena-03 Tie-back activities. 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 the generation of noise from project vessels, MODU, and positioning equipment during Xena-03 Tie-back activities is unlikely to result in an impact significance level greater than slight. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. In particular, the Conservation Management Plan for the Blue Whale (Commonwealth of Australia, 2015a) and associated guidance on key terms requires that pygmy blue whales not be displaced from a foraging area. The nearest recognised foraging BIA is off the Ningaloo Coast, approximately 232 km south-west of the PAA at the closest point. The sound transmission loss modelling studies by JASCO (Stroot et al., 2022; Wecker et al., 2022) predicted that behavioural responses (a conservative surrogate for displacement) could occur up to 8.85 km from the noise source during moored drilling activities or up to 20.7 km from the noise source during DP vessel activities; less than one tenth of the distance to the foraging BIA). Hence, displacement of pygmy blue whales from this foraging BIA as a result of the Xena-03 Tie-back Activities will not occur. The potential impacts are considered broadly acceptable if the adopted controls are implemented and EPO 5 has been applied to demonstrate the activities are not inconsistent with the Blue Whale Conservation Management Plan. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of acoustic emissions to a level that is broadly acceptable and demonstrate the EPOs are met.				

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 4a Limit adverse impacts on fauna from noise emissions during the Petroleum Activities	C 3.1 EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, which	PS 3.1 Vessels will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to manage the risk of fauna collision.	MC 3.1.1 Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans and Woodside Marine Charterers Instructions.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
Program to those with No lasting effect[50]	include the following measures51: vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale; 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, activity support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots; and vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.		MC 3.1.2 Records demonstrate reporting cetacean ship strike incidents to DCCEEW.
	C 1.16 Develop a SIMOPS Plan to manage MODU interactions with other facilities/vessels, where multiple campaigns occur within the PAA (i.e. during xmas tree installation). SIMOPS Plan will contain information on: minimum separation distances communications MODU/vessels/ activities involved in SIMOPS exclusion zone entry and exit processes ROV operations	PS 1.16 MODU and applicable vessels compliant with SIMOPS Plan.	MC 1.16.1 Records demonstrate implementation of SIMOPS Management Plan when MODU working in vicinity of other facilities/vessels, i.e. during xmas tree installation.

[50] Defined as 'No lasting effect (< 1 month); localised impact not significant to environmental receptors' as in Table 2-3, Section 2.6.3.

[51] For safety reasons, the specified distances requirements are not applied for a vessel holding station or with limited manoeuvrability (e.g. loading, back-loading, close standby cover for overside working and emergency situations).

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	helicopter operations key roles, responsibilities and emergency contacts PTW arrangements incident reporting and investigation management of change.		
EPO 4b Undertake the PAP in a manner that does not cause acoustic injuries or prevent biologically important behaviours to pygmy blue whales.	C 4.1 Implement adaptive management procedure prior to: Resupply vessel moves alongside MODU and/or PIV during daylight hours. MODU departing well location (excludes kedging).	PS 4.1.1 Implement adaptive management procedure during daylight hours. Adaptive management procedure to include: Trained crew as marine fauna observers monitor for pygmy blue whales or large unidentified whales for 30 minutes prior to: resupply vessel moves alongside the MODU and/or PIV within the Xena-03 Operational Area. MODU departing well location (excludes kedging). Proceed with move only when no pygmy blue whales or large unidentified whales have been sighted, to the limits of visibility, over the 30-minute monitoring period.	MC 4.1.1 Records demonstrate crew acting as marine fauna observers receive suitable training in detecting marine fauna, including cetaceans, whale sharks and turtles.
			MC 4.1.2 Records demonstrate trained crew on watch prior to resupply vessel moves alongside the MODU and/or PIV or MODU departs well location in the Xena-03 Operational Area.
			MC 4.1.3 Records demonstrate when pygmy blue whale, or large unidentified whale are present, resupply activities moves have not commenced and/or MODU did not depart well location.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	C 4.2 Collect data on opportunistic sightings of Pygmy Blue Whales to gauge presence and behaviour.	PS 4.2 Process developed for collecting PBW sighting data PBW sighting data sent to relevant organisations as required (i.e. Australian Marine Mammal Centre (AMMC)).	MC 4.2.1 Records demonstrate process developed and communicated to crew for collection of Pygmy Blue Whale sighting data.
	C 4.3 Implement speed limitations when safe[52] to do so for MODU and PIV within the Xena-03 Operational Area.	PS 4.3 Vessel speed limitations (6 knots) adhered to by MODU and PIV while in the Xena-03 Operational Area, within the limits of navigational safety.	MC 4.3.1 Records show MODU and PIV travelled at or below 6 knots within the Xena-03 Operational Area, within the limits of navigational safety.
	C 4.3 MODU (if under own propulsion) / PIV stop or deviate from course[53] if pygmy blue whale (or large unidentified whale) observed during entry to the Xena-03 Operational Area.	PS 4.3 MODU (under own propulsion) / PIV stops or deviates from course if pygmy blue whale (or large unidentified whale) observed during entry to the Xena-03 Operational Area,	MC 4.3.1 Records show hybrid/DP MODU and/or PIV stopped or deviated if pygmy blue whale (or large unidentified whale) observed during entry to the Xena-03 Operational Area.

[52] Vessel speeds are at the ultimate discretion of the vessel master and speed restriction may need to be exceeded from time to time to maintain safe navigation.
[53] Unless deemed navigationally unsafe by the vessel master.

6.7.5 Routine and Non-routine Discharges: Discharge of Hydrocarbons and Chemicals

Context		
Wells and Reservoirs– Section 3.4.2 Subsea Infrastructure – Section 3.4.5 Facility Operations – Section 3.5 Hydrocarbon and Chemical Inventories and Selection – Section 3.9 Subsea IMMR Activities – Section 3.10 Xena-03 Drilling &Tie-back Activities – Section 3.11	Physical Environment – Section 4.4 Habitats and Biological Communities– Section 4.5	Consultation – Section 5

Impacts and Risks Evaluation Summary														
Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Discharge of subsea control fluids.		x	x		x			A	F	-	-	PJ GP	Broadly Acceptable	EPO 5
Discharge of hydrocarbons remaining in subsea pipeworks and equipment as a result of subsea intervention works (including pigging).		x	x		x				E					
Discharge of chemicals remaining in subsea pipeworks and equipment or the use of chemicals for subsea IMMR activities.		x	x		x				F					
Discharge of minor fugitive hydrocarbons from subsea equipment.			x		x				F					
Discharge of chemicals, (e.g. MEG), during installation and leak testing of new infrastructure		x	x		x				F					

Description of Source of Impact

Operations

Hydrocarbons and chemicals may be discharged as a result of planned routine and non-routine operations and activities for:

Operational discharges including:

- discharge of subsea control fluids – subsea control fluid is used to control valves remotely from the facility. It is an open-loop system, designed to release control fluid from the control system during valve operations (e.g., up to about 6 L per valve actuation)
- potential non-routine hydraulic or chemical fluid discharge associated with umbilical system losses/weeps.
- discharge of minor fugitive hydrocarbon from wells and subsea equipment (e.g., weeps/seeps/bubbles)
- discharge of chemicals introduced into subsea infrastructure and the production stream, either as process or non-process chemicals (e.g., corrosion inhibitors, biocides, scale inhibitors). Chemicals flow through the production process, with residual hydrophilic chemicals discharged as a component of PW discharged overboard.

IMMR activities (nominal discharges described in Section 3.8.5) including:

- discharge of residual hydrocarbons in subsea lines and equipment and small gas releases associated with isolation testing and breaking containment.
- discharge of residual chemicals in subsea lines and equipment, or the use of chemicals. These chemicals are used and discharged intermittently in small volumes. Small quantities of chemicals may remain in the flushed infrastructure, which may be released to the environment after disconnection.
- discharge of hydrocarbons associated with pigging activities required as shown in Section 3.10.2.8.
- discharge of approximately 100–150 L of preservation fluids from flowlines following flushing when the flowlines are cut and plugs installed in either end of the cut section.

Xena-03 Tie-back Activities

The following activities may result in the discharges of small quantities of flowline and subsea installation preservation and pre-commissioning fluids:

- discharges during barrier testing
- discharges during disconnection of caps from installed structures (manifold, xmas tree, UTA)
- discharges from flexible flowline and flying leads during tie-in and reconfiguration activities.
- discharges from installation vessel's pre-commissioning equipment or subsea infrastructure during leak testing activities
- discharges post leak test, during depressurisation to marine environment.

In addition there is potential for discharge of minor fugitive hydrocarbons from the suspended Xena-03 well prior to xmas tree installation (e.g. weeps/seeps/bubbles).

Flexible Flowline Fluids

The flexible flowline and subsea distribution unit will be installed filled with a chemically treated mixture of up to 50 wt% MEG/water. The MEG concentration must be fibre-grade (99.9 wt%) before mixing with water. The flexible flowline will not require further flooding post-installation but pressure test top-up fluid may be required in the event of test failure.

Installation and tie-in of the flexible flowline to the manifold and xmas tree may result in small quantities of fluids within the flowline being released to the environment. These volumes are expected to be small (1 m3 per tie in point) as the pressure within the flowline is equal to the hydrostatic pressure and the flowline is uncapped for a short duration during tie-in. Water jetting and/ or acid injection (~400 L acid) may be used to clean the connections on the infrastructure prior to tie-in.

A leak test/system pressure test will be performed to test the integrity of the subsea connections, flowline and flowlines, which may result in ~4 m3 of MEG/treated potable water and ~0.6-1.2 L of treatment chemicals (including corrosion inhibitor, biocide, oxygen scavengers and dye) being released to the environment at the locality of the subsea infrastructure. A contingency secondary leak test may also be required, with similar discharge volumes.

Xmas Tree

The xmas tree will be installed with a preservation mixture in the production and annulus bore. There will be a small discharge of preservation fluid associated with testing after connection to the THS (estimated 100 to 150 L).

Hydrocarbons

Testing of manifold isolations may be undertaken to verify that suitable isolations are available for safe tie-in to the subsea distribution unit and flexible flowline. The testing and tie-in may release gas and condensate (up to 400L) over a 48 hour period. This testing is required to verify that suitable isolations are available for safe tie-in and cannot

reasonably be eliminated. The estimated mass of hydrocarbons is considered to be a worst-case, with the actual release volume expected to be smaller.

Well Unload

During well unloading activities, all completion and reservoir fluids will be directed to the Pluto facility and be handled by the systems onboard the platform, in accordance with Sections 3.5.5. All non-hydrocarbon fluids will be discharged overboard with the produced water.

Should well unloading fluids not be directed to the Pluto facility, they may be flared or discharged to the environment via the well test package onboard the MODU. The base oil column, completion fluid, hydrocarbons and produced/condensed water will be measured, handled, separated, treated for overboard discharge (non-hydrocarbon) and flared/burned (hydrocarbon) through the temporary production system on the MODU.

Well Intervention (contingency)

Well intervention activities have been considered within the Petroleum Activities Program, for contingency purposes. During intervention activities, including post xmas tree installation testing and TIV valve operations, local control of the xmas tree may be required. Valve actuation of the trees may be required, which will result in small releases of subsea control fluids to be released to the environment.

All subsea chemicals will be selected, assessed and approved in accordance with a defined framework and set of tools so that the potential impacts are acceptable, ALARP and meet Woodside's expectation for environmental performance, outlined in Section 7.2.1. This procedure is used to demonstrate that the potential impacts of the chemicals selected are acceptable and ALARP (subject to technical and economic constraints).

Impact Assessment

There is potential for localised water column pollution and adverse effects on marine biota as a result of planned routine and non-routine hydrocarbon and chemical discharges during operations and Xena-03 Tie-back activities. However, planned discharges of hydrocarbons and chemicals are minor and are minimised as far as practicable via flushing of the lines back to the facility during IMMR activities, and unloading wells to host during tie-back activities. Discharge locations during routine operations are either the PW stream, subsea valves (subsea control fluid), at dis/connection points in subsea infrastructure, including during installation of pig receivers or launchers, or via the export pipeline to the onshore process. During tie-back activities, discharges may also occur at connection points and during leak testing.

Water Quality

During operations, subsea control fluids are discharged at relatively small volumes during valve actuations (typically <6 L) and IMMR activities at or near the seabed. On release the subsea control fluids are expected to mix rapidly and dilute in the water column. Pigging activities are infrequent and result in relatively small releases of hydrocarbon.

During Xena-03 Tie-back activities, leak testing and tie in of new infrastructure may result in discharges of small amounts of MEG and hydrotest fluids as described above. Contingency activities, such as well intervention may result in minor discharges of subsea control fluids from the xmas tree, similar to valve actuation releases discussed above. On release, impacts of MEG and hydrotest fluids will be localised to the immediate vicinity of the release location with short-lasting impacts. This is based on the low potential for toxicity and bioaccumulation of MEG, small volumes/rates of discharge and rapid dilution in the marine environment.

Gas and condensate may be released during IMMR activities that break containment of isolated subsea infrastructure or during verification testing of the subsea distribution unit. Hydrocarbons will become dispersed as bubbles in the water column, which will rise to the surface. Methane is the principal component of the gas and is relatively insoluble in water. As such, methane is expected to rise until it reaches the sea surface, where it will be readily dispersed in the atmosphere. The concentration of methane will not be sufficient to form an explosive atmosphere or result in asphyxiation. Water-soluble components of the gas, such as carbon dioxide and sulphur dioxide will dissolve in the seawater as the gas bubbles rise in the water column. These soluble gasses occur naturally and are present in relatively low amounts. No measurable impacts to water quality are expected to occur as a result of the gas release.

The insoluble condensate release during verification testing will be buoyant and rise in the water column. The condensate will be released with gas which will act to disperse the condensate within the water column as it rises to the sea surface. The resulting condensate droplets will rise slowly in the water column and may be transported away from the release location by currents. Upon reaching the sea surface, the condensate will almost entirely evaporate, with a relatively small portion remaining entrained in the water column. Condensate droplets are not expected to reach the surface in sufficient quantities to result in surface slicks above thicknesses that result in biological impacts, although a sheen may be visible. Any condensate reaching the surface will spread and weather rapidly. Soluble hydrocarbons will be distributed in the water column through natural water movement and the buoyancy of the condensate droplets and are expected to drop below concentrations recognised as causing biological impacts within tens to hundreds of metres of the release location.

There is potential for slight, localised decrease in water quality at planned discharge locations and potential impacts on marine biota. Impacts to pelagic fish are expected to be limited to avoidance of the localised area of the discharge and short-term, localised decline in planktonic organisms in the immediate vicinity of the discharge.

Ecosystems

Sediments in the PAA are expected to be broadly consistent with those in the NWS Province (as described in Section 4.5), with filter feeders such as sponges, ascidians, soft corals and gorgonians associated with areas of hard substrate. Subsea control fluids and installation fluids are non-toxic and do not have the potential to bioaccumulate.

Receptors that may be impacted by a condensate release during verification testing are in-water receptors within the vicinity of the release location. These receptors include plankton, pelagic fishes and potentially cetaceans. Potential impacts to these receptors include:

acute toxic effects to planktonic organisms near the release location from soluble hydrocarbons. Only a very small portion of the planktonic community at a bioregional scale would credibly be impacted. Planktonic communities have high turnover rates, and recovery from any impacts would occur rapidly. Given the small volume of soluble hydrocarbons, the planktonic community in the upper part of the water column will not be impacted.

temporary displacement of pelagic fishes. Large-scale oil spills in open water typically do not result in fish kills, and it is assumed that fishes in open water will actively avoid harmful concentrations of hydrocarbons. Given the relatively small volume of hydrocarbons released and the resulting localised impact, it is unlikely that displacement of pelagic fishes will occur.

Given the nature and scale of planned discharges, potential impacts are considered to be slight and short term (expected to recover once routine and non-routine discharges cease).

KEFs

The Ancient Coastline at 125 m Depth Contour and Continental Slope Demersal Fish Communities KEF, overlap the PAA (Figure 4-10). The Continental Slope Demersal Fish Communities KEF overlaps the wider Xena-03 Operational Area and the Pluto Facility Operational Area. No significant escarpments, species of conservation significance, emergent features or areas of high biological productivity characteristically associated with the Ancient Coastline at 125 m KEF have been observed in the PAA. Therefore, potential impacts to these regional-scale KEFs are not expected.

A small portion of the Pluto Export Operational Area overlaps the Ancient Coastline at 125 m Depth Contour KEF. Potential impacts to this KEF would be limited to IMMR activities. Given the infrequent and small volumes of discharges associated with IMMR activities, potential impacts to the KEF are not expected.

Cumulative Impacts

Given the adopted controls, the overall impacts from the discharge of hydrocarbons and chemicals to the marine environment is Slight (E) based on short term (<1 year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified				
Good Practice				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Implement Woodside's Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected – no further control required; and If chemicals with a different OCNS rating, sub warning or non-OCNS rated chemicals are required chemicals will be assessed in accordance with the guideline prior to use.	F: Yes. Routinely implemented to the chemical selection process for Woodside facilities. CS: Minimal cost. Standard practice.	Selection and assessment of chemicals in accordance with the Woodside process, reduces environmental impacts associated with planned chemical discharge.	Control is a WMS requirement – must be adopted.	Yes C 5.1
Subsea infrastructure flushed where practicable prior to disconnection to reduce volume/ concentration of hydrocarbons released to the environment.	F: Yes. Subsea infrastructure has been designed such that much of the hydrocarbon containing elements can be flushed back to the riser platform. CS: Minor. Flushing may prolong the cessation of production required for subsea IMMR activities, leading to reduced production.	Flushing reduces the volumes/ concentration of hydrocarbons released to the environment.	Benefit outweighs cost sacrifice.	Yes C 5.2
Monitoring subsea control fluid use, investigate material discrepancies, and using control fluid with dye marker to support identification of potential integrity failures.	F: Yes. The use of control fluid is monitored to maintain adequate fluid in the system. CS: Minimal cost.	Limits the volumes of subsea control fluid discharged to the marine environment.	Benefit outweighs cost sacrifice.	Yes C 5.3
Implement Woodside Engineering Operating Standard - Subsea Isolation). Proven isolation in place for relevant IMMR activities.	F: Yes CS: Minimal cost. Standard practice.	Maintaining and testing the ability to isolate wells and pipelines will ensure barriers are in place and verified limiting the volume of hydrocarbon released.	Control is a WMS requirement – must be adopted.	Yes C 5.4

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns.	F: Yes. CS: Minimal cost. Standard practice.	Reviews will ensure chemicals selected remain ALARP.	Benefits outweigh cost/sacrifice.	Yes C 5.5
ROV inspection during leak test (during XNA03 tie-back activities).	F: Yes. CS: Minimal cost. Standard practice.	A procedure for leak testing work that includes inspection (including by ROV) during testing to identify leakage and trigger activity to stop will reduce likelihood of impacts.	Benefits outweigh cost/sacrifice.	Yes C 5.6
Test subsea manifold isolation valves prior to tie-in.	F: Yes. CS: Minimal cost. Standard practice.	Testing of the isolation valves will provide a valve pass rate to be used to assess isolation requirements and determine the isolations required to confirm to the relevant internal Woodside standards.	Benefits outweigh cost/sacrifice.	Yes C 5.7
Pre-commissioning and flexible flowline subsea installation procedures developed	F: Yes. CS: Minimal cost. Standard practice.	A procedure for pre-commissioning and subsea installation will reduce likelihood of impacts	Benefits outweigh cost/sacrifice.	Yes C 5.8
Subsea isolations conform to the relevant internal Woodside standards which include: Using a double block isolation If it is not practicable to establish a double block isolation, then one effective, proven and monitored barrier (single block isolation) shall be in place, with the following conditions It must be possible to isolate the reservoir by remote operation of tree isolation valves The residual risks must be shown to be ALARP by a documented isolation risk assessment. Procedures and response plans for the activity must be developed and	F: Yes. CS: Minimal cost. Standard practice.	Pass rate (≤ 0.05kg/s) across valve with proven single block isolation. Conditions for single block isolation reduce the likelihood and consequence of an uncontrolled release	If valve testing confirms proven barrier (≤ 0.05kg/s pass rate), slight environmental impact associated with hydrocarbon release is disproportionate to requirement to shut in the well to achieve double isolation. Benefit for additional conditions for single isolation outweigh cost. Benefit outweighs cost.	Yes C 5.9

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
implemented and address all applicable hazards appropriately, including provision for closing tree isolation valves				
Professional Judgement – Eliminate				
Reduce volume or not use preservation and pre-commissioning chemicals including MEG.	F: No. Preservation and pre-commissioning fluids are required to verify the structural integrity of the subsea infrastructure and avoidance of hydrate formation. The volumes selected are required to achieve verification. CS: Potential loss of production due to loss of integrity, possibly leading to a larger environmental incident.	Not considered – control not feasible.	Disproportionate. The cost/sacrifice outweighs the benefit gained.	No
Do not conduct leak testing activities	F: No. Leak testing activities are required to control the potential for corrosion of the flexible flowlines and to determine if any unacceptable restrictions and/or obstructions exist in the line. CS: Potential loss of production due to loss of integrity, possibly leading to a larger environmental incident.	This would eliminate any potential impacts from the leak testing activities but increases the likelihood of loss of integrity during operation and potentially greater environmental impacts.	Disproportionate. The cost/sacrifice outweighs the benefit gained	No
Professional Judgement – Substitute				
Installing closed-loop subsea valve control system.	F: Yes. Closed-loop subsea valve control systems can be installed; however, they may not perform as quickly/reliably as	The potential consequence of the discharges is ranked as incidental, based on the volume, frequency, location, and types of fluid discharged in an open-	When considering the negligible effect from the release of control fluids, the risk and costs of retrofitting a closed-loop subsea valve control system is	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
	open-loop systems. CS: Significant. The design, procurement and retrofitting of a closed-loop valve control system would result in considerable offshore logistics, exposure to safety hazards during installation, and significant financial burden through direct costs and lost production.	ocean environment, and avoiding the discharges would provide little or no environmental benefit.	considered to be grossly disproportionate to the environmental benefit.	
Professional Judgement – Engineered Solution				
Poppetted hydraulic lines in control connections (to minimise release of control/preservation fluids).	F: Yes CS: Minimal cost. Standard Practice	Poppeted connections minimise discharge to marine environment in pressurised hydraulic lines	Benefits outweigh cost/sacrifice.	Yes C 5.10
Routing hydrocarbons to vessel during disconnection of subsea infrastructure.	F: Yes. However, to do so would introduce significant safety risks to the vessel crew (fire, explosion, asphyxiation). CS: Significant. Equipping and training crew on-board subsea support vessels to safely route hydrocarbons to the vessel would result in significant additional costs (in addition to the increased safety risk identified above).	Small environmental benefit from preventing low concentration hydrocarbon discharge.	Given the increased safety risk and the very low environmental impact from hydrocarbon releases during subsea IMMR activities, the cost of routing hydrocarbons to the vessel is grossly disproportionate to the environmental benefit.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Decreasing the frequency of valve actuation.	F: Yes. However, decreasing the frequency of valve actuation may adversely impact the safe functionality and reliability of valves. Reducing the performance of subsea valves may introduce operability impacts, and increased safety and environmental risk associated with loss of containment events. CS: Minimal cost.	The potential consequence of the discharges is ranked as incidental, based on the volume, frequency, location and types of fluid discharged in an open-ocean environment, and reducing the number of discharges would provide little or no environmental benefit.	Decreasing the frequency of valve actuations would lead to a potential decrease in safe functionality and reliability of valves. When considering the potential safety and environmental risks from such a performance degradation, along with the minor impact from the release of control fluids, the cost of decreasing the frequency of valve actuations is considered to be grossly disproportionate to the environmental benefit.	No
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 of planned routine and non-routine hydrocarbon and chemical discharges. 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, planned routine and non-routine hydrocarbon and chemical discharge represents a localised short-term impact that is unlikely to result in a potential impact greater than slight short-term effects on water quality, marine sediment or ecosystem habitat. Further opportunities to reduce the impacts have been investigated above. Fluid discharges from the subsea system during operations, IMMR activities, flexible flowline commissioning and well intervention are routine in the oil and gas industry. The adopted controls are considered good oil-field practice/industry best practice. The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of planned routine and non-routine hydrocarbon and chemical discharges to a level that is broadly acceptable and demonstrates the EPOs are met.				

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 5a Limit adverse water quality impacts to Slight[54], short-term effects from	C 5.1 Chemical Selection and Assessment Environment Guideline:	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will	MC 5.1.1 Chemical assessment register demonstrates the chemical selection,

[54] Defined as 'slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute' as in Table 2-3, Section 2.6.3.

EPOs, EPSs and MC for Pluto Facility Operations			
hydrocarbons and chemicals used in subsea activities during the Petroleum Activities Program.	Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	assessment and approval process for selected chemicals is followed.
	C 5.2 Subsea infrastructure flushed where practicable during IMMR disconnection activities to reduce volume/ concentration of hydrocarbons released to the environment.	PS 5.2 Producing subsea infrastructure containing hydrocarbons flushed to facility (where practicable) to a hydrocarbon concentration where further dilution provides disproportionate cost to environmental benefit, prior to disconnection.	MC 5.2.1 Records demonstrate subsea infrastructure flushing (to facility) where practicable.
	C 5.3 Monitoring subsea control fluid use, investigate material discrepancies, and using control fluid with dye marker to support identification of potential integrity failures.	PS 5.3 Subsea control fluid use monitored and, where losses are unexplained, potential integrity issues are investigated.	MC 5.3.1 Records demonstrate subsea control fluid use is documented, and unexplained discrepancies investigated.
	C 5.4 Implement Woodside Engineering Operating Standard - Subsea Isolation. Proven isolation in place for relevant IMMR activities.	PS 5.4 Proven isolation in place in compliance with Woodside Engineering Operating Standard – Subsea Isolation.	MC 5.4.1 Records demonstrate that there was a proven isolation in place as required.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 5b Limit adverse water quality impacts to Slight[55], short-term effects from hydrocarbons and chemicals used in subsea activities during the Xena-03 Tie-back activities.	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed.

[55] Defined as 'slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute' as in Table 2-3, Section 2.6.3.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
	chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.		
	C 5.5 For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns.	PS 5.5 Acceptability of chemicals is re-evaluated to ensure ALARP, and alternatives are considered.	MC 5.5.1 Records confirm six-monthly reviews have occurred during active drilling campaigns, and any actions/changes are being tracked to closure.
	C 5.6 ROV inspection during leak test (during Xena-03 Tie-back activities).	PS 5.6 ROV inspection during leak test to identify leakage and trigger activity to stop.	MC 5.6.1 Records demonstrate ROV inspection during leak test and record any instances of activity required to stop due to identified leak(s).
	C 5.7 Test subsea manifold isolation valves prior to flexible flowline tie-in during Xena-03 Tie-back activities.	PS 5.7 Valve testing undertaken prior to flexible flowline Xena-03 tie-in.	MC 5.7.1 Records demonstrate testing of isolation valves is completed.
	C 5.8 Pre-commissioning and flexible flowline subsea installation procedures developed during Xena-03 Tie-back activities.	PS 5.8 Flexible flowline is installed in accordance with the pre-commissioning and flexible flowline installation procedure to reduce the likelihood of discharges during installation.	MC 5.8.1 Records demonstrate flexible flowline installed in accordance with procedures
	C 5.9 Subsea isolations conform to the relevant internal Woodside standards which include: Using a double block isolation If it is not practicable to establish a double block isolation, then one effective, proven and monitored barrier (single block isolation) shall be in place, with the following conditions It must be possible to isolate the reservoir by remote operation of tree isolation valves The residual risks must be shown to be ALARP by a documented isolation risk assessment.	PS 5.9 Subsea Isolations implemented conform with the relevant internal Woodside standards and any single isolation will have a proven barrier (pass rate of ≤ 0.05 kg/s).	MC 5.9.1 Records demonstrate isolations are implemented and compliant with the relevant internal Woodside standards. MC 5.10.2 Where a single isolation was used records demonstrate that during testing of valves the pass rate was ≤ 0.05 kg/s.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
	Procedures and response plans for the activity must be developed		
	C 5.10 Poppetted hydraulic lines in control connections (to minimise release of control/preservation fluids).	PS 5.10 Poppetted hydraulic lines in control connections are in place.	MC 5.10.1 Records demonstrate poppetted hydraulic lines in control connections are in place.

6.7.6 Routine and Non-routine Marine Wastewater Discharges: Utility Systems and Drains

Context		
Facility Operations – Section 3.5 Utility Systems – Section 3.6 Support Vessel Operations - Section 3.8 Tie-back Activities – Section 3.11 Vessel-based Activities for the Xena-03 Tie-back - Section 3.12	Physical Environment – Section 4.4	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Discharge of sewage, grey water and putrescible waste from the Pluto Facility, MODU, ASV, installation and support vessels to the marine environment.			x					A	F	-	-	LCS GP PJ	Broadly acceptable	EPO 6
Discharge of deck, bilge and drain water from the Pluto Facility, MODU, ASV, installation and support vessels to the marine environment.			x					A	F	-	-			
Discharge of brine and cooling water from the Pluto Facility, MODU, ASV, installation and support vessels to the marine environment.			x					A	F	-	-			

Description of Source of Impact

Sewage, Putrescible Waste and Grey Water

No sewage is discharged from the facility when it is uncrewed. When the facility is crewed, the sanitary drainage system is a combined black and grey water system, with black and grey water discharged to the marine environment as untreated, un-macerated waste. Sewage is disposed via a dedicated overboard caisson (7.5 m below LAT). Putrescible waste (principally food scraps) bagged and transported to shore for disposal as domestic waste.

The volume of sewage and greywater generated is estimated to be in the order of 1.8 m3 per day (based on an average volume of 75 L/person/day), from the facility when crewed. The actual volume of discharge varies depending on personnel requirements on the facility. Refer to Section 3.6.7 for POB estimates under different activities.

Treatment systems on the facility may require routine maintenance or repair during operations, requiring infrequent short periods in which sewage is directly discharged overboard.

During maintenance campaigns or major projects, an ASV may be utilised inside the PSZ for periods of approximately 90 days to accommodate crews of around 100 POB. The ASV will discharge sewage, putrescible waste and grey water, managed in accordance with MARPOL requirements.

Vessels may also discharge sewage, grey water and putrescible wastes within the Operational Area, but outside of the facility PSZ. Sewage on-board operational vessels is routinely treated (either sewage treatment plant or macerator) prior to discharge.

The MODU and project vessels routinely generate/discharge small volumes of treated sewage, putrescible wastes and grey water to the marine environment (impact assessment based on approximate discharge of 15 m3 per vessel/MODU per day), using an average volume of 75 L/person/day and a maximum of 200 persons on board. However, it is noted that vessels such as the AHV and support vessels will have considerably fewer persons on board. Discharge of waste may occur within the PAA, but outside of the facility PSZ.

During tie-back activities the facility will be crewed during the commissioning phase, in addition to the presence of the MODU, installation vessels and other support vessels, resulting in cumulative volumes of sewerage, putrescible waste and grey water over approximately 12 weeks (Section 3.3.2).

Drain and Bilge Water

Pluto's hazardous open drains system collects wash water and waste liquids from major process and utility equipment and diesel/chemical storage areas, including plated area deck drains, drain tundishes and equipment drip trays in hazardous areas. Drainage into the hazardous open drains system discharges into a collection tank (working volume 11.6 m3), which is periodically pumped to a waste oil storage tank (capacity 4 m3) then transported onshore for disposal. The transfer of liquids from the collection tank to the waste oil storage tank is a manual operation only undertaken while the facility is crewed.

The non-hazardous area open drains system collects liquids from areas designated as non-hazardous. It is segregated from all other drainage systems to eliminate the risk of hydrocarbon vapour transmission from hazardous to non-hazardous areas. Water and any contamination are routed to the non-hazardous area open drains collection tank, which is 2 m3 (with max capacity of 2.6 m3). The collected liquids are manually drained to the hazardous area open drains collection tank during every facility campaign maintenance visit.

The MODU, ASV, installation and support vessels routinely generate and discharge relatively small volumes of bilge water. Bilge tanks receive fluids from many parts of the vessel, including machinery spaces. Bilge water can contain water, oil, detergents, solvents, chemicals, particles and other liquids, solids or chemicals. The MODU and vessels may also discharge drainage water from decks directly overboard or via deck drainage systems; deck drainage may also contain traces of chemicals. Water sources could include rainfall events and/or from deck activities such as cleaning/wash-down of equipment/decks.

Cooling Water and Brine

No brine water is produced on the facility as potable water is supplied from onshore. Additionally, no seawater cooling is undertaken on the facility.

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

During the distillation process, relatively small volumes of reject brine is produced and discharged. Reject brine discharge is typically 20 to 50 percent higher in salinity than the intake seawater (depending on the desalination process used) and may contain low concentrations of scale inhibitors and biocides, which are used to avoid fouling of pipework (Woodside, 2014).

Models developed by the US EPA (Frick et al., 2001) for temporary brine discharges from vessels assuming no ocean current (i.e. 0 m/s) found that brine discharges from the surface dilute 40–fold at 4 m from the source. This modelling can be used as an indicator for predicting horizontal attenuation and diffusion of reject brine; and suggests that the salinity concentration drops below environmental impact thresholds within 4 m of the discharge point.

Seawater is pumped on board and used as a heat exchange medium for the cooling of machinery engines and high temperature drilling fluid on the MODU. Seawater is drawn up from the ocean, where it is subsequently de-oxygenated and sterilised by electrolysis (by release of chlorine from the salt solution) and then circulated as coolant for various equipment through the heat exchangers (in the process transferring heat from the machinery), prior to discharge to the ocean. It is subsequently discharged from the MODU to the sea surface at potentially a higher temperature. Cooling water is often treated with additives including scale inhibitors and biocide to avoid fouling of pipework. Scale inhibitors and biocide are usually used at low dosages, and are usually consumed in the inhibition process, so there is little or no residual chemical concentration remaining upon discharge .In addition, the scale inhibitors and brine are selected and assessed using the Woodside chemical selection process.

Alternatively, MODUs may utilise closed-loop cooling systems. In these systems, fresh water is used in a closed circuit to cool down the engine room machinery, and then further cooled by sea water in a seawater cooler. Seawater used for cooling purposes would be routinely discharged at a temperature expected to be less than 70°C and rates ~50 m^3/d.

Impact Assessment

Sewage, Putrescible Waste and Grey Water

The environmental impact associated with ocean disposal of sewage, grey water and 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.

No significant impacts from planned (routine and non-routine) discharges to the marine environment are anticipated, given the minor volumes involved, the localised mixing zone (as indicated by dilution modelling at the facility and high level of dilution into the open water marine environment of the PAA. This is supported by historical water quality and sewage discharge monitoring undertaken by Woodside around the nearby Goodwyn Alpha platform. The Goodwyn Alpha platform is approximately 72 km northeast of the PAA, therefore conditions are comparable. Water quality monitoring around the Goodwyn Alpha platform (which is a crewed platform) indicates there was no detectable decrease in oxygen saturation, nutrients or increase in oxygen demand at the Goodwyn Alpha platform (BMT Oceanica 2015a). In addition, monitoring of sewage discharges demonstrated that a 10 m3 sewage discharge reduces to approximately 1% of its original concentration within 50 m of the discharge location (Woodside, 2008).

The tie-back is expected to take up to 12 weeks including mobilisation, demobilisation and contingency with subsea installation and pre-commissioning. MODU and installation and support vessel routine discharges are expected to be intermittent in nature for the duration of the tie-back activity. Therefore, impacts to water quality within the PAA are expected to be localised with no lasting effect due to the small mass, relative to daily turnover, the assimilative capacity of the receiving environment, intermittent nature of discharges, and the variable discharge location due to project vessel movement.

Although the NWS Province is characterised as a low nutrient environment (DEWHA 2008), studies of adjacent shelf water have found the area to be “a highly productive ecosystem in which nutrients and organic matter are rapidly recycled” (Furnas and Mitchell 1999). The estimated daily loading from sewage and putrescible waste (Facility ~1.8 m3 per day; MODU/project vessels ~15 m3 per day) is not significant in comparison to the daily turnover of nutrients in the area. Furthermore, installation and support vessels are typically moving when in the PAA, which facilitates mixing of sewage, pulrescible wastes and grey water when discharged.

The impact of nutrients associated with discharge of sewage, grey-water and putrescible waste is considered to have a localised impact with no lasting effect due to the small mass, relative to daily turnover, and the assimilative capacity of the receiving environment.

Drain and Bilge Water

Drain water from the facility and bilge and deck drainage water from the MODU and installation and support vessels is expected to mix rapidly in the marine environment upon discharge. Deck drainage and treated bilge may contain a range of chemicals, oil, grease and solid material. This particulate matter can cause an increase in the turbidity of the receiving waters close to the point of discharge. The addition of these substances into the marine environment will result in a change ambient water quality; however, these discharges will disperse and dilute rapidly, with concentrations significantly dropping with distance from the discharge point. The PAA is located more than 12 nm from land exceeding the exclusion zones required by Marine Order 96 (Marine pollution prevention – sewage) 2018 and Marine Order 95 (Marine pollution prevention – garbage) 2013.

No significant impacts from the planned routine discharges are anticipated, because of the minor quantities involved, the expected localised mixing zone and high level of dilution into the open water marine environment of the PAA. Based on the detailed evaluation and low levels of potential contaminants, the magnitude of potential impact of a change in water quality is considered highly localised with no lasting effects.

Cooling Water and Brine

The key physicochemical stressors that are associated with reject brine and cooling water discharge from MODU and project vessels include salinity, pH, temperature and chemical toxicity.

The potential impacts on water quality due to cooling water discharge include chlorine toxicity and increased water temperatures. Woodside undertook modelling of continuous wastewater discharges (including cooling water) for its Torosa South-1 drilling program in the Scott Reef complex (Woodside, 2014). This study predicted that discharge water temperature decreases quickly as it mixes with the receiving waters, with the discharge water temperature being <1°C above ambient within 100 m (horizontally) of the discharge point, and 10 m vertically (Woodside, 2014). As such, any potential impacts to water quality are expected to occur within approximately 100 m of the source of the discharge, where concentrations are highest.

Reject brine will sink through the water column, owing to the 20% to 50% increase in salinity (Frick et al., 2001), where it will be rapidly mixed with receiving waters and dispersed by ocean currents, decreasing in salinity rapidly as distance from source increases.

The scale inhibitors used in the prevention of fouling within cooling systems are typically low in molecular weight and phosphorous compounds that are water-soluble, and only have acute toxicity to marine organisms approximately

two orders of magnitude higher than typically used in the water phase (Black et al., 1994). The biocides typically used in the industry are highly reactive and degrade rapidly (Black et al., 1994).

Based on the detailed risk evaluation, the magnitude of the potential impact of a change in water quality from routine and non-routine brine and cooling water discharges is assessed as having no lasting effect on the receiving environment.

Cumulative Impacts

Given the activities that may be conducted during the Petroleum Activities Program, there is the potential for cumulative impacts from routine discharges of sewage, putrescible waste, grey water, PW, bilge water or drain water, due to:

- periodic, repeated discharges at the same location (riser platform) over the course of the Petroleum Activities Program
- cumulative discharges from differing point sources (riser platform and various vessels, e.g. ASV, MODU, installation vessels).

Because of the nature of these routine discharges, normal operations are unmanned (and therefore no discharges), the localised spatial extent of impacts and the well mixed receiving environment, the cumulative impacts from these discharges are not considered to result in impacts more than slight short-term impact (i.e. Environment Impact – E). Given the highly localised nature of the impacts of routine discharges, no cumulative impacts are expected from similar discharges from other production facilities (e.g. Wheatstone), Xena-03 drilling and tieback activities, or support vessels.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[56]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 91 (Oil) Marine Order 95 (Pollution prevention – garbage) Marine Order 96 (Pollution prevention – sewage). Marine Orders 91, 95 and 96 (pollution prevention) reduce the potential impact of marine wastewater discharges on water quality.	F: Yes. CS: Minimal cost. Standard practice.	Marine Orders required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Controls based on legislative requirements – must be adopted.	Yes C 6.1
Good Practice				
Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated	F: Yes. Woodside routinely implements a chemical selection process based on the OCNS at the facility. CS: Minimal. The OCNS is widely used throughout the industry, and chemical suppliers	Selection and assessment of chemicals in accordance with the Woodside process reduces environmental impacts associated with planned chemical discharge.	Control is a WMS requirement – must be adopted.	Yes C 5.1

[56] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[56]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	are aware of the requirements of the scheme.			
Professional Judgement – Eliminate				
Capturing and treating all drainage.	F: No. Discharge from deck drainage is produced from rainfall events and is unavoidable. Collecting drainage during uncrewed operations is not possible as there is a risk of the collection tank overfilling, resulting in potential spillage of hydrocarbons. CS: Eliminating the discharge by collecting all contaminated run-off and storing it is not practicable due to the size/weight and the uncrewed philosophy.	Not considered – control not feasible.	Not considered – control not feasible.	No
Storing, transporting and treating/disposing onshore of sewage, greywater, putrescible and bilge wastes.	F: No. 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 – Substitute				
None identified				
Professional Judgement – Engineered Solution				
Facility open hazardous drain and diesel drain system integrity maintained as far as practicable.	F: Yes. CS: Minimal cost. Standard practice.	The open hazardous drain and diesel drain systems are maintained to support appropriate disposal of environmentally hazardous liquids.	Benefits outweigh cost sacrifice.	Yes C 6.4

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[56]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
ALARP Statement: On the basis of the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the impacts of discharge of sewage, putrescible waste, grey water, bilge water, drain water, cooling water and brine from the Pluto Offshore facility, MODU, ASV, installation and support vessels. 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, routine and non-routine discharges of sewage, putrescible waste, grey water, bilge water, drain water, cooling water and brine from the Pluto Offshore facility, MODU, ASV, installation and support vessels are not expected to result in potential impacts greater than localised contamination not significantly above background levels outside a localised mixing zone. Further opportunities to reduce the impacts 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. 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 these discharges to a level that is broadly acceptable and demonstrate the EPOs are met.				

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 6a Limit adverse water quality impacts to Slight[57] from routine and non-routine wastewater discharges during the Petroleum Activities Program.	C 6.1 Contract vessels complying with Marine Orders for safe vessel operations: • Marine Order 91 (Oil) • Marine Order 95 (Pollution prevention – garbage) • Marine Order 96 (Pollution prevention – sewage).	PS 6.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Orders 91, 95 and 96).	MC 6.1.1 Records demonstrate vessels are compliant with standard maritime safety procedures (Marine Orders 91, 95 and 96).
	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed.

[57] Defined as 'slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute' as in Table 2-3, Section 2.6.3.

EPOs, EPSs and MC for Pluto Facility Operations			
	C 6.4 Facility open hazardous and diesel drain system integrity maintained as far as practicable.	PS 6.4 Integrity will be managed in accordance with SCE Management Procedure (Section 7.2.6) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for F22 – Open Hazardous and Diesel Drains, to: • prevent escalation of an incident following loss of containment, fire and/or explosion by removing or containing flammable liquid from hazardous areas • support appropriate containment and disposal of environmentally hazardous liquids to avoid damage to the environment.	MC 1.17.1 Records demonstrate implementation of SCE Performance Standard(s) and Safety Critical Element Management Procedure.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 6b Limit adverse water quality impacts to Slight[58] from routine and non-routine wastewater discharges during the Petroleum Activities Program.	C 6.1 Contract vessels complying with Marine Orders for safe vessel operations: • Marine Order 91 (Oil) • Marine Order 95 (Pollution prevention – garbage) • Marine Order 96 (Pollution prevention – sewage).	PS 6.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Orders 91, 95 and 96).	MC 6.1.1 Environmental and MARPOL inspection records demonstrate vessels are compliant with standard maritime safety procedures (Marine Orders 91, 95 and 96).
	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed.

[58] Defined as 'slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute' as in Table 2-3, Section 2.6.3.

	accordance with the guideline prior to use.		
	C 6.2 Where there is potential for loss of primary containment of oil and chemicals on the MODU, deck drainage must be collected via a drainage water management system	PS 6.2 Contaminated drainage contained, treated and/or separated prior to discharge.	MC 6.2.1 Environmental inspection records demonstrate MODU has a functioning bilge/oily water management system.

6.7.7 Routine and Non-routine Discharges: Produced Water

Context		
Produced Water System – Section 3.5 Well start-up and Commissioning – Section 3.11.4 Platform Well Management and Maintenance Activities – Section 3.5.3	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Discharge of produced water during routine and non-routine operations.		x	x		x			B	E	-	-	LCS GP PJ RB A	Broadly acceptable	EPO 7

Description of Source of Impact

Produced water (PW) consists of formation water (derived from a water reservoir below the hydrocarbon formation) and condensed water (water vapour present within gas/condensate that condenses when brought to the surface). As described in Section 3.5.4 a water handling module has been installed on the riser platform to treat and discharge PW offshore. Water production from each reservoir is not expected to occur initially, as the reservoir ages wells will begin to cut water. It is difficult to anticipate with high confidence when wells will begin to produce water from each reservoir.

Separation of water from reservoir fluids is not practicable to achieve 100%-effectiveness and therefore, PW often contains small amounts of naturally occurring contaminants including dispersed oil, dissolved organic compounds (aliphatic and aromatic hydrocarbons, organic acids and phenols), inorganic compounds (e.g., soluble inorganic chemicals or dissolved metals) and residual process chemicals (including MEG on a non-routine basis) as well as production chemicals such as MEG, water clarifier and corrosion inhibitor. A description of the PW system has been provided in Section 3.5. Potential environmental impacts of PW discharge include changes in water quality, sediment quality and biota potentially reducing ecosystem integrity. The ratio of PW to hydrocarbon and therefore volume of PW each well produces is expected to increase over the field life. It is difficult to anticipate with high confidence when the volumes will require offshore discharge but is predicted to commence in 2024. The maximum possible daily discharge is 3500 m3/day (constrained by process equipment capacity); actual discharge rates during the Petroleum Activities Program fluctuate in line with production rates however are expected to be well below the maximum capacity.

Monitoring and Management Framework

Overview

This section describes the monitoring and management framework which Woodside has developed to support the monitoring of PW discharges from offshore assets. The Australian and New Zealand Guidelines (ANZG) for Fresh and Marine water quality have been implemented and are consistent with the principles of the National Water Quality Management Strategy.

Environmental values are defined as particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health and that require protection from the effects of pollution, waste discharges and deposits (ANZG, 2018). The relevant environmental values considered are:

- ecosystem integrity – maintaining ecosystem processes (primary production, food chains) and the quality of water, biota and sediment.
- cultural and spiritual – in the absence of any specific environmental quality requirements for protection of this value, it is assumed that if water quality is managed to protect ecosystem integrity, this value is achieved in line with the guideline.

The relationship between key elements of ecosystem integrity, indicators and relevant monitoring activities undertaken on a routine and non-routine monitoring basis are shown in Figure 6-1. As per State Waters Technical Guidance: Protecting the quality of Western Australia's marine environment (EPA 2016) key elements to maintain ecosystem integrity have been identified as water quality, sediment quality and biological indicators (biota). By limiting the changes to these key elements to acceptable levels there is high confidence ecosystem integrity is maintained. For each of these elements an indicator has been identified and monitoring designed to identify changes. Monitoring changes in water quality and sediment quality as well as investigating potential toxicity via whole effluent toxicity (WET) testing and implementing management to maintain acceptable levels of changes is standard industry practice in Commonwealth and State waters. The relevant indicators to understand changes in key elements and therefore potential for impact to ecosystem integrity are physio-chemical stressors; toxicants in water; biological indicators and toxicants in sediment. A number of default and/or derived guideline values for each indicator have been defined and are monitored to detect changes. Guideline values serve as an early warning that potential changes beyond the acceptable limits may occur. Further investigation is then required to confirm whether there is potential to exceed the acceptable limit of change.

The approved mixing zone boundary for the facility is 1300 m. The approved mixing zone protects 95% of species, as calculated using the species sensitivity distribution (SSD) statistical method on the results of direct toxicity assessment. The protection of 95% of species guidelines have been adopted for a slightly to moderately disturbed system at the approved mixing zone boundary given the discharge location (ANZG 2018).

Given the proximity of the discharge point to the Montebello Marine Park Multiple Use Zone (~416 m from the facility) the acceptable limit at the boundary of the Multiple Use Zone is to protect 95% of species. The justification for these limits of change being "acceptable" is provided in the impact assessment section.

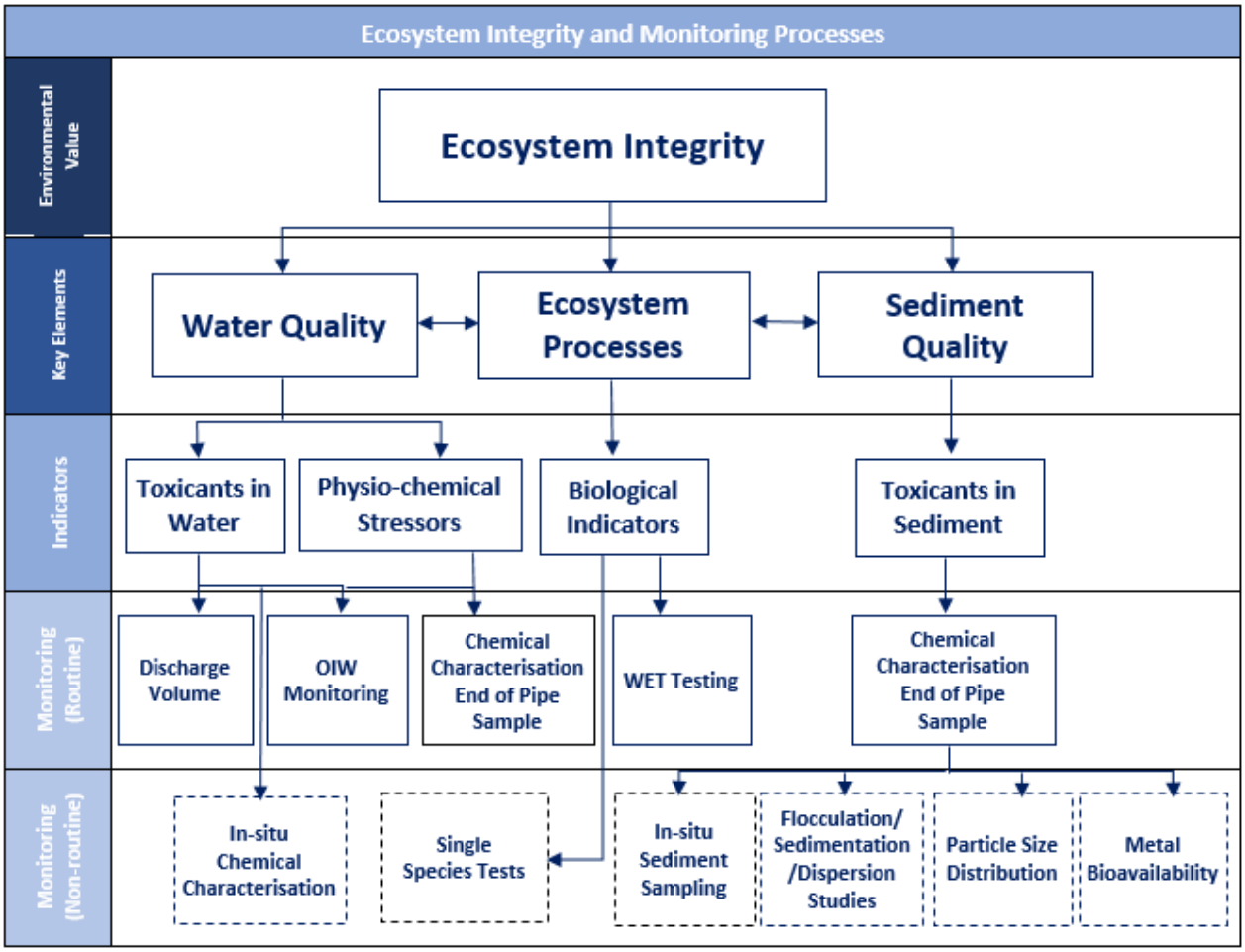


Figure 6-1: Ecosystem Integrity and Monitoring Process

Operational Monitoring

OIW monitoring during routine operations is undertaken via an online analyser. Online analyser information is sent via transmitter instantaneously and reported to the control system (CS) and is also captured within the process historian database (PHD). The CS facilitates visibility in the Central Control Room (either from Local Central Control Room at PLP or Remote Central Control Room in Perth), for manual or automated process control changes to be made, and/or annunciate alarms (e.g. high oil in water specification). PHD information is available onshore for analysis and trending. During each intervention visit on an approximately eight-weekly basis or six times per year operators manually sample PW and undertake manual analyser QC checks either at the onshore lab or on the facility.

Any discrepancies that are identified between instrument readings and CS/PHD that are outside of expected tolerance are investigated to determine the cause. As discussed in the Section 3.5.5.2, two analysers have been installed on the facility. If an analyser is faulty or breaks down, any anomalies that are identified are investigated to determine the cause and may be addressed by corrective maintenance during the next intervention visit.

Loss of Signal Management

If there is a loss of signal from both OIW analysers, operators attempt to troubleshoot remotely and monitor process stability for changes. If analysers cannot be restored and there are no observable changes to a stable operating process, low water cut, and high confidence of results below 30 mg/L, the next intervention visit will include reinstatement of the analyser operation if the next planned intervention is within seven days. If the next planned intervention is greater than seven days away, a 'reactive intervention' visit takes place to repair the analysers. Similarly, if analysers cannot be restored and there are no observable changes to a stable operating process, low water cut, and high confidence of results below 30 mg/L the reactive intervention visit will be performed within 7 days.

If there is a lack of certainty around results risking OIW measurements exceeding 30 mg/L for more than six consecutive hours, and a risk of OIW exceedance (24-hour rolling average) is anticipated, the asset may undertake a 'reactive intervention visit' via helicopter to verify results. A react visit if required is deployed to the platform within 48 hours, weather and time-of-day permitting.

High OIW Management

If the analyser is online and the OIW measurement exceeds 30 mg/L for more than six consecutive hours, an Operational Risk Assessment will be performed to determine if the high OIW could have occurred as a result of faulty equipment. If the risk of OIW exceedance (24-hour rolling average) is anticipated, the asset may undertake a 'reactive intervention visit' via helicopter to verify results.

For both loss of signal and high OIW management, a Standard Operating Procedure has been developed. It will display decision criteria to allow clear interpretation and facilitate compliance with OIW standards. Any EPS breaches are reported as Recordable Incidents.

Baseline Monitoring

As per EPBC Act condition requirements for the Pluto Gas condensate field (EPBC 2006/2968, condition 1(c) ii), Woodside undertook a baseline monitoring program in 2021 which included water, sediment, biological and physical monitoring. The assessment determined that ambient conditions meet the ANZG 2018 default guidelines values prior to discharge of PW and that benthic habitats present were typical of the North West Shelf in similar depths (BMT 2022).

Initial Monitoring

Initial samples of PW will be collected during the first intervention visit after reaching steady state conditions (at the end of the commissioning, optimisation and validation period) when the facility is operating (i.e., not during shutdown conditions) to characterise the discharge stream and potential toxicity. PW samples should represent normal operations, so sampling should only be undertaken during periods of normal production for the facility. Sampling should as far as reasonably practicable provide a representative sample. Representative samples are taken at a time when all PFW-producing wells are online (or as many as reasonably possible) with a consideration of chemicals that may be present in the discharge stream. Monitoring includes the following:

Chemical characterisation to identify if toxicants with the potential to bioaccumulate exceed the 80% species protection guideline value at end of pipe. If toxicants with the potential to bioaccumulate are predicted to exceed guideline values at end of pipe further investigations are required as described in the monitoring and management framework.

Chemical characterisation of the PW will be completed to verify 99% species protection safe dilutions for comparison with the approved mixing zone. If 99% safe dilutions are not predicted to be achieved at the boundary of the approved mixing zone, further investigations are required as described in the monitoring and management framework.

WET testing will be conducted to verify 95% species protection safe dilutions (as per SSD) for comparison with the approved mixing zone dilutions. If 95% safe dilutions are not predicted to be achieved at the boundary of the approved mixing zone, further investigations are required as described in the monitoring and management framework.

If 99% safe dilutions of chemical characterisation are not predicted to be achieved at the boundary of the marine park, further investigations are required as described in the monitoring and management framework. WET testing will be conducted (in parallel with chemical characterisation) to verify 95% species protection safe dilutions for comparison with the mixing zone dilutions at the Marine Park boundary at 416 m.

Settling velocity and particle size distribution analysis will be completed to ascertain the potential for contaminants to flocculate and settle out of solution and impact sediment quality. If an exceedance in water quality occurs, the results of these studies will inform if non routine sediment sampling is required prior to the next routine monitoring event.

Quarterly chemical characterisation and single species toxicity testing (initial sampling plus three events) is proposed during the first 12 months after reaching steady state conditions. WET testing will be completed to develop a robust understanding of variability in effluent toxicity. Results of chemical characterisation, single species toxicity tests will be compared against Offshore Marine Discharges Adaptive Management Plan (OMDAMP59) guideline values. Exceedances of guideline values require further investigation including multiple lines of evidence. If further investigation confirms the guideline value has been exceeded, a review of single species testing is conducted and if required additional WET testing. The single specie test proposed is a bacteria (Vibrio fischeri, Microtox® luminescence 5 and 15-min). This acute test is consistent with other Woodside PW discharging facilities and targets the lowest trophic level and most sensitive species. Initial monitoring will be conducted in accordance with the OMDAMP and where appropriate routine monitoring triggers, methods and standards applied (e.g. requirements for WET testing) so that there is consistency and comparability of data.

Routine Monitoring

PW is monitored and managed in accordance with the OMDAMP. The OMDAMP details routine monitoring assessment against guideline values, analytical methods and actions when a guideline value is exceeded.

The guideline values are applied through a risk-based approach that is intended to capture any uncertainty around the level of impact by staging monitoring and management responses according to the degree of risk to ecosystem integrity. The approach provides a level of confidence that management responses are not triggered too early (i.e., when there is no actual impact) or too late after significant or irreversible damage to the surrounding ecosystem" (EPA 2016). Routine monitoring applicable to the facility, is undertaken to compare against guideline values (described in Table 6-14). Changes in water quality can be detected early and can indicate the potential for an impact to sediments or biota prior to it occurring. WET testing provides additional lines of evidence if there is a potential for impacts.

PW samples should represent normal operations, so sampling should only be undertaken during periods of normal production for the facility. Where possible, samples are taken at a time when all PFW-producing wells are online (or as many as reasonably possible) with a consideration of chemicals that may be present in the discharge stream. The WET tests are undertaken on a broad range of taxa of ecological relevance for that accepted standard test protocols are well-established. WET tests are mainly focused on the early life stages of test organisms, when organisms are typically at their most sensitive to contaminants and are designed to represent local trophic level receptors. A minimum of eight toxicity tests are carried out with each PW sample during WET testing. The toxicity tests include a range of tropical and temperate Australian marine species and are selected based on their ecological relevance, known sensitivity to contaminants, availability of robust test protocols and known reproducibility and sensitivity as test species for assessing PW in marine environments. Specific tests are listed in the OMDAMP however other tests can be exchanged over time if tests are not available, or become obsolete, however, preference would be for tests that mimic the receiving environment as closely as possible (i.e., for most facilities this would be tropical, marine water tests) and for at least eight mainly chronic tests (Warne et al. 2015). The dilutions required to protect 95% of species is calculated using the ANZECC/ARMCANZ (2000) statistical distribution methodology on the results of direct toxicity assessment using sub-lethal chronic endpoints. The protection of 95% of species at the boundary of the Montebello Marine Park protects ecosystem integrity and associated values.

Settling velocity and particle size distribution analysis is proposed as part of the initial monitoring of representative discharge to confirm potential for sediment impacts. Results of these studies will inform if non-routine sediment sampling is required prior to the next routine monitoring event.

Table 6-14 Trigger values and frequency of routine monitoring

Routine Monitoring	Trigger Value	Frequency
Chemical characterisation End of pipe sample – toxicants	Results that are predicted to be higher than the 99% species protection guideline value at boundary of the approved mixing zone.	Annual.
	Results that are predicted to be higher than the 99% species protection guideline value at boundary of the marine park.	Annual.

[59] *The OMDAMP is reviewed annually. As such, it is important to note the OMDAMP information presented in this EP is subject to update to reflect new methodologies and adaptive management. Any changes in the OMDAMP are subject to the Change Management requirements.*

	Toxicants with the potential to bioaccumulate are predicted to be higher than the 80% species protection guideline value at end of pipe.	Annual if initial monitoring indicates 80% guideline values for toxicants with the potential to bioaccumulate are not met at end of pipe.
Chemical characterisation End of pipe sample – physio-chemical	Results that are predicted to be higher than the 99% species protection guideline value at boundary of approved mixing zone.	Annual.
WET testing	The 99% species protection safe dilutions derived from the WET testing species sensitivity distributions are not predicted to be achieved at boundary of approved mixing zone.	Three yearly. Conducted in parallel with annual chemical characterisation.
	The 95% species protection safe dilutions derived from the WET testing species sensitivity distributions are not predicted to be achieved prior to the boundary of marine park zone.	Three yearly. Conducted in parallel with annual chemical characterisation.
Review of continuous operational monitoring results	Increases in the average monthly OIW concentration by 5 mg/L for more than six consecutive months or by 10 mg/L for two consecutive months.	Monthly.
Discharge volume	Mean discharge volume (m3/day) is equal to or below the level required to meet approved mixing zone based on WET testing.	Monthly volume review.

Note: earlier toxicity year means the year in which the most recent WET test occurred.

If a guideline value is exceeded, there is uncertainty around whether the environmental value is being protected and further investigation is required.

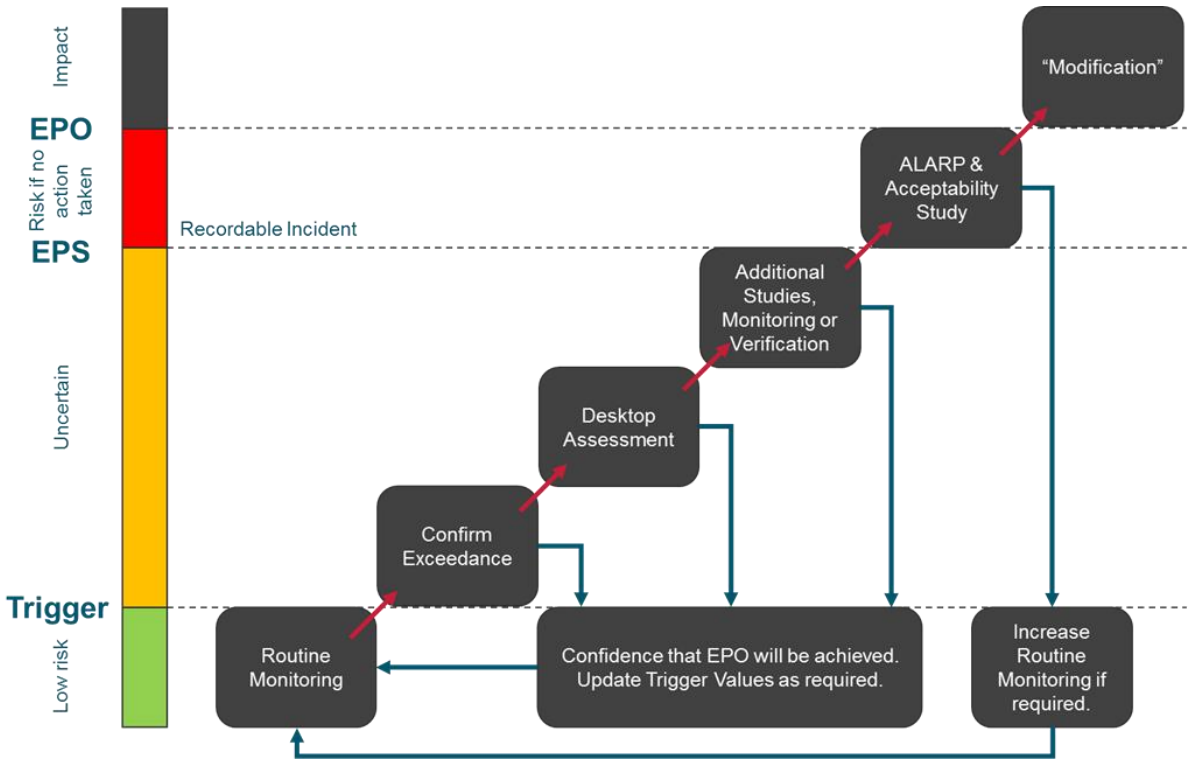


Figure 6-2: Routine Monitoring and Adaptive Management Framework for Produced Water

Further Investigations and non-routine exceedance monitoring

Detectable exceedances in guideline values may occur without impacting ecosystem integrity. To provide confidence that ecosystem integrity has been achieved, further investigation (per the OMDAMP) will be required in the form of a desktop study to initially assess the exceedance in context of available data (multiple lines of evidence) and confirm if there is potential for impact to the environmental value. A desktop assessment is necessary before undertaking any additional non-routine or in-situ monitoring. This ensures monitoring programs are designed and implemented to provide robust findings based on appropriate survey design.

A range of methods can be used to detect guideline value exceedances (e.g., relative percentage difference, control charts, multivariate analysis, etc.) depending on the dataset available. An appropriate method is selected as described in the OMDAMP due to the variable nature of environmental data. If critical data is not available, the desktop study will identify potential data gaps and may recommend additional non-routine studies and/or monitoring to ensure the assessment is appropriately undertaken. The purpose of the 'further investigations' step is to provide certainty that the EPS has been achieved, if a guideline value has been exceeded. The key investigation steps are described below:

Confirm the guideline value has been exceeded – Review quality assurance and quality control, methodology and possible sources of contamination to determine if the results are reliable, or if any factors have occurred that may compromise the integrity of the monitoring or data.

Desktop assessment to understand whether the EPS is at risk – If a guideline value is confirmed to be exceeded, multiple lines of evidence are considered including historical and current data from routine and non-routine monitoring and studies. This assessment shall consider whether there is adequate evidence to demonstrate that acceptability criteria have been met and ecological integrity is not at risk (EPS not breached). If the desktop assessment determines that the existing body of evidence is insufficient, it shall outline what additional monitoring or studies are required. The desktop assessment is needed before undertaking any additional infield monitoring. It ensures monitoring programs are designed and implemented to provide robust findings based on good survey design. Potential additional monitoring/studies may include but is not limited to:

- single species toxicity testing (collected annually in parallel with routine chemical characterisation should further investigation be required)
- WET test (collected in parallel with routine chemical characterisation should further investigation be required)
- dilution modelling and or studies
- flocculation, sedimentation, settling velocity and/or dispersion analysis
- metal bioavailability
- scanning electron microscopy and particle size distribution analyses
- in-situ monitoring (water quality and/or sediments).

Routine monitoring activities may be required ahead of schedule and additional monitoring not listed may be undertaken as appropriate. Field monitoring is undertaken in accordance with a plan that details timing, locations and objectives of monitoring.

Conduct additional studies to confirm the EPS is not at risk – Monitoring results provide additional lines of evidence to determine whether there is a risk to ecosystem integrity due to unacceptable changes in water quality, sediment, or biological indicators. Given the significant health, safety and technical risks, logistics and planning required, monitoring of the receiving environment is typically only considered when all other sources of evidence are insufficient to demonstrate that ecological integrity is not at risk. The OMDAMP provides detailed guidance on the steps and actions required to be undertaken if a guideline value is exceeded and this may include additional non-routine monitoring to verify that ecological integrity is maintained.

If an environmental impact is deemed to be within acceptable limits of change, the desktop assessment may consider a review of guideline values to ensure they are appropriate. If the environmental impact is deemed to be outside of the acceptable limits of change, an ALARP/Acceptability study is required to determine what additional controls can be implemented to ensure the impacts are acceptable. An EPS breach is a Recordable Incident, which is reported and managed as outlined in Section 7.13.5.

ALARP/Acceptability Study

An ALARP/Acceptability study is conducted once it has been determined, as a result of further investigations, that there is potential for an impact that exceeds the acceptable limits of change. The ALARP/Acceptability study shall be conducted in accordance with the ALARP Demonstration Procedure, to determine additional controls that may be necessary to reduce the potential impacts. Additional management measures (controls) may include technology or process upgrades, and reservoir management. Woodside will implement the additional controls identified in the ALARP/Acceptability study, that are required to give confidence that the acceptable limits on environmental impact can be achieved. Field validation of model assumptions and additional monitoring to assess whether impacts have been realised using a gradient monitoring design will be considered.

Impact Assessment

Potential impacts of PW discharge include:

- changes to water quality
- toxicity to biota
- changes to sediment quality.

To understand potential impacts from PW discharges, Woodside has undertaken a suite of comprehensive in-situ testing and sampling representing long-term operational periods from its offshore production facilities. The details of this testing and resultant understanding of potential environmental impacts are outlined below.

Potential Impacts to Water Quality

Potential impacts to water quality are to be assessed through chemical characterisation of the end of pipe discharge. Variability in the chemical composition is managed via the Monitoring and Management Framework.

Although reservoir fluids are available from the current production at the Pluto LNG Plant onshore, these are not deemed to be representative of PW characteristics at the offshore facility. The export pipeline transports hydrocarbons, condensed water and rich MEG to the Pluto LNG Plant onshore. There is significant difference between the natural compositions of PW associated with the reservoir compared to that condensed from the gas. Condensed water has low levels of dissolved salts while PW from the reservoir contains varying levels of salts. The presence of residual process chemicals further complicates any comparisons between onshore and offshore PW. Given the natural difference onshore PW samples are deemed to not be representative for the purposes of this assessment. It is not possible to collect a sample of PW that is representative of the discharge prior to treatment facilities achieving stable operation.

The discharge stream is expected to comprise primarily of PW from the Pluto reservoir. PW may also be derived from the Pyxis reservoir and Xena reservoir. Naturally Occurring Radioactive Materials (NORM's) have not been detected previously. Given PW will continue to be primarily from the Pluto reservoir increased NORMs are not expected and increased monitoring beyond that described above is not proposed.

Woodside has successfully managed impacts from PW from six facilities via the OMDAMP and intends to implement this Monitoring and Management Framework to manage variability in PW at this facility.

Chemical Characterisation of PW (Physio-chemical Parameters and Toxicants in Water)

During appraisal drilling for the Pluto project, samples of the formation water were obtained from three wells at various locations and depths within the reservoir with trace elements measured from each well in order to establish a basis for the process design (Table 6-15). The reported concentrations of metals were based on the highest levels measured from any of the three wells sampled (two Pluto, one Xena). The concentrations of metals within the three wells were highly variable. Metals with the potential to bioaccumulate (e.g., lead, mercury) were an order of magnitude lower in the other two wells compared to the worst case well used for the basis of design. Mercury concentrations measured from the three wells were 0.03, and <0.002 mg/L. Lead concentration measured from the three wells were 0.11, 0.03 and <0.02 mg/L. During routine operations a number of wells will be produced at any given time therefore the produced water will be comprised of formation water from a number of wells. The maximum toxicant concentrations from a single well will be diluted by wells with lower concentrations resulting in lower concentrations prior to discharge. Therefore, it is expected that lower concentrations will originate in the produced water and that these lower concentrations will be below the guideline values. The formation water will also be diluted by condensed water in the process further reducing concentrations. There have been no further opportunities to analyse PW from the reservoir to date. No ANZG 2018 guideline values are available for the ions listed within Table 6-15, as such dilution requirements are not listed. Dilutions to reach ANZG 2018 99% species protection guideline values are provided where applicable.

Table 6-15 Pluto Development Basis of Design Data Predicted PW Characteristics

Ions	Concentration (mg/L)
Calcium	125
Magnesium	22
Iron, Fe (Soluble)	2
Sodium	6960
Potassium	1000
Strontium	15
Barium	28
Chloride	10434

Sulphate	10
Bicarbonate	1303
Acetate	1259
Organic Acid	500

Table 6-16 Pluto Development Basis of Design Reservoir Metal Characteristic Concentrations versus ANZG default or derived guideline values for marine waters.

Metal and Metalloid	ANZG Guideline Value (mg/L) a	Concentration Range (mg/L)		Dilutions required to achieve 99 % guideline value based on High Concentration
		Low	High	
Silver	0.0008 (moderate)	-	< 0.02	25
Aluminium	0.0021 b	0.46	7. 23	3443
Arsenic	0.0023 (III) (low) 0.0045 (V) (low)	< 0.008	0.08	35
Cadmium	0.0007 (high)	< 0.001	0.01	15
Chromium	0.0077 (III) (low) 0.00014 (VI) (very high)	< 0.02	0.07	10-500
Cobalt	0.00005 (very high)	0.01	0.10	2000
Copper	0.0003 (very high)	0.26	1.30	4333
Manganese	0.08	0.03	2.00	25
Nickel	0.007 (high)	0.48	2.98	426
Lead	0.0022 (low)	0.03	0.11	50
Zinc	0.0033 (very high)	0.54	0.66	200
Mercury	0.0001 (very high)	< 0.002	0.03	300
Selenium	c	-	0.06	-

a 99% species protection guideline value (ANZG 2018) ranking of reliability is shown in parenthesis.

b Golding et al. (2015) and draft submission paper to the Council of Australian Government's Standing Council on Environment and Water (SCEW).

c No guideline value or low reliability guideline value only available.

d Draft submission paper to the Council of Australian Government's Standing Council on Environment and Water (SCEW 2014).

The metal concentrations in the PW of the other Woodside offshore facilities are either lower than the ANGZ (2018) 99% species protection guideline values or between the 99% and 95% species protection guideline values at end of pipe. However, initial monitoring is proposed to confirm toxicants with the potential to bioaccumulate are below 80% species protection at end of pipe.

The composition of PW is complex and may consist of additional components such as volatile aromatic compounds Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) and Polycyclic Aromatic Hydrocarbons (PAHs), concentrations of which vary throughout the field life. The chemical characterisation of the discharged PW will be verified by initial monitoring.

There is potential for slight, localised decrease in water quality at the discharge location and within the mixing zone with potential adverse effects on marine biota. Within the approved mixing zone impacts to pelagic fish are expected to be limited to avoidance of the localised area of the plume and short-term, localised decline in planktonic organisms in the immediate vicinity of the discharge plume.

Discharge Volumes

The maximum expected discharge rate is 3,500 m3/day (integrity limit). The average daily PW discharge rate is expected to be significantly less than the maximum rate as demonstrated on other Woodside facilities. However, as the total volume of PW is expected to increase as the field ages, environmental impacts have been assessed against maximum expected discharge rates and monitored as per the OMDAMP.

Residual Process Chemicals

Residual process chemicals may be present in the PW stream. Process chemicals are subject to Woodside's chemical selection and approval process. The largest chemical by volume, MEG is rated OCNS Group E (lowest hazard) and is considered PLONOR. Corrosion inhibitor required for the operation of the PW module and subsea system is assessed as having a CHARM assessment calculation rating of Gold. Chemicals will decrease the water quality in the immediate area of the release (i.e. surface waters at the release location); however, the consequence is expected to be temporary and localised due to dilution with the PW stream and the open ocean mixing environment, distance from sensitive receptors and relatively low and or non-routine discharge volumes.

Potential Impacts to Biological Indicators

Upon achieving steady state PW processing, chemical characterisation and WET testing of the PW will be completed in order to establish actual toxicity and to verify the approved mixing zone.

WET Testing

Most treated PW has low to moderate toxicity (Neff et al. 2011), with actual toxicity of discharge dependant on the chemical constituents of the PW and any added process chemicals, the level of treatment and dilution with condensed water prior to release, and the dilution of the discharge as it mixes with seawater. Most hydrocarbons in PW are considered non-specific narcotic toxins with additive toxicities; therefore, the toxicity of a PW will, in part, depend on the total concentration and range of bioavailable hydrocarbons (Neff, 2002).

WET testing is undertaken to allow for interactions between toxicants and take into account toxicants that cannot readily be measured or are not known to be present in the sample. For the WET testing a range of tropical and temperate Australian marine species are selected based on their ecological relevance, known sensitivity to contaminants, availability of robust test protocols, and known reproducibility and sensitivity as test species (ANGZ 2018).

The partitioning of contaminants between PW and condensate is unknown for the Pluto reservoir, therefore using the toxicity of the Pluto condensate as a surrogate for PW discharge is not appropriate. Woodside has extensive operational experience with PW characterisation from gas condensate facilities on the North West Shelf of Western Australia. Actual 99% and 95% species protection safe dilutions will be provided from initial monitoring WET testing to verify the approved mixing zone is being achieved.

During design of the PW handling module, the then available suite of Woodside PW WET testing results guided the conservative selection of the GWA species protection level (SPL) safe dilutions as 1:2,000 – which is basis for Pluto QSRA studies, and informing the approved mixing zone (2019 Environment Plan). This value has been retained for consistency in the 2024 Pluto EP assessment, and is appropriately more conservative than more recent worst-case dilutions required for similar assets as shown below in Table 6-31.

Recent WET testing data collected in 2022 and 2023 from existing operating facilities Table 6-31 was reviewed to verify a reasonable level of conservatism is included in impact assessment to ensure that 99% species protection safe dilutions, will be met within the approved mixing zone.

Table 6-17: Actual 99% and 95% species protection level (SPL) safe dilutions at Woodside's current PW discharge facilities

Facility	99% SPL safe dilutions	95% SPL safe dilutions
Angel	1:417	1:278
Goodwyn Alpha	1:1,388	1:205
North Rankin	1:63	1:44
Okha FPSO	1:102	1:67

In addition to this, in the context of assessing short-term non-routine OIW discharges with varied initial OIW concentration assumptions, the OSPAR (2014) dispersed oil concentration of 70 µg/L was used as the PNEC rather than the ANZECC/ARMCANZ (2000) guideline value (low reliability) of 7 µg/L. The PNEC of 70 µg/L derived by Smit et al (2009) is considered more appropriate than the Tsvetnenko (1998) derived 7 µg/L as all tests used in the Species Sensitivity Distribution (SSD) were chronic as opposed to acute converted to chronic values with an acute chronic ratio (ACR) of 25 as used by Tsvetnenko (1998). Further information on assessment of non-routine PW discharges is provided in modelling summary and Non-routine Activities Impact Assessment sections below.

Determination of Approved Mixing Zone

The principal aim of the modelling was to quantify the likely extents of the near-field and far-field mixing zones and therefore the potential impact of the PW to the marine environment. Three modelling methods were integrated to simulate the potential dispersion, an oceanic hydrodynamic model (HDROMAP) for current data, a near-field discharge model (PDS surface discharge model), and a far-field advection and dispersion model (MUDMAP) (APASA, 2017). The dispersion of contaminants will depend, initially, on the geometry and hydrodynamics of the discharge itself, where the induced momentum and buoyancy effects dominate over background processes. This region is

generally referred to as the near-field zone and is characterised by variations over short time and space scales. As the discharge mixes with the ambient waters, the momentum and buoyancy signatures are eroded, and the background, or ambient, processes become dominant.

The far-field modelling expands on the near-field work by allowing the time-varying nature of currents to be included, and the potential for recirculation of the plume back to the discharge location to be assessed. The near-field simulations consider steady-state unidirectional currents, while the far-field simulations account for currents that vary in speed and direction over time and space, far field modelling represents minimum dilutions achieved 95% of the time. Validation of the current data used for the modelling was performed using infield current measurements located approximately 30 km to the southwest of the Pluto riser platform location, two-point current measurements nearest to the surface, at depths of approximately 10 m and 70 m were used to evaluate the modelled current data. The outcome of the comparison was good agreement at all current speeds, and the modelled data product was suitable for PW discharge modelling. Validation of tidal predictions was performed using the model output and independent predictions of tides. All comparisons demonstrated that the model produces a very good match to the known tidal behaviour for a wide range of tidal amplitudes and clearly represents the varying diurnal and semi-diurnal nature of the tidal signal.

The dilution modelling results are based on the maximum design flow rates of 3,500 m3/day representing the worst-case load to the environment. At lower actual discharge rates, dilutions levels are expected to be achieved closer to the discharge point than those predicted by the modelling due to reduced loading to the environment.

Near Field

Modelling indicated that, irrespective of the season, given the elevation of the discharge above the water surface, the plume will initially plunge downward into the water column creating a turbulent mixing zone. Once the initial jet momentum ceased, the plume would remain sufficiently buoyant to rise to the surface to continue to mix with ambient waters, though at a slower rate. As a result of the mixing during the initial plunge and buoyant rise, the salinity and temperature of the discharge plume are predicted to reach background level over a short distance.

During low current speeds, the discharge will plunge the deepest (~11.5 m below sea level) and resurface closest to the riser platform (within approximately 10-11 m), with average dilution levels of 1:137-1:142 predicted at the end of the near field zone. Under medium and high current, the plunge depth becomes progressively shallower (approximately 7.5 and 5.5 m below sea level, respectively) due to the increasing deflection of the plume as it enters the water. The subsequent resurfacing of the plume under medium and high current occurs around 32 m and 63 m from the riser platform discharge location, respectively, regardless of season. Average dilution levels at the end of the near field zone under medium and high currents are predicted to be 1:135-1:237 and 1:277-1:283, respectively. Under all current conditions, the plume is predicted to resurface and remain in the upper layer of the water column (5-10 m).

Far Field

The far field modelling for all simulations indicated that the discharge plume would drift horizontally with the currents prevailing in the near surface layer while undergoing vertical and horizontal dispersion. Variable and patchy concentrations were predicted within the plume, attributed to large variation in current flows past the discharge point. The annual dilutions are provided below in

Generally, the overall plume footprints were observed to vary between season, with a noticeable north to north-westerly drift during the summer months and a south to south-westerly drift during the winter months. In the transitional months, more variation in the transport patterns was evident.

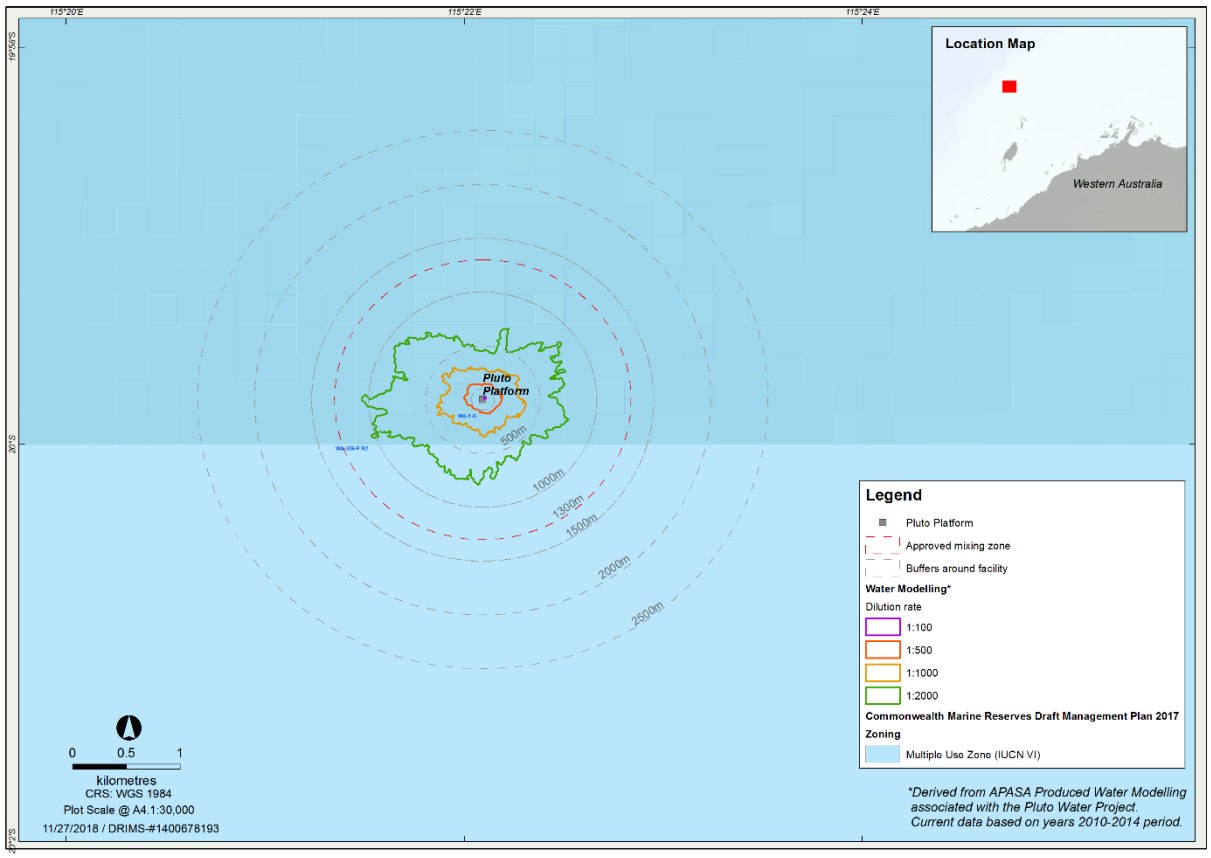


Figure 6-3: Annual dilution contours for a 3,500 m3 discharge from the Pluto Riser Platform

Modelling shows 2,000 dilutions can be achieved at maximum discharge rates in all conditions at 1300 m; therefore, this has been selected as the approved mixing zone boundary. This approved mixing zone will be reviewed and potentially adjusted after results of initial monitoring are received. Additionally, modelling predicts that 99% species protection safe dilutions can be achieved at the AMP boundary under all conditions. PW discharge rates are likely to vary up to a maximum rate of 3,500 m3 per day throughout field life.

Additional modelling was undertaken in 2024 (RPS,2023) to assess the potential impact of possible lower-rate discharges including those during non-routine activities such as production system restarts and water cut well start-ups. These intermittent activities have potential for short term variations in OIW specification which require system flexibility to optimise and stabilise the PW process, and hence may see short periods of elevated OIW concentration, not more than 50mg/L and 100mg/L 24-hour rolling average, for discharge rates limited to those lower than the design basis - as 1,900 m3/day and 795 m3/d respectively.

Bioaccumulation

Bioaccumulation refers to the amount of a substance taken up by an organism through all routes of exposure (water, diet, inhalation, epidermal). The Bioaccumulation Factor is the ratio of the steady-state tissue concentration and the steady-state environmental concentration (assuming uptake is from food and water). The test developed to measure the ability of a substance to bioaccumulate, namely, the octanol-water partition (Pow), is based on the preferential partitioning of lipophilic organic compounds into the octanol phase. Partitioning into octanol can be correlated with the attraction for such compounds to the fatty tissue (lipid) of organisms.

Bioaccumulation of BTEX compounds has been observed to occur in the laboratory, only at concentrations far in excess of that discharged from facilities on the NWS (for example refer to Berry, 1980); hence it is unlikely that BTEX would bioaccumulate at the exposure concentrations that may be experienced by biota around the Pluto facility. Baseline characterisation of the PW discharge will verify BTEX levels in the PW from the facility.

In contrast to BTEX compounds, PAH compounds have high Pow values indicative of the potential for bioaccumulation (Vik et al, 1996). Neff and Sauer (1996) based on available literature for laboratory and field studies investigating the bioaccumulation of PAHs. The bioaccumulation values for PAHs in marine organisms collected near PW discharges in the Gulf of Mexico reported by Neff and Saur (1996) indicate that the highest bioaccumulation factor was in the tissues of bivalve molluscs and the lowest in the muscle tissue of fish.

The most comprehensive field study assessing bioaccumulation of hydrocarbons and metals from PW discharged into offshore waters is that by Neff et al (2011). At the request of the United States Environmental Protection Agency (USEPA), the Gulf of Mexico Offshore Operators Committee sponsored a study of bioconcentration of selected PW

chemicals by marine invertebrates and fish around several offshore production facilities discharging more than 731 m3 per day of PW to outer continental shelf waters of the western Gulf of Mexico (by comparison Pluto discharges will be up to 3500 m3/day). The target chemicals identified by USEPA included five metals (As, Cd, Hg, 226Ra and 228Ra), three volatile Monocyclic Aromatic Hydrocarbons (MAH), benzene, toluene, and ethylbenzene, and four semi-volatile organic chemicals, phenol, fluorene, benzo(a)pyrene, and di (2 ethylhexyl) phthalate. Additional MAH (m-, p-, and o-xylenes) and a full suite of 40 parent and alkyl PAH and dibenzothiophenes were also analysed by Neff et al (2011) in PW, ambient water, and tissues at some platforms.

Concentrations of MAH, PAH, and phenol as determined by Neff et al were orders of magnitude higher in PW than in ambient seawater. There was no evidence of MAH or phenol being bioconcentrated. All MAH and phenol were either not detected (> 95% of tissue samples) or were present at trace concentrations in all invertebrate and fish tissue samples. Concentrations of several petrogenic PAHs, including alkyl naphthalene's and alkyl dibenzothiophenes, were slightly, but significantly higher in some bivalve molluscs, but not fish, from discharging than from non-discharging platforms. These PAH could have been derived from PW discharges or from tar balls or small fuel spills. Concentrations of individual and total PAH in mollusc, crab, and fish tissues were well below concentrations that might be harmful to the marine animals or to humans who might collect them for food at offshore platforms (Neff et. al., 2011).

It is expected that bioaccumulation is unlikely to result in increased levels of BTEX in biota surrounding the riser platform; however, there may be an elevation in PAH levels. Given the similarity of the chemical characterisation of PW discharges from Woodside facilities to those elsewhere in the world including those in the Gulf of Mexico (Rob Phillips Consulting 2016), the results from Neff et al (2011) can be used to infer the very low potential for adverse bioaccumulation effects to marine organisms, or to humans, if they were to consume any affected fish, molluscs or crabs found on upper near-surface legs of the facility.

The potential environmental impact associated with bioaccumulation of PW constituents in the water column is considered to be slight and a localised effect on a small number of non-threatened species in waters immediately surrounding the facility. The potential risk to fisheries is further reduced to ALARP as a result of negligible exposure given the PSZ that prohibits fishing from or near the platform. Given the nature of the PW discharge from the riser platform, the potential for bioaccumulation of PW contaminants (in particular BTEX) is considered to be minor and restricted to sessile organisms growing on the legs of the platform.

Impacts to Australian Marine Parks, KEFs and Biologically Important Areas

The facility is located approximately 416 m from the boundary of the Multiple Use Zone (IUCN Category VI) of the Montebello Marine Park. This zone is managed to allow ecologically sustainable use while conserving ecosystems, habitats and native species (Section 4.8).

The approved mixing zone overlaps 0.05% (1.6 km2 of the 3412 km2) Multiple Use Zone. Potential to impact the values of the Montebello Marine Park are expected to be very localised and are considered below.

Table 6-18 Values of the Montebello Marine Park

Value	Potential Impact
Ancient Coastline at the 125 m depth contour	The KEF is located approximately 6.5 km from the PW discharge point and is outside of the approved mixing zone. Modelling predicts the PW will form a buoyant plume extending less than 1,300 m from the discharge point, therefore, no contact and no impacts to biological indicators associated with the KEF are expected from the plume. Potential for impacts are monitored and managed to the approved mixing zone boundary; therefore, no impacts to the KEF situated outside the approved mixing zone are anticipated.
Species including species listed as threatened, migratory, marine or cetacean under the EPBC Act	A number of threatened migratory, marine or cetacean species may be in the approved mixing zone (Section 4.6). Species are primarily migratory and are not anticipated to spend long durations within the approved mixing zone. Toxicants are expected to rapidly dilute and are not considered to cause acute toxicity. By monitoring and managing water quality and sediment quality impacts to the approved mixing zone boundary, no impacts are expected to threatened migratory, marine or cetacean species.

BIA flatback turtle internesting buffer around the Montebello Islands (Oct – Mar)	The Montebello Islands, located approximately 41 km from the PW discharge, are the nearest emergent land and potential nesting habitat (minor) for flatback turtles. During internesting turtles remain close to the nesting beach or rookery (DOEE, 2017). Typically, internesting habitat is located immediately seaward of designated nesting habitat (DOEE, 2017). The approved mixing zone is within the Pilbara flatback turtle 60 km internesting buffer zone (October – March) however given the approved mixing zone is over 40 km from the nearest nesting beach internesting turtles are not anticipated to remain in the approved mixing zone for prolonged periods of time or in large numbers. Chronic discharge is identified as a moderate risk threat in the Recovery Plan for Marine Turtles for the Pilbara flatback population (DOEE, 2017). Given the localised area of impact, 95% species protection safe dilutions will be achieved by the boundary of the marine park and the distance to nesting habitat no impacts are expected to this value.
BIA foraging for whale sharks along the 200 m isobath, with seasonally high use (April–June)	The 200 m isobath is located about 17 km outside the approved mixing zone. Given the localised area of impact and that whale sharks are transiting the area, no impacts are expected.
BIA breeding habitat for seabirds	There is no nesting habitat within the approved mixing zone, therefore aggregations of breeding birds are unlikely to be present in the approved mixing zone. Foraging areas are located outside the approved mixing zone. No impacts are expected to this value.
BIA pygmy blue whale migration corridor (northern migration April to August; southern migration October to January) from Indonesian Waters to southwest Australia	The pygmy blue whale migration is thought to follow deep oceanic routes (DEWHA, 2008). In the NWMR, pygmy blue whales migrate along the 500 m to 1000 m depth contour on the continental slope where they are likely to opportunistically feed on ephemeral krill aggregations (DEWHA, 2008). Given the BIA is located outside the approved mixing zone and that PW forms a surface buoyant plume, no impacts are expected to this value.
Cultural Values	Cultural and spiritual values have been identified by the monitoring and management framework. In the absence of any specific environmental quality requirements for protection of this value, it is assumed that if water quality is managed to protect ecosystem integrity (95% species protection safe dilutions), this value is achieved in line with the EPA technical guideline.
Heritage values	No international, Commonwealth or national listings apply to the Montebello Marine Park currently. The Western Australia Barrow Island and the Montebello–Barrow Island Marine Conservation Reserves are outside of the approved mixing zone and therefore are not predicted to be impacted. Two historic shipwrecks, the Trial and Tanami, are located about 30 km outside of the approved mixing zone and therefore are not impacted by PW.

Information about the adaptive management program in place to address changes in routine discharge rates and other factors that may alter the assessment of risk is outlined within the OMDAMP. The Montebello Marine Park special protection zone for benthic habitat and sanctuary zone boundaries are located approximately 36 km to the south of the riser platform. As such, there are no impacts anticipated in these zones.

There are no impacts anticipated to the values of the Montebello Marine Park (including natural, cultural, heritage and socio-economic values). Wider water quality and sediment impacts are considered in respective sections above. Discharges are monitored and managed to achieve a 95% species protection safe dilution to protect ecosystem integrity via the OMDAMP at the AMP boundary.

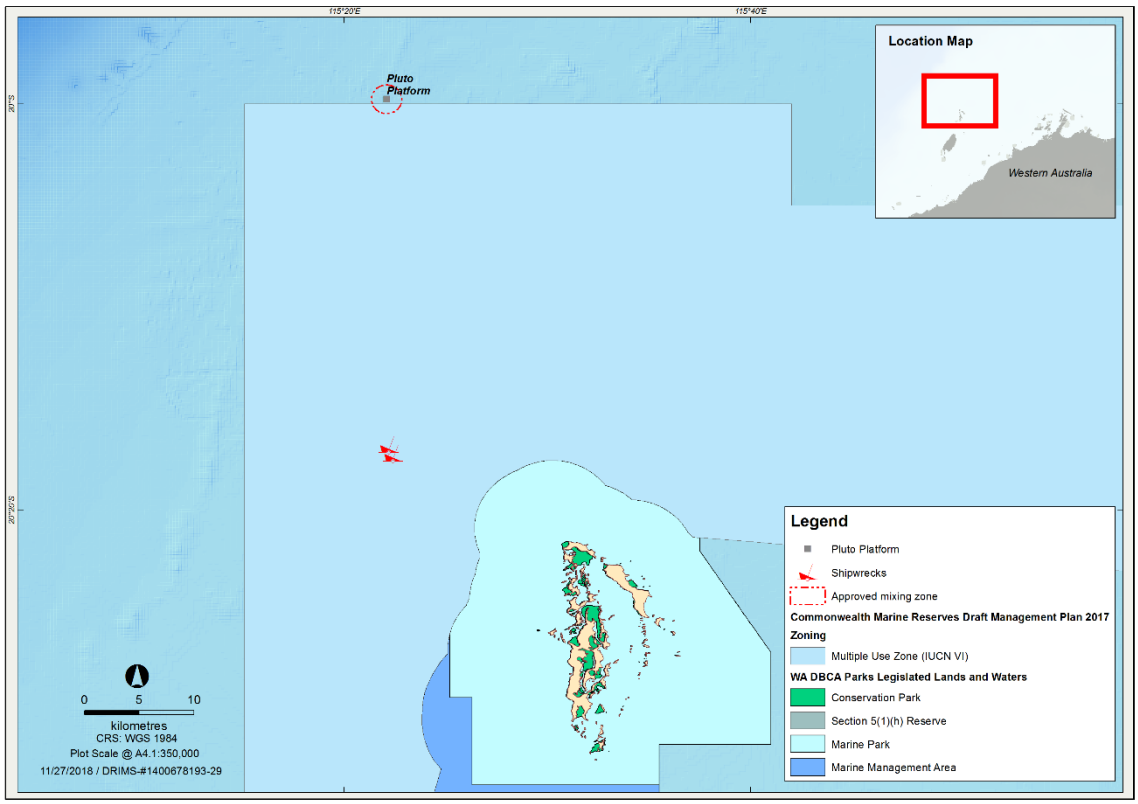


Figure 6-4 Montebello Marine Park Zones and heritage values

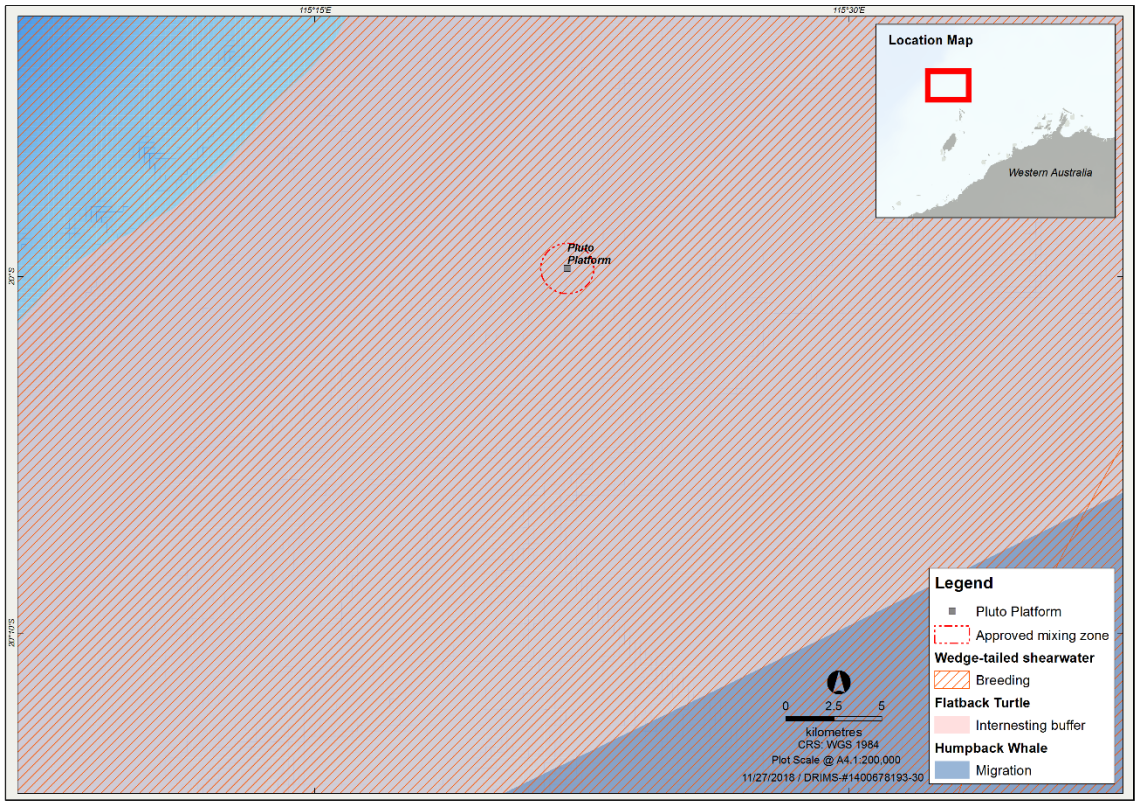


Figure 6-5 Biologically important areas

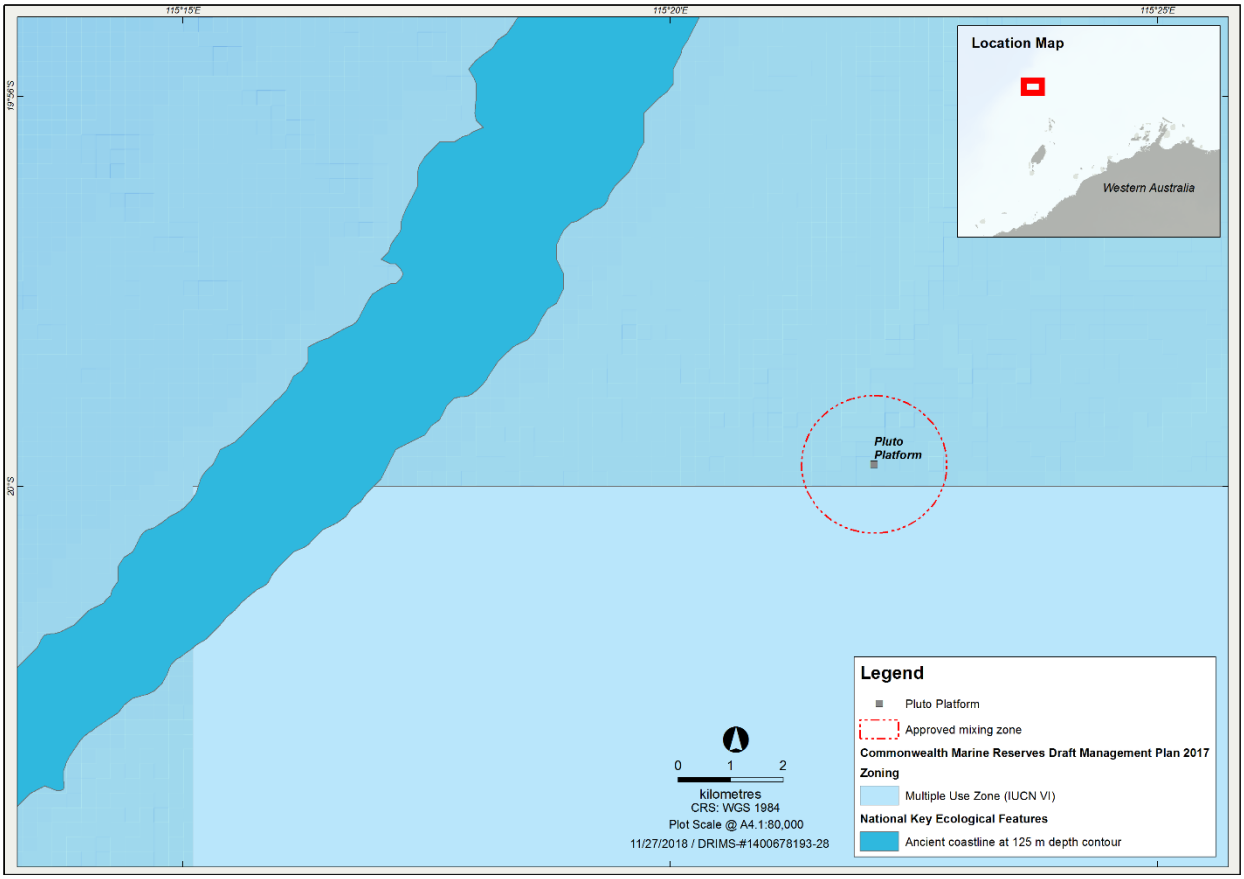


Figure 6-6 Key Ecological Features

Potential Impacts to Sediment Quality

Potential impacts to sediment quality were assessed through sediment surveys and supported by the results of flocculation studies and potential impacts to water quality.

Toxicants in Sediments

Accumulation of PW contaminants in sediments depends primarily on the volume and concentration of particulates in PW discharges or constituents that sorb onto seawater particulates the area over which those particulates could settle onto the seabed (dominated by current speeds and water depths) and re-suspension, bioturbation and microbial decay of those particulates in the water column and on the seabed.

Baseline sediment surveys were completed to provide a baseline monitoring prior to the discharge of PW from the riser platform. The benthic habitat within the approved mixing zone is predominantly soft sediment with sparsely associated epifauna, which is broadly represented throughout the NWS Province (Section 4.2). Benthic communities of soft sediment are characterised by burrowing infauna such as polychaetes, with biota such as sessile filter feeders occurring on areas of hard substrate (such as subsea infrastructure). Benthic grab sampling in the vicinity of the continental slope region of the Operational Area revealed a sparse abundance, high variability and high diversity of infauna dominated by polychaetes with other fauna including nemerteans and sipunculids and crustaceans (mainly amphipods) (SKM, 2007). Higher, albeit low, infauna density was reported at the shelf break (200 m) compared to deeper areas on the continental slope.

Within the approved mixing zone potential impacts to sediment quality may result in localised impacts to benthic communities. The potential extent of such impacts is extremely small in relation to the extent of the soft sediment habitats that are broadly represented within the Operational Area and the wider NWS Province. As such, impacts to benthic communities are expected to be localised with no lasting effect. There is no history of drilling with oil-based muds at the riser platform.

The PW plume is predicted to be buoyant, due to lower salinity and/or higher temperature than surrounding seawater. Therefore, potential contaminants in the PW discharge may be introduced into sediments around the riser platform through precipitations of soluble contaminants and flocculation and sedimentation of the particles in the PW plume. Studies into potential sediment accumulation from PW discharge have been undertaken by Woodside (Jacobs 2016). The study found that the PW at all facilities had very small amounts of solid material, with very little potential of settling or flocculation due to the very small particle sizes.

Initial monitoring is described above and includes settling velocity and particle size distribution to confirm potential for precipitation and flocculation.

Dr Graeme Hubbert categorised particulate behaviour based on oceanographic experience and mathematical calculations using settling rates and resuspension velocities for various particle sizes. He determined that particles of a size 1 to 5 µm would never permanently settle out of the water column, and that particles of a size 5 to 40 µm would not permanently settle out of the water column, unless they were in very deep water (> 5000 m) or in areas where hydrodynamic conditions were very weak and did not continuously resuspend the particles.

It is anticipated PW will not impact sediment quality to an unacceptable level; however, this will be verified via initial monitoring and results considered and managed by the OMDAMP. Should initial routine monitoring indicate the potential for impact to sediment quality to an unacceptable level, it will be necessary to undertake further investigations. This may include additional chemical characterisation, sedimentation studies, non-routine sediment sampling and/or bioavailability testing.

Non-Routine PW Discharges Impact Assessment

Production Restarts

There is the potential for the facility to experience high OIW during production restarts. Wells that have been shut in are required to be MEG and corrosion inhibitor dosed to maintain pipeline integrity, this may in part cause emulsions to form and OIW management issues. Wells that are either condensed water or have less associated produced water are expected to experience similar high OIW issues.

During production restart events, the modelled discharge rate of 5,000 bbl/day (795 m3/day) achieves 2,000 dilutions within 425 m from the platform in all directions and 3,719 dilutions are achieved at the AMP boundary as absolute worst-case (RPS 2023). With the additional controls, and non-routine discharge criteria of up to 100 mg/L 24hour rolling average (see Demonstration of ALARP table below) with lower-than-design discharge rates it is expected that OIW Predicted-No-Effect-Concentrations (PNEC) of 70 µg/L will be readily achieved for daily and monthly average timescales within an approximate 200-425 m radius of discharge (worse-case), and well before the AMP Multiple Use Zone at 416 m in a southerly direction.

Water Cut Well Restarts

Water cut wells that have been shut in for extended periods of time, may have varied produced water profiles on restart which can impact process stability until stable rates are achieved. It is expected that this can take a number of days for water rates to plateau from each individual water cut well when restarted.

During water cut well restart events, the modelled discharge rate of 12,000 bbl/day (1,900 m3/day) achieves 2,000 dilutions within 606 m from the platform in all directions and 2,107 dilutions are achieved at the AMP boundary (RPS 2023). With the additional controls, and non-routine discharge criteria of up to 50 mg/L 24hour rolling average (see Demonstration of ALARP table below) with lower-than-design discharge rates it is expected that OIW Predicted-No-Effect-Concentrations (PNEC) of 70 µg/L will be readily achieved for daily and monthly average timescales within an approximate 300 m radius of discharge (worse-case minimum dilution), and well before the AMP Multiple Use Zone at 416 m in a southerly direction.

Based on modelling and the non-routine short duration of elevated OIW, the non-routine discharge during production restarts and restarts of water cut wells is considered to have a short term, temporary and localised impact to water quality, and not predicted to result in impacts beyond the approved mixing zone, or AMP boundary.

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)[60]***	***Benefit in Impact/ Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None identified.				
Good Practice				
Implement Woodside's Chemical Selection and Assessment Environment Guideline:	F: Yes. Routinely implemented to the chemical selection process for Woodside facilities.	Selection and assessment of chemicals in accordance with the Woodside process, reduces	Benefits outweigh cost/sacrifice.	Yes C 5.1

[60] Qualitative measure

• Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required; and • If chemicals with a different OCNS rating, sub warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the procedure prior to use.	CS: Minimal cost. Standard practice.	environmental impacts associated with planned chemical discharge.		
Monitoring of OIW concentrations in accordance with PARCOM 1997/16 Annex 3 methodology. Limiting average PW OIW during routine operations to less than 30 mg/L (over a 24hr rolling average (ra.)). During non-routine production restart and water cut well re-start activities: limit PW OIW to less than 100 mg/L 24hr rolling average (<5000 bbl/day ra.), for the first 7 days following re-starts; OR limit PW OIW to a 50 mg/L 24hr rolling average (<12,000 bbl/day ra.), for up to 7 days. PW OIW is limited to a 30 mg/L monthly rolling average for all activities. Tertiary coalescing filter separation will be used for all non-routine activities where this aligns with achieving beneficial	F: Yes. CS: Monitoring and implementation costs. Standard practice. The 30 mg/L 24-hour rolling average limit proposed is a legacy of the former Environment Regulations 29 and 29A repealed in 2014. Reduction of this limit is not considered feasible or practicable. The current limit is effective in managing potential impact of PW discharge. Short-term non-routine criteria support ensuring PW operations achieve environmental outcomes (EPO) with ALARP management of start-up constraints which could otherwise resulting in frequent flaring, system upsets, and/or addition of process chemicals for integrity management	Limiting OIW concentrations within PW reduces impacts to the environment.	Benefits outweigh cost/sacrifice.	Yes C 7.1.1

OIW concentration objectives.	(potentially adversely affecting overall outcomes and OIW separation performance)			
Monitoring routine and implementation of the Adaptive Monitoring and Management Framework for PW discharges including: Monitoring of PW discharge volume Chemical characterisation WET testing; and Timing of annual / triennial sampling to be representative aiming to detect change, considering when the reservoir cuts formation water.	F: Yes. CS: Monitoring costs. Standard practice.	The OMDAMP provides for detection of significant changes to the PW discharge characteristics (i.e. volumes, OIW concentration, chemical characterisation) that may cause an increased impact or risk to the marine environment. Monitoring is designed to detect if 95% species protection is achieved at the approved mixing zone boundary. Through the implementation of the OMDAMP, potential risks to the environment are reduced.	Woodside has developed the OMDAMP based on operational experience from relevant offshore assets. The OMDAMP considers risk-based adaptive management measures.	Yes C 7.2
Online monitoring and/or procedural controls in place to monitor and control PW discharge volume and OIW concentrations, and prevent discharge of PW with high OIW concentrations through OIW analyser, or off spec/outage procedures. Process performance monitored by OIW concentration analyser and volume meter(s).	F: Yes. CS: Minimal cost. Standard practice.	The OIW analysers and flow meter provides optimal process control and safeguarding to monitor, control and prevent discharge of PW with high OIW concentration to the environment.	Online monitoring control is WMS requirement– must be adopted.	Yes C 7.3
The online analyser is calibrated with a manual sample in accordance with Offshore Laboratory Determination of Oil in Water Standard Operating Procedure.	F: Yes CS: Monitoring and implementation costs. Standard practice.	Calibration of equipment to maintain quality control.	Calibrations undertaken at appropriate frequency to maintain quality control and in line with procedures.	Yes C 7.4

Professional Judgement – Eliminate		
Reinjecting PW into reservoirs.	F: No. Some technical risk associated with reservoir uncertainty and ultimate reservoir recovery. Economically not feasible. CS: Significant. The reinjection of PW would require significant modification to the PLA facility, including drilling of injection wells. This would require considerable design and construction costs. Previous studies indicate a cost in excess of $400 million CAPEX for a PW reinjection solution on-board the Pluto facility. Benefit in Impact reduction The environmental impacts in the approved mixing zone around the facility would be eliminated. Long term biological impacts from PW that are outside of the acceptable limits of change (i.e. impacts to ecosystem integrity from contaminant accumulation in sediment and bioaccumulation effects over time) are prevented by the PW Monitoring and Management Framework. Proportionality As part of the possible solutions for managing PW from the Pluto operations, Woodside examined the potential for reinjection of PW. Woodside did not identify a suitable reservoir, and such an option would require additional drilling activities to be undertaken. Reinjection is not feasible unless a suitable reservoir is identified. It is not feasible to reinject into a previous Pluto appraisal well, or future shut-in well because this would further accelerate the production of PW from the reservoir and reduce the overall recoverable volume from the reservoir. Given the limited space available on the platform, subsea separation would be required, this is novel technology with limited operational experience. Drilling and Subsea work activities to establish a reliable PW reinjection well and subsea infrastructure also introduce significant complexity, risk and cost. Together the significant technological and operational risks, associated environmental impact (drilling and subsea construction, greenhouse gas emissions associated with 7–15 MW based on known requirements for Enfield–Laverda) is considered significantly disproportionate to the potential slight environmental impact improvement. As such, no further engineering design or screening studies reporting is considered reasonably practicable. It is not necessary to conduct a reservoir-by-reservoir analysis to understand these costs. For Type B impacts, it is appropriate to consider case specific drivers to ALARP management. The lack of a suitable reservoir contrasts with Woodside's facilities that currently reinject PW. At Nganhurra, for example, water re-injection was required to maintain reservoir pressure for production and was a key part of the FDP to optimise overall field recovery. As PW alone is not sufficient to maintain reservoir pressure, seawater is used to make up the balance. Therefore, given the significant economic benefits associated with reinjection at NGA, the ALARP outcome is different from NGA to Pluto. The reinjection of PW would also introduce additional sources of environmental risks and impacts, such as those associated with drilling injection wells (e.g. drill cuttings) and maintaining injection capability (e.g. increased greenhouse gas emissions from power generation for pumps, increased chemical usage, etc.). Given the localised, slight non-significant impact of PW discharges, and the considerable costs involved in developing a PW reinjection capability for the Pluto facility, implementation risks and environmental impacts (greenhouse gas, chemical use), the costs are grossly disproportionate to the potential environmental benefit gained.	No

Professional Judgement – Substitute				
None identified.				
Professional Judgement – Engineered Solution				
Chemical injection of water clarifier, demulsifier to reduce OIW concentration, if required.	F: Potentially feasible. CS: Moderate. Initial cost of modifying production system to include chemical dosing point. Ongoing cost of chemical procurement.	Potential minor reduction in OIW concentration; however, does not reduce the overall consequence rating. Further, this results in additional chemical load, and lifecycle environmental footprint associated with packaging, logistics, waste management and potential process upsets.	Benefits outweigh cost/sacrifice.	Yes C 7.5
Secondary treatment stage (HIGF) to reduce OIW concentration.	F: Yes. Process design adopts an HIGF unit. CS: Moderate. Integrated in to process design. Ongoing cost of maintenance.	Installation of a secondary treatment stage (HIGF) has been provided on the NNC facility to ensure OIW remains below 30 mg/L (24-hour rolling average) during routine operations.	As part of the possible solutions for managing PW from the Pluto operations, Woodside examined the potential for installation of various secondary treatment technologies. The HIGF was identified as the optimal secondary treatment stage in order to maximise OIW separation prior to discharge overboard during routine operations.	Yes C 7.1.3
Adoption of a permanent tertiary treatment stage to reduce OIW concentration. Filters are used during the initial commissioning period and non-routine activities if required to minimise OIW concentration of PW discharged.	F: Potentially feasible. CS: Moderate. Integrated in to process design. Ongoing cost of maintenance.	Potential minor reduction in OIW concentration.		Yes C 7.1.3
Professional Judgement – Procedures and Administration				
Routine in situ monitoring beyond the requirements of Woodside's OMDAMP for an existing asset	F: Yes. CS: Increasing the frequency of field based monitoring would result in additional offshore demand on resources, safety	In situ monitoring following release is not an effective control to manage the nature of PW discharges and results no impact reduction. Increases to in situ monitoring	Long term monitoring of water and sediment) characteristics at the facilities indicate the PW discharge is not detectable beyond	No

	hazards and costs associated with an offshore environmental monitoring program, such as vessel activities, logistics, manual labour, analytical laboratory and service provider costs.	beyond the adaptive management approach outlined in the OMDAMP does not follow good application of the hierarchy of controls and results in disproportionate sacrifice with regard to execution risks and costs for limited gain.	the approved mixing zone. No sediment contamination has been detected. PW separation process design, optimisation, monitoring and surveillance offer the primary controls, with discharge OIW analysis in place to detect performance variations. Further, Woodside maintains a routine OIW monitoring program for the PW stream (including adaptive management via the OMDAMP, which assesses the need for in situ monitoring). The work undertaken to date provides Woodside with a sound understanding of the nature and scale of the environmental impacts from PW discharge, which would not be further improved by increasing the frequency of in situ monitoring. The execution risks and cost of implementing this control is grossly disproportionate to the environmental benefit.	

Risk Based Analysis

Application of Woodside's Risk Management Procedures and implementation of the OMDAMP ensures the routine assessment of PW impacts, identification of changes to discharges, systematic assessment of risks and ongoing assessment/monitoring of discharge streams to reduce risk to ALARP, that includes:

ongoing hazard identification, risk assessment and the identification of control measures

ongoing PW discharge monitoring.

Company Values

Corporate values require all personnel at Woodside to comply with appropriate policies, standards, procedures and processes while being accountable for their actions and holding others to account in line with the Woodside Values. As detailed above, the Petroleum Activities Program will be undertaken in line with these policies, standards and procedures that include suitable controls to manage PW discharge.

Societal Values

Due to the Petroleum Activities Program's proximity to sensitive receptors and potential uncertainty around PW discharges, the PW discharge consequence rating presents a Decision Type B in accordance with the decision

support framework described in Section 2.6.1. Consultation was undertaken for this program to identify the views and concerns of relevant stakeholders, as described in Section 5.

Woodside has sent an Activity Factsheet to all identified relevant stakeholders regarding the Petroleum Activities Program (Section 5 and Appendix F), no specific concerns around PW discharge were identified through this process.

ALARP Statement

Based on 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 of PW discharge. Woodside has undertaken extensive PW process studies, trials (emulsions) and risk-based analysis (PW discharge modelling) to inform the evaluation and assessment of environmental impacts and risks. Woodside also implements a risk-based adaptive OMDAMP. The outcomes of the modelling studies and process engineering have been considered in determining the ALARP position.

As no reasonable additional/alternative controls are currently identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts are considered ALARP.

Demonstration of Acceptability

To assess and determine the acceptable limits of impacts from PW discharges, Woodside has considered the following criteria, appropriate guidelines, principles of Ecologically Sustainable Development, Company Values and Societal Values.

Other Requirements (includes Laws, Polices, Standards and Conventions)

The adopted controls and acceptability assessment has considered regulatory guidance, in particular WA EPA (2016) Technical Guidance: Protecting the Quality of Western Australia's Marine Environment and the ANZG (2018) guidelines. Both sources of Regulatory Guidance provide that environmental values should be identified, and levels of ecological protection should then be set. To ensure ecosystem health is maintained overall, the cumulative size of the areas where lower levels of ecological protection apply should be proportionally small compared to the areas designated high and maximum. The ANZG (2018) guidelines similarly provide guidance that levels of protection should be identified, based on the environmental values to be protected. The Monitoring and Management Framework aligns to the levels of protection described by both WA EPA (2016) Technical Guidance and the ANZG 2018 guidelines through the acceptable limits of change.

The level of ecological protection provided to sensitive receptors is consistent with the North-west Network Management Plan (2018). By monitoring and managing to the 95% species protection safe dilutions at 1300 m, there can be high confidence that any potential for impacts will be detected and managed via the OMDAMP.

Principles of Ecologically Sustainable Development

Woodside has established several research projects to understand the marine environments in which we operate, notably in the Exmouth Region and the Kimberley Region, including Rankin Bank, Glomar Shoals, Enfield Canyon and Scott Reef. Woodside's corporate values require that we consider the environment and communities in which we operate when making decisions.

Woodside looks after the communities and environments where we operate. Risks are inherent in petroleum activities; however, through sound management, systematic application of policies, standards, procedures and processes, Woodside considers that despite this potential impact, the extremely low impact of PW is acceptable.

The proposed activity has been assessed and considered in accordance with Australian IUCN Reserve Management Principles, conditions of the class approval (Section 1.9), objectives of the IUCN category VI zone (Section 1.9), the North West Marine Park Management Plan and the values of the Montebello Marine Park. Discharge of PW is acceptable providing that 95% species protection safe dilutions are met at the Montebello Marine Park boundary. This removes potential to adversely impact on biodiversity, ecological integrity, social amenity or human health. Activities will not be conducted in a manner inconsistent with the Objectives of the respective zones of the AMPs, the Principles of the IUCN Area Categories of the Values of the AMPs.

Internal Context

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

- Woodside Environment and Biodiversity Policy (Appendix A);
- Woodside Risk Management Policy; and
- Woodside Environmental Performance Procedure (which specifies maximum mixing zones and minimum sampling requirements).

Woodside corporate values include working sustainably, with respect to the environment and communities in which we operate, listening to internal and external stakeholders (below) and considering HSE when making decisions.

External Context

Woodside recognises that its licence to operate from a regulator and societal perspective is based on historical performance, complying with appropriate policies, standards and procedures, and understanding the expectations of

external stakeholders. External stakeholder consultation was undertaken with relevant stakeholders (Section 5), prior to the Petroleum Activities Program and feedback was incorporated into this EP where appropriate. In particular, the Director of National Parks (DNP) was consulted as part of the 5-yearly update for this document. In addition, Woodside undertook additional consultation (2022) specific to PW discharge monitoring and management and other activities including baseline data collection on sediment quality during the engagement process.

By providing PW monitoring and control measures that are commensurate with the risk rating, location and sensitivity of the receiving environment (including social and aesthetic values), Woodside believes this addresses broad societal concerns to an acceptable level.

Acceptability Statement

Routine and non-routine discharges of PW have been evaluated as representing potential slight, localised, short-term impacts to water quality, marine sediment, marine fauna and ecosystem/habitat. As per Section 2.6.1, Woodside considers 'high order impacts' (Decision Type B impacts such as PW discharge) as acceptable if ALARP is demonstrated using good industry practice, consideration of company and societal values and RBA, if legislative requirements are met and societal concerns are accounted for, and the alternative control measures are grossly disproportionate to the benefit gained. In addition, acceptability is assessed against the above criteria.

The adopted controls are considered good oil-field practice/industry best practice, are consistent with WA EPA (2016), ANZG (2018) and Woodside's internal requirements. Further opportunities to reduce the impacts have been investigated (refer ALARP demonstration) and considered to be grossly disproportionate to the benefit gained. Woodside considers the adopted controls appropriate to manage the impacts of PW discharge to an acceptable level.

EPOs, EPSs and MCs For Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 7 No impact to ecosystem integrity from Produced Water outside of the Approved Mixing Zone boundary.	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed.
	C 7.1.1 Monitoring of OIW concentrations in accordance with PARCOM 1997/16 Annex 3 methodology.	PS 7.1 Limiting average PW OIW during routine operations to less than 30 mg/L (over a 24hr rolling average. During non-routine production restart and water cut well re-start activities: limit PW OIW to less than 100 mg/L 24hr rolling average (<5000 bbl/day ra.), for the	MC 7.1.1 Records demonstrate OIW rolling average limits are not exceeded during routine and non-routine (production restart and water cut well restarts) activities.
	C 7.1.2 Continuous reservoir management during routine operations, i.e. changing the relative contribution to facility production of each well, including choking back high OIW wells, to maintain OIW concentrations below Performance Standard.		

	C7.1.3 Adopting a tertiary and secondary treatment stage to reduce OIW concentration.	first 7 days following re-starts; OR limit PW OIW to a 50 mg/L 24hr rolling average (<12,000 bbl/day ra.), for up to 7 days. PW OIW is limited to a 30 mg/L monthly rolling average for all activities. Tertiary coalescing filter separation will be used for all non-routine activities where this aligns with achieving beneficial OIW concentration objectives.	
	C 7.2 Implementation of the Adaptive Monitoring and Management Framework for Produced Water.	PS 7.2.1 No potential to impact ecosystem integrity from PW outside of acceptable limits of change. The acceptable limit of change is no impacts from PW beyond the approved mixing zone.	MC 7.2.1 Records show routine monitoring has been conducted. Settling velocity and particle size distribution analysis is proposed as part of the initial monitoring of representative discharge to confirm potential for sediment impacts. Results of these studies will inform if non-routine sediment sampling is required prior to the next routine monitoring event. Further investigations have identified no potential to impact ecosystem integrity from PW outside of acceptable limit.

	C 7.3 Online monitoring and/or procedural controls in place to monitor and control PW discharge volume and OIW concentrations and prevent discharge of PW with high OIW concentrations through: OIW analyser, or off-spec/outage procedures.	PS 7.3.1 (a) Instrumentation integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environmental risk related to Damage to SCEs for: P31 – Environmental Emissions Monitoring and Controls, to: provides means of detecting environmental releases, emissions and discharges to prevent MEEs from manifesting over time, and/or assure compliance monitoring and reporting equipment. ensures monitoring data is available to control PW discharge volume and OIW concentrations; to prevent discharge of PW with high OIW concentrations.	MC 1.16.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
		PS 7.4 (b) Online monitoring and/or procedural controls in place to monitor and control PW discharge volume and OIW concentrations, and prevent discharge of PW with high OIW concentrations by implementing procedures (under development) that includes response measures in the event of: increasing or off-spec PW OIW readings loss of signal for two OIW analysers.	
	C 7.4 The online analyser is calibrated with a manual sample in accordance with Offshore Laboratory Determination of Oil in Water Standard Operating Procedure.	PS 7.4 Complete calibrations of online analyser and manual OIW sampling equipment in accordance with Offshore Laboratory Determination of Oil in Water Standard Operating Procedure.	Refer to MC 7.4.1 Records demonstrate manual sampling and calibration undertaken during commissioning activities as appropriate.
	C 7.5 Chemical injection of water clarifier, demulsifier to reduce OIW concentration.	PS 7.5 For routine operations, PW is treated through the PW treatment system so that OIW is limited to a 30 mg/L 24-hour rolling average.	MC 7.5.1 Records demonstrate OIW rolling average limits are not exceeded during routine activities.

6.7.8 Routine and Non-Routine Discharges: Drill Cuttings, Drilling Fluids and Well Removal Fluids

Context		
Drilling Activities – Section 3.11.1 Contingent Activities – Section 3.11.5	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5	Consultation – Section 5

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems/Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Routine discharge of WBM drill cuttings to the seabed and the marine environment		x	x		x			A	E	-	-	GP PJ	Broadly Acceptable	EPO 8
Routine discharge of drilling muds (WBM) to the seabed and the marine environment		x	x		x				E					
Non-Routine discharge of treated NWBM drill cuttings to the marine environment		x	x		x				D					
Non-routine discharge of wash water from mud pits and vessel tank wash fluids		x	x		x				E					
Routine discharge of well clean-out fluids		x	x		x				E					
Non-routine discharge of well annular fluids		x	x		x				F					

Description of Source of Impact

Drilling Operations

The Petroleum Activities Program will involve the drilling of the Xena-03 well, drilled over a period of approximately 60 days (including mobilisation, demobilisation and contingency). Drilling activities generate drill cuttings, require cementing of the casing, and require the use of a range of fluids. Throughout the drilling program several different fluids are to be run through the closed circulation system including, but not limited to, drilling fluids (water-based muds and non water-based muds), sea water, and kill-weight brine.

Routine drilling discharges will include:

- drill cuttings
- drilling fluids direct to seabed (WBMs only), retained on cuttings and bulk discharge of mud pits (WBMs only)

- Non-routine drilling discharges may include:
- drill cuttings and fluids generated due to respud or side tracking
- WBM, swarf and cement cuttings
- well abandonment and use of fluids (subsea control, completions and well annular fluids).

Drilling activities are described in Section 3.11.1. The well will be drilled as a series of sections, as detailed in Section 3.11.1. The top hole section of the well will be drilled without a riser in place (i.e. riserless drilling). Drill cuttings and unrecoverable WBMs are discharged at the seabed for the top-hole sections, which are drilled riserless (i.e. no closed loop with the MODU). This results in a localised area of sediment deposition (known as a cuttings pile) around and in proximity to the well site influenced by prevailing seabed currents.

Upon drilling of the top hole section, a casing will be cemented in place, a BOP installed and a riser put in place between the BOP and the MODU. The riser remains in place during drilling of the bottom hole sections and facilitates the circulation of drilling fluids and cuttings between the well bore and the MODU. This enables cuttings and drilling fluids to be circulated back to the MODU, where the cuttings are separated from the drilling fluids by the solids control equipment (SCEt) and typically re-used in the closed loop system between the well bore and the MODU. The cuttings (with adhered residual fluids) are, in typical circumstances, discharged below the water line, with their fate and dispersion determined by cuttings particle size and the density of the unrecoverable fluids. In contrast the fluids are recirculated into the fluid system where there are a number of mud pits (tanks) on the MODU that provide a capacity to mix, maintain and store fluids required for drilling activities. The mud pits form part of the drilling fluid circulating system and may be discharged at the end of specific well sections, where there is a requirement to change the drilling fluid system or the drilling fluid cannot be re-used (due to deterioration/contamination). Bulk discharge of this type is only permitted for WBMs.

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

Drill Cuttings and Fluids

As described above, the primary discharges used as the basis of the impact assessment for this Petroleum Activities Program are as follows:

- Drill cuttings: drilling generates drill cuttings due to the breakup of solid material from within the borehole. The resultant drill cuttings are basically rock particles of various shapes, with sizes typically ranging from very fine to very coarse.
- Drilling fluids: serve many purposes including maintaining borehole stability and hydrostatic pressure, reducing friction and cleaning/ cooling of the drill bit, in addition to acting as a medium to carry cuttings from the well bore and return them to the surface at seabed or on the MODU. There are two main types of drilling fluids as follows:

- WBMs consists mainly of fresh water or seawater with the addition of chemical and mineral additives to aid in its function. Drilling additives typically used may include chlorides (e.g. sodium, potassium), bentonite (clay), cellulose polymers, guar gum, barite or calcium carbonate. These additives are either completely inert in the marine environment, naturally occurring benign materials, or readily biodegradable organic polymers with a very fast rate of biodegradation in the marine environment. Bentonite and guar gum are listed as 'E' category fluids under the OCNS and is included on the Oslo Paris (OSPAR) Commission PLONOR (chemicals that 'pose little or no risk to the environment') list (OSPAR Commission, 2021). WBMs can be discharged to sea as fluids retained on cuttings and as bulk discharge from mud pits.

For the purposes of this impact assessment, the indicative dimensions, discharge locations and approximate drill cuttings and drilling fluid volumes provided in Table 6-19 represent the estimated discharges for the Xena-03 Tie-back activities.

Table 6-19: Estimated discharge of cuttings and volumes of drilling fluids used for Xena-03 Tie-back activities.

Well section width (inches)	Cuttings ~volume (m^3)	Drilling fluid type	Drilling fluid ~ volume (m^3)	Hole section	Discharge point
42	72	Seawater1 with pre-hydrated bentonite (PHB) sweeps/XC polymer	157	Top hole	Seabed

	26	569	Seawater1 with pre-hydrated bentonite (PHB) sweeps/XC polymer	752		
	17.5	304	WBM	920	Production hole #1	Surface
	13.5 or 12.25	163	WBM	327	Production hole #2	
	9.875	15	WBM	2640	Reservoir section	
Total planned activities		***591 m³***		***5573 m3***		
Indicative Contingent Activities – NWBM. If NWBM required, these volumes will replace WBM volumes for production hole #2	13.5 or 12.25	163	NWBM	670 (retained fluid on cuttings)	Production hole #2	Surface
Indicative Contingent Activities - one top-hole respud	42" + 26" + 17.5" sections	534	Seawater1 with PHB sweeps/XC polymer for 42"/26" sections. WBM for 17.5" sections.	3030	Top hole + production hole #1	As above for each section
Indicative Contingent Activities - sidetrack one section (WBM or NWBM, not both)	~12.5 - 13.5" section	163	WBM	1590	Production hole #2	Surface
	~12.25 - 13.5" section	163	NWBM	670	Production hole #2	Surface

1 seawater volume is not included in the estimated 'drilling fluid volume'

Subsea – Displacement, Completion and Well-bore Cleanout Fluids

Reservoir drilling and completion fluids are usually brines (i.e. a mixture of seawater or formation water) with additives that can include:

- chlorides (often sodium, potassium or calcium)
- bromides
- hydrate inhibitor (mono-ethylene glycol (MEG))
- biocide
- oxygen scavenger.

They are designed to have the proper density and flow characteristics to be compatible with the reservoir formation. Completion fluids are used to run well completions, and during wellbore clean up and flowback during drilling.

Wellbore and casing clean-up are required at various stages of the drilling operations so that the contents of the well are free of contaminants before the next stage of drilling. A chemical wellbore cleanout fluid train may be used to remove residual fluids from the wellbore. The wellbore cleanout fluid is usually brine (similar to completion fluid) that can include several chemicals, such as biocide and surfactant. During the clean-up process, fluids are circulated back to the MODU.

Cleanout fluids and completion brine will be captured and stored on the MODU and discharged if oil concentration is less than 1% by volume or returned to shore if discharge requirements cannot be met. Discharge volume would be ~400 m³.

Contingent Drilling Activities

Non-water Based Muds

NWBM are not planned to be used but may be required as a contingency during drilling should the offset history, geohazards assessment and borehole stability studies indicate that NWBM is required to manage well stability to safe levels. Where NWBM is needed to drill a well section, the cuttings from the NWBM drilling fluid system will also pass through a cuttings dryer to reduce the average residual oil on cuttings (OOC) for the well (only sections using NWBM) to ALARP, prior to discharge. In the event of SCE failures, cuttings may be discharged without having passed through the dryer; however, this will only occur for a short duration while the drill string is being moved to a safe location in the well and existing cuttings are circulated out of hole. A decision will then be made on the case for drilling ahead without the failed SCE, while still meeting residual OOC discharge limits. Drilling ahead while SCE breakdown assessment and repairs occur is a contingent activity subject to additional controls; however, the standard mode of operation for the management of cuttings to ALARP is to treat cuttings through a dryer. An OOC discharge limit of <6.9% on wet cuttings will be averaged over well sections drilled with NWBM for the well.

Should NWBM be used, mud pit residue may be discharged to the sea where the residue contains <1% oil volume. Where the mud pit residue exceeds 1% by volume, the residue will be retained and disposed of onshore.

Base oil and chemicals used in NWBM are assessed in accordance with the Chemical Selection and Assessment Environment Guideline.

Respud

It is unlikely that the well would be required to respud. If required, the most likely scenario is that the decision to respud is made during drilling of the top hole section of the well; therefore, the incremental increase in cuttings and fluids discharges is associated with the repeat drilling of the same top hole sections for the respudded well with the same associated discharges. A respud once drilling of the bottom hole sections has commenced is far less likely, given the time and effort already committed to the well. However, if this was to occur, the associated discharges would also be a repeat of the discharges required to re-drill the same sections of the respudded well.

Permanent Plugging Program and Removal of Well Infrastructure

If required as a contingency activity, the base case for permanently plugging the well includes the use of WBM and wet cement and will produce well annulus fluids (residual hydrocarbons and residual produced formation water). These fluids/cuttings will be generated during the well bore clean-out, drilling of existing cement barriers, installation of permanent abandonment barriers, circulation of the annulus and washing out of the mud pit.

Potential additional activities that may be required as part of the Petroleum Activities Program includes milling, which will produce metal swarf, drilled cement and formation rock. All of the downhole plugging for permanent abandonment activities are conducted through the marine riser. This is a closed system, meaning there are no planned discharges directly to sea during these activities. Planned discharges of the above fluids are only planned to occur after they have been received on the MODU.

The following describes the source of impact with respect to discharge of clean-up fluids, well kill fluids, grit and flocculent only. See Section 6.7.9 for cement, cementing fluids and subsea control fluids. For the purposes of this impact assessment, the indicative dimensions, discharge locations and approximate volumes are provided in Table 6-20.

Table 6-20: Estimated discharges of solids and volumes of drilling fluids used for contingency plugging and well infrastructure removal

Description	Discharge Point	Discharge	Approximate Solids Discharged (m^3)	Approximate Fluid Discharged (m^3)	Potential Additional Solids (m^3)	Potential Additional Fluid Discharge (m^3)
Drill out cement plug	Below sea level	WBM and cement cuttings	2	1	0	0
Kill well	Below sea level	Well kill fluid	0	0	0	Discharged if oil concentration is less than 1% by volume or returned to shore if discharge requirements cannot be met.

End of well discharge	Below sea level	WBM, brine, mud pit and vessel tank was fluids	0	600	0	0
Milling (potential activity using WBM)	Below sea level	WBM, swarf, cement and formation rock	0	0	2 (swarf) 3 (cement) 3.5 (formation rock)	1600
Milling (potential activity using NWBM)	Below sea level	NWBM, swarf, cement and formation rock	0	0	2 (swarf) 3 (cement) 3.5 (formation rock)	5
Mechanical cutting	Within the well, below the mudline	Metal and cement cuttings from well infrastructure and lubrication for the cutting tool.	0	0	Negligible volumes may be released to surface sediments if cut is made at or close to the mudline	
ABWJ cutting	Within the well, below the mudline	Flocculant and grit	4 tonnes (planned to be released within the well, above the top permanent plug with small volumes entering sediments at cutting depth).	250 L (planned to be released within the well, above the top permanent plug with small volumes entering sediments at cutting depth).	Small volumes may be released to surface sediments if cut is made at or close to the mudline	

Drilled Cement

Indicative volumes of drilled cement for the well are outlined in Table 6-21. The shallow cement plug will preferentially be drilled out with WBM. The drilling fluids will pass through shakers to remove the cement cuttings from the drilling fluid before discharging the cement cuttings.

Well Annular Fluids

Well annular fluids refer to the fluids that remain in the wellbore, or annular spaces between the casing. They may consist of weighted drilling fluid and cement-contaminated mud, seawater, barite, cement polymer, and may include small amounts of hydrocarbon. Upon wellhead removal small volumes (~1.5 m^3) of fluid exchange between the annular spaces and the ocean may occur. The exchange will not be instantaneous as the annular spaces are small and the fluids are typically heavier than seawater. In the unlikely event routine wellhead removal techniques are unsuccessful, this fluid exchange is expected to occur over time following sufficient corrosion of the wellhead.

The small volumes and non-instantaneous nature of the release of the well annular fluids is expected to result in rapid dilution to a no-effect concentration within metres of the release location.

Well Bore Clean-out and Well Kill Fluids

If permanent plugging activities are required, the well will generally be displaced from well kill brine to viscosified brine, or cleaned, which may include residual annulus fluid. A chemical clean-out pill or fluids train will be circulated between the two fluids. This will result in a discharge of fluids in accordance with Woodside's internal guidelines to ensure the potential impacts of the chemicals selected are acceptable.

Should there be clean-up brine contaminated with base oil or NWBM, it will be captured and stored on the MODU for discharge if oil concentration is less than 1% by volume, or returned to shore if discharge requirements cannot be met.

If well kill fluid fails to be bullhead pumped into the well, reservoir fluids may need to be bled off at the MODU through well control equipment (dedicated bleed off/well test spread). In this event, well control equipment will be used to separate the well kill fluids from the hydrocarbons and direct the hydrocarbons to be flared, vented or incinerated,

depending on a number of factors including the volume, weather conditions, and safety requirements as documented in relevant procedures for this activity. The well kill fluids will be captured and stored on the MODU and discharged overboard if oil concentration is less than 1% by volume or returned to shore if discharge requirements cannot be met.

Milling

If permanent plugging activities are required, there is a potential additional activity where the well casing needs to be milled out (up to 100 m). This will produce milled swarf (2 m^3), drilled cement cuttings (~3 m^3) and formation rock (~3.5 m^3) and will preferentially be completed using WBM. There may be instances where NWBM is required for operational purposes to manage well stability to safe levels. The solids from the WBM or NWBM drilling fluid system (including the swarf, drilled cement cuttings and formation rock) will also pass through the shakers, to separate these solids before discharging them. Given the small volumes of solids and only limited drilling into formation rock, no oil on cuttings (OOC) discharge limits have been applied, as would be the case for a drilling activity. The estimated volume of solids discharged with residual NWBM on them is expected to be about 5 m^3 (per 100 m milled interval).

Removal (Cutting) of Well Infrastructure (Contingency)

The planned cutting depth for removal of the wellhead is approximately 3-5 m below the mudline. Discharges from cutting of well infrastructure using either an abrasive water jet cutting method of a mechanical cutting tool are therefore expected to be confined predominately within the well and settle on the top of the permanent plug. During final cut through the conductor pipe, small amounts of flocculant and grit will be released below the mudline to sediments immediately surrounding the well.

Should cutting at a shallower depth be required, these discharges may be released to the seabed surface. For the mechanical cutting tool, discharges will be limited to small quantities of metal and cement cuttings from the infrastructure itself as well as small quantities of lubricant. For the abrasive water jet cutting method, discharges include a small amount of grit and flocculant. Depending on the cutting depth, pressure from the jet cutting could push some of the material up to the seabed surface causing localised smothering of benthic communities as well as create localised and temporary increases in turbidity around the well.

Impact Assessment

Potential impacts to environmental values

Routine and non-routine drilling-related discharges may result in the following impacts:

- change in water quality
- change in seabed sediment quality
- change in seabed habitat
- injury/mortality to marine fauna (benthic communities).

Some fluids are discharged at the sea surface (or just below); and some are discharged at the seabed. Due to water depth at the drilling location (177 m), this will determine the exposure pathway, and hence potential impacts and receptors.

Drill Cuttings and Retained Fluids

Water Quality and Planktonic Communities

Drill cuttings and retained drilling fluid discharges are expected to increase turbidity and TSS levels above ambient concentrations above the seabed (top-hole well section) or in the upper surface layers (bottom-hole well sections with discharge below the water line from the MODU). Drill cuttings discharge will be generally intermittent and of short duration (over a total period of about 15 days) during drilling of the well.

Top-hole well section drill cuttings and drilling fluids (WBM) will be discharged at the seabed. The coarser material (drill cuttings) will deposit on the seabed and the finer sediment material (the WBM) will cause localised elevated TSS in the water column above the seabed surrounding the well. This reduction in water quality will be temporary (limited to the operational discharges during drilling) and subject to rapid dispersion and dilution by prevailing seabed currents.

During bottom-hole well sections, when drill cuttings with retained drilling fluids (WBM) are discharged below the water line (from the MODU), the larger particles, representing about 90% of the mass of the solids, form a plume that drops out of suspension in the water column rapidly and, deposits on the seabed. About 10% of the mass of the solids (the fines predominately composed of drilling fluid) form a plume in the upper surface layer (depending on the depth of discharge from the MODU) that will be transported by prevailing currents away from the MODU and is diluted rapidly in the receiving waters (Neff 2005, 2010). There is a large body of knowledge indicating a discharge of cuttings with adhered fluids diluting rapidly, finding that within 100 m of the discharge point, a drilling cuttings and fluid plume released at the surface will have diluted by a factor of at least 10,000. Further to that, Neff (2005) states that in well mixed oceans waters, the plume is diluted by more than 100-fold within 10 m of the discharge site.

Dispersion of the cuttings plume is influenced by a number of factors: particle sized distribution of the cuttings and fluids, operational discharge events and rates and metocean conditions such as ocean current speed. The case studies described in Neff (2005) used WBMs and surface current speeds of 0.15–0.3 m/s. As currents in the PAA are

expected to be within this range, and WBMs (bulk discharge) will contribute the largest input to elevated TSS/turbidity during drilling discharges, the dispersion extent as determined by Neff (2005) is considered representative for Xena-03 tie-back activities.

Using the widely-accepted dilution factor of 10,000 (Neff, 2005), cuttings (and adhered fluids) are expected to reach 100 mg/L TSS within 100 m of the MODU. Using a conservative ocean current speed of 0.1 m/s, these discharges are expected to disperse to 100 mg/L within ~16 minutes.

Given the generally low concentration of TSS outside the immediate vicinity of the discharge point, due to rapid dispersion of sediment and the short period of intermittent discharge, the plume is not expected to have more than a very highly localised reduction in water quality and area of potential ecological impact. It is not predicted to impact productivity of the water column.

The combination of low toxicity and rapid dilution of unrecoverable NWBMs discharged in association with drill cuttings are of little risk of direct toxicity to water-column biota (Neff et al., 2000).

Injury/mortality to planktonic species may occur due to a change in water quality following discharges of drill cuttings and fluids. Impacts to these organisms can be as a product of both physical and chemical alterations of water quality, predominantly in the water column.

As outlined above, using the widely-accepted dilution factor of 10,000 (Neff, 2005), cuttings (and adhered fluids) are expected to reach 100 mg/L TSS within 100 m of the MODU over a period of ~16 minutes. Minimal impact to plankton (phytoplankton, zooplankton and meroplankton (larvae of invertebrates and fish) is therefore expected from the discharge of drill cuttings. Neff (2010) explains that the lack of toxicity and low bioaccumulation potential of the drilling muds means that the effects of the discharges are highly localised and are not expected to spread through the food web (of which planktonic species are the basis).

Impacts to zooplankton from turbidity are associated with variations in predator prey dynamics, which favours planktonic feeders over visual feeders (Gophen, 2015), while impacts to phytoplankton occur due to decreases in available light, therefore reducing productivity (Dokulil, 1994).

Jenkins and McKinnon (2006) reported that levels of suspended sediments greater than 500 mg/L are likely to produce a measurable impact upon larvae of most fish species, and that levels of 100 mg/L will affect the larvae of some species if exposed for periods greater than 96 hours. Jenkins and McKinnon (2006) also indicated that levels of 100 mg/L may affect the larvae of several marine invertebrate species, and that fish eggs and larvae are more vulnerable to suspended sediments than older life stages. However, dilution estimates (e.g. Hinwood et al., 1994; Neff, 2005) suggest suspended sediment concentrations caused by the discharge of drill cuttings will be well below the levels required to cause an effect on fish or invertebrate larvae (i.e. predicted levels are well below a 96-hour exposure at 100 mg/L, or instantaneous 500 mg/L exposure), beyond the immediate vicinity of the discharge.

Due to the low levels of planktonic productivity in the offshore area, plankton populations on a regional scale are not expected to be affected by drilling or well abandonment activities. In addition, due to the open nature of the marine environment of the PAA and associated environmental conditions (i.e. windy, strong currents, etc.), the content and dispersive nature of drilling muds within the marine environment and the high population replenishment of these organisms, it is expected that impacts to plankton species will be limited to within tens of metres of the discharge point and return to previous conditions within a relatively short period of time. On this basis, the impacts to plankton from routine and non-routine discharges during drilling activities is slight.

Sediment Quality and Benthic Communities

Accumulation of drill cuttings, grit and flocculent on the seabed causes changes in the physical properties of the seabed sediment such as the particle size distribution (PSD), the introduction of contaminants (metals such as barium) from retained drilling fluids (WBM) and associated ecological effects.

The discharge of drill cuttings and unrecoverable fluids at the seabed during riserless top hole drilling results in a localised area of sediment deposition (known as a cuttings pile) surrounding the well site. The cuttings pile distribution may reflect prevailing seabed currents and spread predominately downstream of the well site but overall extent from the well site is typically tens of metres. The dimensions of the cuttings pile depend on several factors, including volume (approximately 641 m3 of top hole cuttings) and composition of cuttings, and oceanographic conditions at the discharge location. The top-hole well section drill cuttings and retained drilling fluids (WBM) to seabed have the greatest impact to sediment quality and modification of the habitat in proximity to the well, as the solids tend to clump and settle rapidly around the discharge point (Neff, 2010).

Indicative components of the WBM system outlined in Section 3.11.2 have a low toxicity. Bentonite and chemicals from the family of XC polymers (Xanthan Gum or similar) are listed as ‘E’ category fluids under the OCNS and considered to ‘pose little or no risk to the environment’. Metals such as barium from these additives will be present in the drilling fluid, primarily as insoluble mineralised salts, and consequently are not released in significant amounts to the pore water of marine sediments and have low bioavailability to those benthic fauna which may come into contact with the discharged barite (Crecelius et al., 2007; Neff, 2008). The XC polymer and bentonite sweeps have very low toxicities and are considered by OSPAR to pose little or no risk to the environment.

As described above, the bottom hole sections are drilled after the riser is fitted. Cuttings and unrecoverable fluids are discharged below the water line at the MODU site, resulting in drill cuttings and retained drilling fluids rapidly dispersing through the water column. The larger cuttings particles will drop out of suspension and deposit in proximity

to the well site (tens to hundreds of metres distance) with potential for localised spreading downstream, while the finer fluid particles will remain in suspension and will be transported further away from the well site, rapidly diluting and eventually depositing over a larger area (hundreds of metres to several kilometres) downstream of the well site. Drill cuttings from the bottom-hole sections will be smaller in volume (approximately 482 m3Table 6-19) and as determined by surface discharge, depth of seabed and time to reach seabed, result in an extended area of deposition, but a much thinner cuttings pile depth (IOGP, 2016). The fines associated with the retained drilling fluids or mud pit bulk discharge of WBM will settle over a greater extended distance as a thin, undetectable veneer on the seabed. Predicted impacts for bottom hole cuttings are generally confined to a maximum of 500 m from the discharge point (IOGP, 2016). The final deposition of drill cuttings and drilling fluids is largely determined by seabed depth and the time to drop out of suspension within the water column and deposit on the seabed. This leads to the coarser cuttings material being deposited at a location offset but closest to the well site in an area downstream and a distance up to of several hundreds of metres, with associated ecological effects within this area and the fines (predominately drilling fluids) dispersed over a greater distance from the discharge site, typically several kilometres but with no associated ecological effects.

Benthic organisms below the cuttings pile will be buried and smothered; however, the cuttings pile is expected to be recolonised over time. Ecological impacts to benthic biota are predicted when sediment deposition is equal to or greater than 6.5 mm in thickness (IOGP, 2016). This amount of sediment deposition from top hole and bottom hole cuttings is expected to be confined to within a few hundred metres around the well location, although this depends on the nature of the cuttings, the water depth and currents of the receiving environment (IOGP, 2016). A conservative radius of 500 m representing a zone of potential ecological impact has been applied to each well location for this impact assessment. Mobile benthic fauna, such as demersal fish, may be temporarily displaced from where cuttings discharges accumulate. Furthermore, ecological impacts are not expected for mobile benthic fauna such as crabs and shrimps or pelagic and demersal fish, given their mobility (IOGP, 2016). Balcom et al., (2012) concluded that impacts associated with discharging cuttings and base fluids are minimal, with impacts highly localised to the area of the discharge deposition on the seabed. Changes to benthic communities are normally not severe. Organic enrichment can occur, leading to anoxic conditions in the surface sediments and a loss of infauna species that have a low tolerance to low oxygen concentrations, and to a lesser extent chemical toxicity near the well location. These impacts are highly localised with short-term recovery that may include changes in community composition with the replacement of infauna species that are hypoxia-tolerant (IOGP, 2016). Recovery of affected benthic infauna, epifauna and demersal communities is expected to occur, given the short duration of sediment deposition and the widely represented benthic and demersal community composition.

It is acknowledged that transport of fines (associated with the drilling fluids) will disperse beyond the zone of potential ecological impact but there are no associated ecological effects expected beyond this zone (500 m distance from each well site). Low levels of sediment deposition away from the immediate area of each well site would represent a thin layer of settled drill cuttings and drilling fluids, which will likely be naturally reworked into surface sediment layers through bioturbation (US Environmental Protection Agency, 2000). Metals such as barium from the drilling fluid additives are used as a tracer of dispersion and are typically detected beyond the zone of ecological impact but as discussed for sediment quality (above), the insoluble mineralised salts (the source of barium) have low bioavailability to benthic biota.

Impacts associated with routine and non-routine drilling discharges will be largely limited to an area surrounding the well. The low sensitivity of the benthic communities/habitats within and in the vicinity of the PAA, combined with the low toxicity of WBMs and residual NWBMs, no bulk discharges of NWBM and the highly localised nature and scale of predicted physical impacts to seabed biota, affirm that any predicted impact is considered likely but of a slight environmental consequence.

KEFs

The Xena-03 Operational Area overlaps the Continental Slope Demersal Fish Communities KEF (Section 4.7). While drill cuttings will be discharged within the KEF, the highly localised turbidity and sediment deposition effects will not affect demersal fish communities, beyond temporary avoidance behaviour for some individual fish. Within the conservatively applied zone of potential ecological impact (500 m radius) burial or smothering of epifauna and infauna will be largely confined to close proximity to the wellhead. Recovery of affected benthic infauna, epifauna and demersal fish communities is expected to occur, given the short duration of sediment deposition and the widely represented benthic and demersal community composition. The small portion of the overall KEF area that overlaps the Xena-03 Operational Area, in combination with the predicted recovery of the affected benthic communities, affirms that any predicted impact is considered to be a slight, short-term effect.

Cultural Heritage

The Xena-03 Operational Area is located further offshore than the Ancient Coastline at 125 m depth contour KEF (Section 4.7). The Xena-03 Tie-back activities do not pose a risk to Indigenous Cultural features on the Ancient Landscape between the mainland and the Ancient Coastline KEF.

Drilling Fluids (Bulk Discharge)

WBM may be bulk discharged at the end of specific well sections, as described above, where there is a requirement to change the drilling fluid system or the drilling fluid cannot be re-used (due to deterioration/contamination). A small

quantity of WBM and NWBM residue (<1%) may also be discharged at the sea surface while cleaning the mud pits, typically at the conclusion of drilling activities or when changing between mud types.

Discharge of WBM will result in a buoyant plume of fine materials that will rapidly dilute and decrease in turbidity levels immediately away from the discharge point. WBM samples collected by Jones et al. (2021) from the mud pits just before discharge during the Greater Western Flank-2 drilling campaign were ~90% silt sized (<62.5 µm) with a mean diameter of 12 µm (gel-polymer) and 33 µm (KCl-polymer). Total suspended solid (TSS) levels in the gel-polymer mud and KCl-polymer mud were 257 g/L and 245 g/L respectively. Jones et al. (2021) used an ROV to observe mud pit discharges and reported the discharge to exit the discharge outlet as a jet of material in a distinctive cloud-like plume descending rapidly to the seabed and growing in diameter with increasing depth.

The subsea plume can be expected to disperse over a wide area (up to several kilometres), with no discernible sediment deposition on the seabed and no physical or biological impacts, particularly given the water depth at the drilling location (176 m). Impacts beyond the 500 m zone of ecological impact for the well as described for drill cuttings and retained fluids discharge is not expected.

Subsea – Displacement, Completion and Well-bore Cleanout Fluids

Discharges such as displacement, completion and wellbore cleanout fluids are typically inert and of low-toxicity. These fluids are mostly brine, with a small proportion of chemical additives such as surfactants, biocide, corrosion inhibitor, oxygen scavenger, MEG and guar gum. The volume of one wellbore and subsequent discharge volume would be ~400 m3. Any change to water quality is expected to be localised and temporary. Rapid dilution due to prevailing ocean currents in the open water environment would lead to any changes in water quality such as low toxicity contaminants being temporary (only for the duration of the discharge) and reducing water quality within a short distance of the discharge location.

Removal (Cutting) of Well Infrastructure (Contingency)

The planned cutting depth is approximately 3-5 m below the mudline, therefore discharges from cutting of well infrastructure using either an abrasive water jet cutting method of a mechanical cutting tool are expected to be confined predominately within the well and settle on the top of the permanent plug. During final cut through the conductor pipe, small amounts of flocculent and grit will be released below the mudline to sediments immediately surrounding the well.

Should cutting at a shallower depth be required, however, these discharges may be released to the seabed surface. For the mechanical cutting tool, discharges will be limited to small quantities of metal and cement cuttings from the infrastructure itself as well as small quantities of lubricant. For the abrasive water jet cutting method, discharges include a small amount of grit and flocculent. Depending on the cutting depth, pressure from the jet cutting could push some of the material up to the seabed surface causing localised smothering of benthic communities as well as create localised and temporary increases in turbidity around the well. All chemicals used for infrastructure removal are assessed in accordance with the Woodside Chemical Selection and Assessment Environment Guideline.

Cumulative Impacts

The seabed around the Xena-03 well is in close proximity to other wells and hence the discharge of drill cuttings and drilling fluids from the well may result in cumulative impacts. The benthic habitats and communities that may be impacted by the discharge of drill cuttings and fluids are widely represented in the region and not of high conservation value. The area within which cumulative impacts may occur is relatively small and would be substantially smaller than the area impacted directly by drill cuttings and fluids discharges. Other aspects of the Petroleum Activities Program that may impact upon benthic habitats will be localised around the Xena-03 wellhead and subsea infrastructure, hence the potential area impacts by cumulative impacts from other aspects is very small. Recovery is expected to occur through natural processes. Hence cumulative impacts will be slight and of no lasting effect (i.e., Environment Impact – F).

Summary of Potential Impacts to environmental values(s)

Given the adopted controls, it is considered that routine discharges of drill cuttings and drilling fluids described will not result in a potential impact greater than slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes (i.e. Environment Impact – E).

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Legislation, Codes and Standards				
No additional controls identified.				
Good Practice				
Implement Woodside's Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected – no further control required; and If chemicals with a different OCNS rating, sub warning or non-OCNS rated chemicals are required chemicals will be assessed in accordance with the guideline prior to use.	F: Yes. Routinely implemented to the chemical selection process for Woodside facilities. CS: Minimal cost. Standard practice.	Selection and assessment of chemicals in accordance with the Woodside process, reduces environmental impacts associated with planned chemical discharge.	Control is a WMS requirement – must be adopted.	Yes C 5.1
For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns	F: Yes. CS: Minimal cost. Standard practice.	Regular reviews will ensure chemicals selected for drilling fluids remain ALARP.	Benefits outweigh cost/sacrifice.	Yes C 5.5
Written NWBM justification process followed.	F: Yes. CS: Minimal cost. Standard practice.	The written justification takes onboard the technical need for NWBM use, receiving environment, cost and additional controls that may be required. By undertaking formal assessment, the potential impacts are well understood, allowing for development of control measures to reduce the consequence of NWBM use. This provides an overall environmental benefit.	Benefits outweigh cost/sacrifice.	Yes C 8.1
NWBM base oils selected based on expected toxicity.	F: Yes. CS: Minimal cost.	By selecting a base oil with lower toxicity, the consequence of the release on the	Benefits outweigh cost/sacrifice	Yes C 8.2

[61] Qualitative measure

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
		environment is reduced.		
Backload bulk NWBM or maintain on rig for re-use	F: Yes. CS: Minimal cost. Standard practice.	By restricting the volume of NWBM for overboard discharge, the consequence of the release on the environment is reduced. Although no change in likelihood is provided, the decrease in consequence results in an environmental benefit.	Benefits outweigh cost/sacrifice.	Yes C 8.3
Bulk operational discharges conducted under MODU's Permit to Work (PTW) system (to operate discharge valves/pumps).	F: Yes. CS: Minimal cost. Standard practice.	The MODU's PTW may slightly reduce the volumes of bulk discharges occurring, but it is unlikely to be significant given that bulk discharges are often operationally required and cannot be eliminated.	Benefits outweigh cost/sacrifice.	Yes C 8.4
Displacement, brine, workover or intervention fluids contaminated with hydrocarbons will be treated prior to discharge or containment. If discharge specification not met the fluid will be returned to shore.	F: Yes. CS: Minimal cost. Standard practice.	Ensuring <1% oil content will provide a small reduction in consequence when fluids are discharged to the environment.	Benefits outweigh cost/sacrifice.	Yes C 8.5
SCEt used to treat NWBM cuttings prior to discharge.	F: Yes. CS: Minimal – more frequent cuttings sampling and testing.	Achieving average oil on cuttings (sections using NWBM only) discharge limit of 6.9% or less oil on wet cuttings will have a small reduction in consequence.	Benefits outweigh cost/sacrifice.	Yes C 8.6
In event of SCE failure (including auger) while drilling with NWBM, the initial action will be to cease drilling and determine whether to repair SCE or drill ahead until next practicable opportunity to trip out of the hole. If cuttings are discharged during dryer or auger	F: Yes. CS: Cost and schedule implications due to cessation of drilling.	Ceasing of drilling in the event of equipment failure will allow for time to assess feasibility of drilling ahead while still meeting residual OOC discharge requirements.	Benefits outweigh cost/sacrifice.	Yes C 8.7

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
failure, measurement of OOC to occur more frequently from shakers.				
Professional Judgement – Eliminate				
No additional controls identified				
Professional Judgement – Substitute				
No additional controls identified				
Professional Judgement – Engineered Solution				
Mud pit wash residue will be measured for oil content prior to discharge.	F: Yes. CS: Minimal cost. Standard practice.	Ensuring <1% oil content will provide a small reduction in consequence when residue is discharged to the environment.	Benefits outweigh cost/sacrifice.	Yes C 8.8
WBM drill cuttings returned to the MODU will be processed using SCEt equipment.	F: Yes. CS: Minimal cost. Standard practice.	Limiting the discharge of WBMs through reuse will reduce the consequence of the using WBM.	Benefits outweigh cost/sacrifice.	Yes C 8.9
Drill cuttings returned to the MODU will be discharged below the water line.	F: Yes. CS: Minimal cost. Standard practice.	Discharge of drill cuttings below the water line will reduce carriage and dispersion of cuttings thereby reducing the consequence of cuttings discharges during the Petroleum Activities Programme.	Benefits outweigh cost/sacrifice.	Yes C 8.10
Cuttings reinjection into formation. Cuttings are crushed, slurrified and pumped to a desired geological structure with a suitable seal, below the seabed through an annulus or tubing.	F: No. No concurrent drilling or direct sequential drilling planned which would require cuttings to be stored prior to re-injection. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Riserless Mud Recovery (RMR) system to return top-hole cuttings/mud from the riserless section of the well to the MODU prior to treatment onboard and discharge from the MODU (below the water line).	F: Not technically feasible due to water depth. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Riserless Mud Recovery (RMR) system to return top hole cuttings from the riserless section of the well to the MODU prior to transport to an alternative discharge location or back to shore for disposal.	F: Not technically feasible due to water depth. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Return riser-in-place cuttings for disposal at another marine location or onshore for processing and land disposal (skip and ship) for whole well to reduce risk of benthic disturbance. OR Return riser-in-place cuttings for all sections drilled with NWBM for disposal onshore (to reduce potential residual oil on cuttings to environment).	F: Yes. CS: Primary cost/sacrifice of this option is the additional handling required in transporting cuttings to alternative disposal location. Particularly the health and safety risks associated with high frequency of support vessel activity alongside the rig and the amount of crane lifting required if a cuttings skip/drilling waste container system were employed. Other cost/sacrifice elements which are considered include: Further treatment of cuttings onshore is required to ensure a standard suitable for landfill. Class II disposed locally (e.g. Karratha). Class III landfill requires transport to Geraldton or Perth Increased risk of unplanned vessel collision or loss of cuttings during transfer activities Environmental impact (suspended sediment/ sedimentation) of discharging cuttings at new location and	Compared to adopted control, return riser in place cuttings would achieve a reduction in cuttings/mud discharged (although discharge would still occur during riserless drilling on the basis this control is not adopted) at the well location; however, given current impact assessment and controls adopted, this would not result in a significant reduction on consequence.	Disproportionate. Given the adopted controls and low current risk rating, the high cost/sacrifice outweighs the benefit gained over the duration of the Petroleum Activities Program. Impact assessment has determined no sensitive benthic receptors in the vicinity and a low level of impact potential from overall cuttings/mud discharge therefore benefit to be gained from cuttings/mud recovery is disproportionate to the risks introduced by cuttings relocation (including if an alternative system which doesn't use transport containers was implemented).	No

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
	other regulatory approvals may also be required (e.g. sea dumping permit). Potential halt to drilling activity if transfer operations are delayed due to weather or operational issues Additional environmental impact incurred (air emissions) from vessel use and onshore trucking for transportation of cuttings. Disposal via landfill and/or treatment does not eliminate an environmental impact. These options have their own impacts and therefore disadvantages if implemented.			
Reduce total drill cuttings by implementing slim well design.	F: No. Slim well design is not considered feasible based on the following factors: The well design is optimised to minimise the size of hole drilled while still being able to reach the targets and meet development objectives safely. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Water quality and/or sediment monitoring of drill cuttings or drilling fluids to verify impact during activity.	F: Yes. CS: For in-water sampling utilising ROV - Time and logistics for tool change out from	No environmental benefit would be gained by implementation of monitoring during the activity. Monitoring could be used to inform additional control measures in future	Disproportionate Cost/sacrifice outweigh benefit to be gained in the context of existing environment (deep water,	No

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
	operational tools to specialised scientific sampling tools. Additional POB to operate ROV and coordinate sampling program. Low ROV availability due to operations can limit time to perform environment monitoring. If additional ROV is required on the MODU, deck space and resources to run/store/service ROV. Resources for sample processing (space/ equipment/ personnel).	drilling activities; however, there is a considerable body of existing scientific literature on potential impacts of drill cuttings and impacts are generally well understood. Furthermore, it is not guaranteed that additional controls would be feasible, or if they would provide any environmental benefit.	open ocean communities with no proximity to sensitive benthic communities or receptors). Although adoption of this control could be used to verify EPOs associated with drilling mud and cutting discharge, alternative controls identified achieve an appropriate outcome.	
Use SCE with secondary treatment for NWBM: Thermomechanical systems (to achieve <1% average oil on cuttings).	F: Yes – with associated infrastructure including vessels for offline storage and delivery to thermomechanical dryer. CS: The primary cost/sacrifice of this option is the monetary outlay for acquisition and implementation which is estimated at $800,000 to mobilise, install and demobilise, along with a running cost of about $32,000/day. Other factors considered include: It is estimated that it would take a minimum of seven months to mobilise, install and commission the	A reduction in consequence would be achieved by reducing the average oil on cuttings discharged.	Disproportionate. Cost/sacrifice outweighs benefit to be gained in the context of existing environment and drilling campaign.	No

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
	system on to the MODU. Complex and unfamiliar system to integrate with the rig systems. Increased health and safety exposure due to: crew of nine engineers and technicians required to run the plant. multiple crane lifting operations, during installation, operations and demobilisation. rotating machinery heat illness deck congestion due to large footprint of the plant.			
Time restricted discharge of WBM and/or cuttings to align with tide/current or other oceanographic events.	F: Yes. CS: Disruption to drilling operations in having to stop drilling at time when discharge of WBM and/or cuttings might not be permitted. Additional mud storage volume required.	Given the offshore location, oceanographic changes are unlikely to significantly affect the dispersion of cuttings and therefore no environmental benefit would be gained.	Disproportionate. The cost/sacrifice outweighs the benefit gained – No hard coral or other photo-sensitive benthic communities in the vicinity of the well to rationalise phased/ timed discharge.	No
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 drill cuttings and fluids discharges to the marine environment. 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, routine discharges of drilling cuttings and fluids to the marine environment are unlikely to result in a potential impact greater than slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), cultural heritage, physical or biological attributes. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice. The potential impacts and risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted				

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)9F[61]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
controls appropriate to manage the impacts and risks of these discharges to a level that is broadly acceptable and demonstrates the EPO has been met.				

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 8 No impact to water quality or marine biota greater than a consequence level of Slight[62] from discharging drilling cuttings or fluids during the Petroleum Activities Program.	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNSNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable. Refer to Section 6.7.5.	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed.
	C 5.5 For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns.	PS 5.5 Acceptability of chemicals is re-evaluated to ensure ALARP, and alternatives are considered.	MC 5.5.1 Records confirm six-monthly reviews have occurred during active drilling campaigns, and any actions/changes are being tracked to closure.
	C 8.1 Written NWBM justification process followed.	PS 8.1 NWBMs only used where written justification process has been followed.	MC 8.1.1 Records show NWBM justification process has been followed and NWBM only used where technically required.
	C 8.2 NWBM base oils selected based on expected toxicity.	PS 8.2 Group III base oils used in NWBM.	MC 8.2.1 Fluid reports demonstrate that only Group III base oils used in NWBM.
	C 8.3 Backload bulk NWBM or maintain on rig for re-use	PS 8.3 No overboard disposal of bulk NWBM	MC 8.3.1

[62] Defined as “Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.” as in Table 2-3, Section 2.6.3.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
			Incident reports of any unplanned discharges of NWBM
	C 8.4 Bulk operational discharges conducted under MODU's permit to Work (PTW) system (to operate discharge valves/pumps).	PS 8.4 Increased level of assurance and verification on bulk operational discharges.	MC 8.4.1 Environmental inspection records demonstrate that bulk discharges are conducted under the MODU PTW system.
	C 8.5 Displacement, brine, workover or intervention fluids contaminated with hydrocarbons will be treated prior to discharge or contained. If discharge specification not met the fluid will be returned to shore.	PS 8.5 Achieve less than 1% by volume oil content before discharge.	MC 8.5.1 Discharge reports demonstrate contaminated fluids were less than 1% by volume oil content before discharge.
	C 8.6 SCEt used to treat NWBM cuttings prior to discharge.	PS 8.6 Average OOC (sections using NWBM only) discharge limit of 6.9% or less oil on wet cuttings is achieved.	MC 8.6.1 Discharge reports confirm the average OOC for the entire well (sections using NWBM only) do not exceed limit.
	C 8.7 In event of SCEt failure (including auger) while drilling with NWBM, the initial action will be to cease drilling and determine whether to repair SCEt or drill ahead until next practicable opportunity to trip out of the hole. If cuttings are discharged during dryer or auger failure, measurement of OOC to occur more frequently from shakers	PS 8.7 The decision whether to repair SCEt or drill ahead has considered the estimated time for repairs and the amount of drilling until next planned trip out of hole, to ensure the OOC limit is not exceeded.	MC 8.7.1 Records demonstrate that in the event of auger or cuttings dryer failure (where no redundancy is available), active drilling is initially stopped as soon as safe to do so. Evidence of assessment to drill ahead with failed SCEt can be produced. Discharge report confirms the average OOC for the entire well (sections using NWBM only) do not exceed limit.
	C 8.8 Mud pit wash residue will be measured for oil content prior to discharge.	PS 8.8 Achieve less than 1% by volume oil content before discharge	MC 8.8.1 Discharge report demonstrates after pit clean out (for pits potentially contaminated with base oil) that mud pit wash residue was less than 1% by volume oil content before discharge.
	C 8.9 WBM drill cuttings that are returned to the MODU will be	PS 8.9 WBM drill cuttings that are returned to the MODU processed using SCEt	MC 8.9.1 Daily drilling reports demonstrate that

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	processed (using SCEt equipment).	equipment allowing reuse of mud prior to discharge.	operational SCEt is in use.
	C 8.10 Drill cuttings returned to the MODU will be discharged below the water line.	PS 8.10 Cuttings discharged below the water line	MC 8.10.1 Inspection records confirm cuttings discharge chute/line below the water line.

6.7.9 Routine and Non-Routine Discharges: Cement, Cementing Fluids, Subsea Well Fluids, Unused Bulk Product and Subsea Chemicals from Xena-03 Tie-back Activities

Context		
Xena-03 Drilling and Tie-back Activities – Section 3.11	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5	Consultation – Section 5

Impact Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tools	Acceptability	Outcome
Routine discharge of cement and cementing fluids, to the seabed and the marine environment.		x	x		x			A	F	-	-	GP PJ	Broadly Acceptable	EPO 9
Routine discharge of subsea well fluids (including BOP and well construction activity control fluids).		x	x		x			A	F	-	-			
Produced / reservoir water disposal		x	x		x			A	F	-	-			
Non-routine discharge of unused bulk products at end of drilling campaign		x	x		x			A	F	-	-			

Description of Source of Impact

Cement, Cementing Fluids, Grout, Subsea Well Fluids and Unused Bulk Products at End of Drilling Campaign

Cementing Fluids, Cement and Grout

Cementing fluids, including cementing mix water, may require discharge to the marine environment under various scenarios during drilling and tie-back activities for the Xena-03 well.

At the commencement of the drilling campaign there may be a requirement to run a cement unit test to ensure the functionality of the cement unit and the cement bulk delivery system prior to performing an actual cement job. This test would result in a small volume of approximately 10 m3 of cement slurry being discharged at the sea surface. The slurry is usually a mix of cement and water however may contain stabilisers or chemical additives.

When cementing the conductor and surface casings after top hole sections of a well have been drilled, cement must be circulated to the seabed to ensure structural integrity of the well. Excess cement is pumped so that structural integrity is achieved. If the hole is completely in-gauge and there are no downhole losses while pumping the cement, a maximum volume of 80 m³ is estimated to be circulated to the seabed at the well location, which forms a thin concrete film on the seabed in close proximity to the well.

Wherever possible, the cement line flush volumes are included in the planned cement jobs. After each cement job, leftover cement slurry in the cement pump unit and the surface lines is flushed and discharged to the sea to prevent clogging of the lines and equipment. This is estimated at about 10 m³ discharged. In the unlikely event a respud event

is required it would result in additional cement jobs. Also, in the rare event that the cement products become contaminated, the entire volume (~180 m³) may need to be discharged to sea.

Cement spacers can be used as part of the cementing process, within the well casing, to assist with cleaning of the casing sections prior to cement flow through. The spacers may consist of either seawater or a mixture of seawater and dye. The dye is used to provide a pre-indicator of cement overflow to the seabed surface, to ensure adequate cement height.

If grout bags are used, after grouting activities at each span site, the downline and pump will need to be purged using seawater. This will result approximately 5 m3 (downline volume) of grout discharged to the ocean. This flushing is required once per grout site.

Subsea Fluids – Blow Out Preventors (BOP) and Well Construction Activity Control Fluids

Subsea fluids are likely to be released during drilling, including the release of BOP control fluids. Subsea control fluids are water-based hydraulic control fluids used in control systems on the subsea trees and BOPs. The BOP is required, by legislation, to be regularly function tested when subsea.

Subsea control fluids will be discharged during function testing of the BOP on installation and pressure testing.

The BOP is function tested during assembly and maintenance and during operation on the seabed as described in Section 3.11. As part of this testing, small volumes of BOP control fluid (generally consisting of water mixed with a glycol based detergent or equivalent water-based anti-corrosive additive) are released to the marine environment.

Each time a pressure and function test is undertaken approximately 3620 L of water-based fluid is released to the marine environment, of this approximately 4% is control fluid additive. BOP operation includes function and pressure testing approximately every 21 days, and a function test (approx. 2665 L) approximately every seven days, excluding the week a pressure test is conducted.

Subsea Fluids – Displacement Fluids

As required throughout activities with the riser connected, the well will be displaced from one drilling fluid system to another. A chemical clean-out pill or fluids train will be circulated between the different fluids. This will result in a discharge of operational fluids in accordance with the Woodside internal guidelines.

Produced / Reservoir Water

If well unloading activities were to occur, a temporary production system water filtration treatment package will be used to treat produced/reservoir water before discharge. Prior to discharging, the fluids are cycled through an oilbond filtration system and gauge tank. Water filtration is standard practice for well unloading operations and the produced water will be treated to meet 30 ppm OIW. Fluids that cannot be treated or flared will be sent onshore in tanks for disposal.

Non-Routine Discharge of Unusued Dry Bulk Products at the End of the Drilling Campaign:

Adequate stocks of dry bulk product are required to be stored on the MODU for the duration of the drilling activity for safe operations and well control purposes, as defined in the Woodside Well Control Bridging Document. Approximate quantities typically required are as follows:

- Cement: approximately 100 tonnes
- Barite: approximately 120 tonnes
- Bentonite: approximately 120 tonnes

At the end of the drilling activity and prior to demobilisation, Woodside is contractually obliged to remove the dry bulk product from the MODU. A number of options for removing excess product from the MODU exist, with the last option being to discharge to the marine environment. Woodside have developed a process to assess all safe and technically feasible options for the excess product before a decision is made to discharge overboard, this includes the considering the following options, as described below and illustrated in Figure 6-7:

- Retaining products on the MODU to be used for subsequent Woodside drilling activities where the activity is not the last in the Woodside MODU sequence, or
- Retaining products on the MODU to be used by the next titleholder who has the MODU on hire, or
- Transfer to another Woodside contracted MODU operating in the region, or
- Transferring to another titleholder-contracted MODU operating in the region, or
- Returning to shore for onshore storage and/or disposal if a facility is available that is both safe and technically feasible to transfer dry bulk products to, and
- Discharged to the marine environment as a slurry as a last resort, if it is concluded that no other options outlined in Figure 6 1 are feasible and that concentrations of mercury and cadmium in barite are <1 mg/kg and <3 mg/kg, respectively.

Woodside's base plan is to retain dry bulk products on board the MODU at the end of the campaign, either for reuse by Woodside (if a subsequent Woodside drilling activity is contracted after the petroleum activity), or transfer the dry bulks to the next titleholder who has the MODU on hire. At the time this EP was written it was not yet confirmed

whether Woodside would be contracting the MODU for subsequent petroleum activities or if there was another titleholder who planned to contract it.

If there are no available options to leave the dry bulk products on the MODU, Woodside would look to transfer excess dry bulk product to another MODU operating in the region, either for Woodside use or for another titleholder. MODU schedules and regional activities are closely monitored to identify these transfer opportunities early, allowing sufficient time to coordinate transfer arrangements. At the time this EP was written it was not yet confirmed if there was another MODU to transfer dry bulk product to, and this opportunity typically presents towards the end of a drilling activity. Woodside has a proven record of transferring dry bulk materials for reuse between operators and offshore facilities within these timeframes.

The backload of dry bulks to shore at the end of the campaign has been explored with Woodside's fluids providers. However, current onshore infrastructure does not support the safe transfer of bulk product at high pressure. When the MODU receives bulk product from a shore base, it involves the pneumatic transfer of product from a lower pressure container/tank to the higher pressure MODU or supply vessel container/tank. However, transfer of bulk product from the MODU to shore would involve the transfer of that material, which is powder, from a high pressure to low pressure mobile tank. These high to low pressure transfers of dry powder carry safety risk as the pressure differential between the two systems can result in an uncontrolled, or rapid fluid flow causing pressure build up, beyond safe limits. Dry bulk products can be transported from shore when initially processed given the manufacturing locations have necessary infrastructure to package bulks in bags for transportation and sale, including bagging machines. These dry bulk products cannot be returned to shore in this same manner. Once the product is transported offshore, it is stored in tanks under high pressure conditions. To return product to shore in the same manner it is initially transported from manufacturing location, the product would need to be high-pressure transferred from the MODU or support vessel tanks to bags, which is not considered to be feasible.

During the PAP Woodside will continue exploring the feasibility of installing appropriate infrastructure including pressure release valves and other transfer equipment to enable safe transfer of dry bulk product to shore.

If reuse of excess bulks for subsequent activities in the region is not possible and no feasible options for safe transfer of dry bulk product are identified by completion of the campaign, excess dry bulk will be discharged to the marine environment in the form of a slurry. This will only occur if it can be demonstrated that there are no other options identified in Figure 6-7. Use and discharge of all chemicals and products will be conducted in line with Woodside's internal guidelines (Section 7.2).

Dry bulk materials generally pose little or no risk to the environment (PLONOR)[63], though barite may contain traces of heavy metals, such as mercury and cadmium. Woodside requires that concentrations of mercury and cadmium in barite be <1 mg/kg and <3 mg/kg, respectively. This conforms to the American Petroleum Institute (API) specification for drilling barite. Heavy metal analysis is conducted on individual batches of stock barite prior to mobilisation offshore. This sampling confirms that heavy metals of concern (cadmium and mercury) are within limits prescribed by API standards.

[63] Barite (as barium sulphate) is on the OSPAR List of Substances Used and Discharged Offshore which are Considered to Pose Little or No Risk to the Environment (PLONOR). The List is available at: https://www.cefas.co.uk/media/p3sbu3bn/ospar-list-of-substances-used-and-discharged-offshore-which-are-considered-to-pose-little-or-no-risk-to-the-environment-plonor-update-2021.pdf

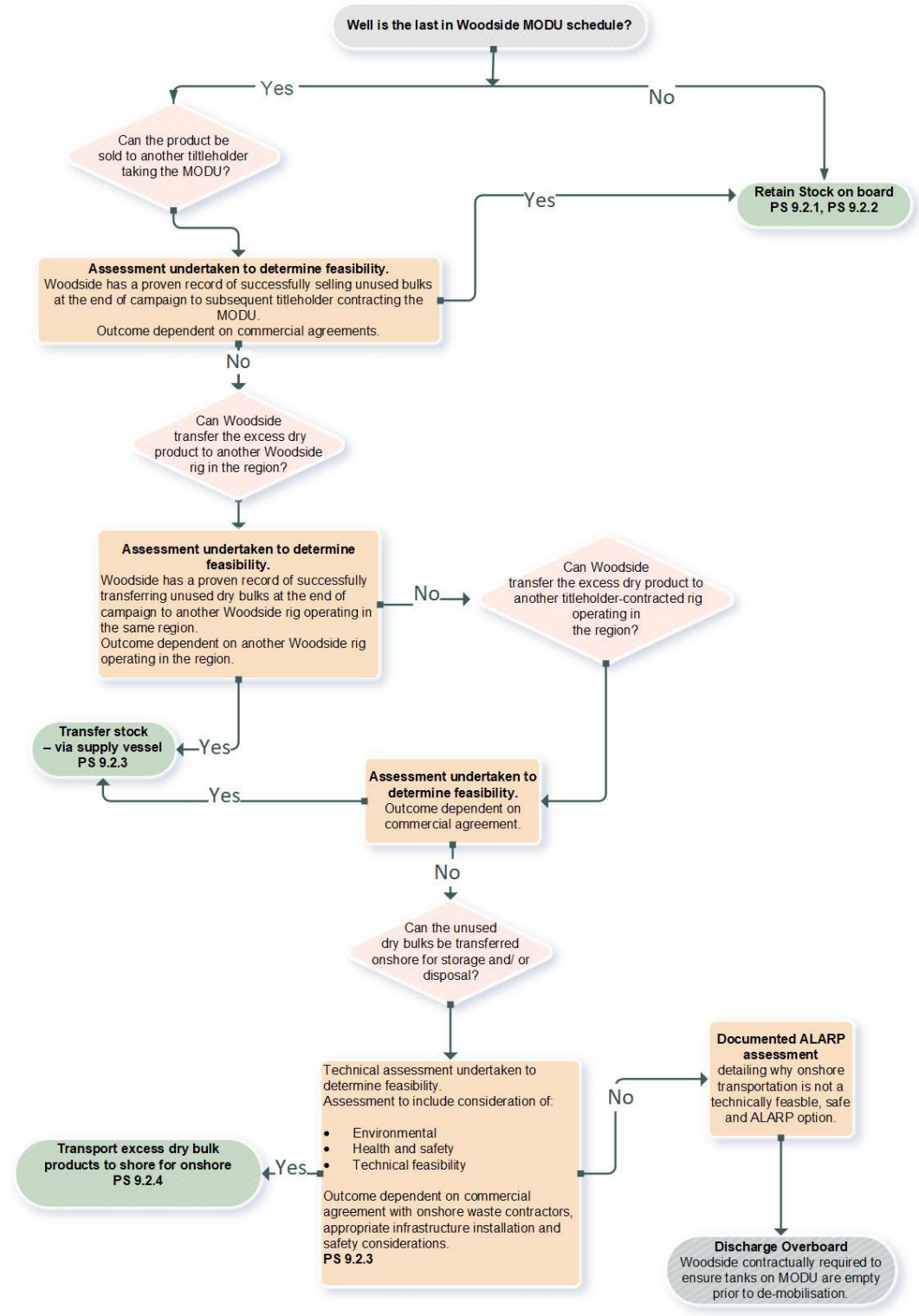


Figure 6-7: Management process for excess bulk product

Impact Assessment

Potential impacts to environmental values

Pelagic and benthic habitats and communities in the Xena-03 Operational Area are considered to be of low sensitivity and reflective of the wider NWMR. No known regionally significant benthic or infauna habitat occur in the area. The Continental Slope Demersal Fish Communities KEF overlaps the Xena-03 Operational Area (Section 4.7), however the targeted well location is not located within the KEF. Impacts to values and sensitivities of this KEF are not expected due to the location of the well, small physical footprint of the discharges, coupled with the low toxicity of cementing and subsea fluids used for the Petroleum Activities Program. The likelihood of any significant impact to marine biota is subsequently considered to be low.

Cement and Grout

Sediment Quality and Benthic Communities

Impacts of cement and grout on the marine environment are predominantly associated with localised burial of benthic biota in the direct physical footprint of deposition. Cement operations and grout discharge during drilling involve routine and non-routine discharges that can result in turbidity in the water column. Reduction in water quality will be temporary (limited to the cement operational discharges during drilling) and subject to rapid dispersion and dilution by prevailing currents. Modelling of cement discharges for another offshore project (BP Azerbaijan, 2013) was used because it provides an appropriate, but conservative, comparison of the potential extent of exposure from this activity. In this study, two hours after the start of discharge, plume concentrations were determined to be between 5 and 50 ppm with the horizontal and vertical extents of the plume ~150 m and 10 m, respectively (BP Azerbaijan, 2013). Five hours after ceasing the discharge, modelling indicates that the plume will have dispersed to concentrations <5 ppm.

Cement is the most common material currently used in artificial reefs around the world and is inert. The potential for toxicity is associated with chemical additives that may be added to cement mixtures. Therefore, the toxicity associated with the discharge of cement is limited to the subsurface release of cement (not discharge of slurrified or dry cement). Once the cement has hardened, chemical additives are locked into the cement (Terrens et al., 1998) and not expected to pose any toxicological risk to benthic biota from leaching or direct contact. Most cement discharges that will occur during the drilling activities will be at the seabed during cementing of the casing. Once overspill from cementing activities hardens, the physical sediment properties of the area directly adjacent to the well (10–50 m) will be permanently altered (Terrens et.al., 1998). The potential disturbance area is an estimated 0.007 km². Cement discharges at the seabed will overlap with the highest deposition of drill cuttings and drilling fluids. The highly localised physical footprint at the well site is not expected to affect the overall diversity or ecosystem function of the benthic communities of the area.

The potential impacts to benthic communities caused by smothering from a surface release of cement or a seabed release of grout are expected to be significantly less, due to small volumes, intermittent nature of these discharges, and high potential for dispersal by ocean currents. This impact on soft sediment communities is not expected to affect the diversity or ecosystem function in this area and is only considered a short-term impact.

KEFs

The Xena-03 Operational Area overlaps the Continental Slope Demersal Fish Communities KEF. The targeted Xena-03 well location is ~2.5 km from the Continental Slope Demersal Fish Communities KEF. The potential for interaction is limited to a surface release of cement within the KEF. However, as described above, the surface release of cement or the seabed release of grout will be highly localised around the well location. Recovery of affected demersal fish communities is expected to occur, given the small volume and dispersion, and the widely represented benthic and demersal community composition. The small portion of the overall KEF area that overlaps the Xena-03 Operational Area, in combination with the predicted recovery of the affected benthic communities, affirms that any predicted impact is considered to be a slight, short-term effect.

Cultural Heritage

The targeted Xena-03 well location (~176m) and Xena-03 Operational Area is not located within the Ancient Coastline at 125 m depth contour KEF, which extends from the 115-130 m isobath (Section 4.7). The targeted well location is ~4.5 km from the Ancient Coastline at 125 m depth contour KEF, The Xena-03 Tie-back activities do not pose a risk to Indigenous Cultural features on the Ancient Landscape between the mainland and the Ancient Coastline KEF.

Cementing Fluids, Subsea Well Fluids (BOP Control Fluids and Well Displacement Fluids) and Other Unused Bulk Products

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 of the chemicals selected are acceptable, ALARP and meet Woodside's expectation for environmental performance. Therefore, any chemicals selected and potentially released are expected to be of low toxicity and biodegradable. Additionally, where cements have been mixed in excess and cannot be reused or returned to shore, these will be turned into a slurry. As chemicals have initially been chosen based on the environmental performance and based on an ALARP assessment, additional dilution prior to discharge further reduces the environment impact to water quality, sediment quality and marine benthic and/or infauna communities. Given the minor quantities of routine and non-routine planned discharges, short discharge durations and the low toxicity and high dispersion in the open, offshore environment, any impacts on the marine environment are expected to be slight and short-term.

Summary of Potential Impacts to environmental values(s)
The overall impact significance level for routine and non-routine discharges of cement, cementing fluids, subsea well fluids and unused bulk product is E based on slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[64]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified				
Good Practice				
Implement Woodside's Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected – no further control required; and If chemicals with a different OCNS rating, sub warning or non-OCNS rated chemicals are required chemicals will be assessed in accordance with the guideline prior to use.	F: Yes. Routinely implemented to the chemical selection process for Woodside facilities. CS: Minimal cost. Standard practice.	Selection and assessment of chemicals in accordance with the Woodside process, reduces environmental impacts associated with planned chemical discharge.	Control is a WMS requirement – must be adopted.	Yes C 5.1
For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns	F: Yes. CS: Minimal cost. Standard practice.	Regular reviews will ensure chemicals selected for drilling fluids remain ALARP.	Benefits outweigh cost/sacrifice.	Yes C 5.5
Bulk operational discharges conducted under MODU's Permit to Work (PTW) system (to operate discharge valves/pumps).	F: Yes. CS: Minimal cost. Standard practice.	The MODU's PTW may slightly reduce the volumes of bulk discharges occurring, but it is unlikely to be significant given that bulk discharges are often operationally required and cannot be eliminated.	Benefits outweigh cost/sacrifice.	Yes C 8.4
Displacement, brine, workover or intervention fluids contaminated with hydrocarbons will be treated prior to discharge or contained.	F: Yes. CS: Minimal cost. Standard practice.	Ensuring <1% oil content will provide a small reduction in consequence when fluids are discharged to the environment.	Benefits outweigh cost/sacrifice.	Yes C 8.5

[64] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[64]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
If discharge specification not met the fluid will be returned to shore.				
During well unloading and completions activities, if PW is not flared, it will be processed through the well test water treatment package prior to discharge to the environment.	F: Yes. CS: Minimal cost. Standard practice.	Reduced toxicity to the marine environment when discharged.	Benefits outweigh cost/ sacrifice	Yes C 9.1
Professional Judgement – Eliminate				
Do not use BOP control fluids.	F: No. BOP and xmas tree control fluids are critical to the operation of the BOP and xmas trees. CS: Not considered, control not feasible.	Not considered, control not feasible.	Not considered, control not feasible.	No
Excess dry bulk products will be managed as per Figure 6-7.	F: Yes. However, the cement may not meet the required technical specifications, and hence not be usable. CS: Minor administrative costs associated with coordinating reuse opportunities. Cost savings associated with the re-use or onsell of the dry bulk products. Moderate cost associated with onshore transportation and/ or disposal, if deemed feasible.	Reusing bulk products or identifying an opportunity for it to be returned to shore may eliminate any environmental impacts associated with discharge to the marine environment, where these options are safe and technically feasible. Furthermore, following the process outlined in Figure 6-7 confirms that discharge to the marine environment only occurs when there are no other safe or technically feasible options and therefore when ALARP.	Benefits outweigh cost/sacrifice	Yes C 9.2
Sampling/analysis of stock barite to ensure acceptable levels of heavy metals (i.e. concentrations of mercury and cadmium in barite are <1 mg/kg and <3 mg/kg, respectively)	F: Yes. CS: Minimal cost. Standard practice.	Barite may contain heavy metal such as cadmium and mercury, depending on its geological origin. Limiting the concentrations of cadmium and mercury is consistent with industry good practice.	Benefits outweigh cost/sacrifice.	Yes C 8.8

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[64]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		Limiting cadmium and mercury concentrations in barite reduces the environmental risk from discharges of barite to the environment.		
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 cement, cementing fluids, subsea well fluids and unused bulk products. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement The impact assessment has determined that, given the adopted controls, cement, cementing fluids, subsea well fluids and unused bulk products discharges are unlikely to result in an impact greater than slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes. Further opportunities to reduce the impacts have been investigated above. The adopted controls are considered good practice. When considering the broader acceptability of the potential impacts consideration has been given to the legislative context, including International Conventions such as the Minamata Convention. Woodside has undertaken an assessment of the PAP and the Minamata Convention (including measures in Article 9(5), and considers that the PAP is not inconsistent with the Minamata Convention. The potential impacts are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of these discharges to a level that is broadly acceptable and demonstrates the EPO will be met.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 9 No impact to water quality or marine biota greater than a consequence level of Slight[65] from discharging cement, cementing fluids, subsea well fluids and	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed.

[65] Defined as "Slight, short-term impact (<1 year) on species, habitat (but not affecting ecosystems function), physical or biological attributes." as in Table 2-3, Section 2.6.3.

unused bulk products during the Petroleum Activities Program.	selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	
	C 5.5 For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns.	PS 5.5 Acceptability of chemicals is re-evaluated to ensure ALARP, and alternatives are considered.	MC 5.5.1 Records confirm six-monthly reviews have occurred during active drilling campaigns, and any actions/changes are being tracked to closure.
	C 8.4 Bulk operational discharges conducted under MODU's permit to Work (PTW) system (to operate discharge valves/pumps).	PS 8.4 Increased level of assurance and verification on bulk operational discharges.	MC 8.4.1 Environmental inspection records demonstrate that bulk discharges are conducted under the MODU PTW system.
	C 8.5 Displacement, brine, workover or intervention fluids contaminated with hydrocarbons will be treated prior to discharge or contained. If discharge specification not met the fluid will be returned to shore.	PS 8.5 Achieve less than 1% by volume oil content before discharge.	MC 8.5.1 Discharge reports demonstrate contaminated fluids were less than 1% by volume oil content before discharge.
	C 9.1 During well unloading and completions activities, if produced water is not flared, it will be processed through the well test water treatment package prior to discharge to the environment.	PS 9.1.1 Produced water discharged to the marine environment achieves discharge specification of <30 ppm.	MC 9.1.1 End of Well Discharge Reports demonstrate that formation water met discharge specification.
	C 9.2 Options for use of excess bulk cement, bentonite and barite will be managed as per Figure 6-7.	PS 9.2.1 Where the MODU is contracted for a subsequent Woodside drilling activity immediately following the PAP, bulk cement, bentonite and barite is retained on-board for reuse.	MC 9.2.1 Records demonstrate that if the MODU is contracted for subsequent drilling activity immediately following the PAP, dry bulk cement, bentonite and barite retained on board MODU for reuse at the conclusion of drilling campaign.
		PS 9.2.2 Where activity is last in Woodside MODU schedule, assess feasibility to transfer unused dry bulk cement, bentonite and barite to next titleholder who has the MODU on hire, and/ or	MC 9.2.2 Records demonstrate that where activity is the last in the Woodside MODU schedule, feasibility of transfer of unused dry bulk cement, bentonite and barite to next operator of

		transfer to another Woodside or other titleholder-contracted rig operating in the region. If deemed feasible, bulks to be retained on board or transferred for reuse.	the MODU, and/ or transfer to another Woodside or other titleholder-contracted rig in the region assessed and implemented if feasible.
		PS 9.2.3 Technical assessment of elimination of dry bulk discharge of barite on completion of drilling campaign undertaken, where options for reuse of bulk products on rig or other rigs in the region (PS 9.2.1, PS 9.2.2) are not feasible. Assessment to consider: • Environmental risk • Health and safety risk • Feasibility and timeframes for onshore disposal.	MC 9.2.3 Records demonstrate study undertaken where other options for reuse are not applicable.
		PS 9.2.4 No discharge of bulk barite at completion of the drilling campaign, where assessment deems onshore transportation considered technically feasible and ALARP.	MC 9.2.4 Records demonstrate bulk barite transported onshore where transportation options are feasible and ALARP.
	C 8.8 Sampling/analysis of stock barite to ensure acceptable levels of heavy metals (Cadmium and Mercury).	PS 8.8.1 Sampling/analysis of stock barite to ensure that heavy metals of concern (cadmium and mercury) are within limits prescribed by API standards: • Mercury (Hg): max 1 mg/kg (<1ppm) dry weight in stock barite • Cadmium (cd): max 3 mg/kg (<3ppm) dry weight in stock barite	MC 8.8.1 Barite powder test results demonstrate that concentrations of heavy metals within stock barite used during the activity did not exceed: • Mercury (Hg): max 1 mg/kg (<1ppm) dry weight in stock barite • Cadmium (cd): max 3 mg/kg (<3ppm) dry weight in stock barite

6.7.10 Routine and Non-routine Atmospheric (direct) and Greenhouse Gas Emissions (direct and indirect)

Context		
Utility Systems – Section 3.6 Operational Flaring – Section 3.7.1 Greenhouse Gas Emissions – Section 3.7.4 Vessel-based Xena-03 Drilling and Tie-back Activities – Section 3.11	Physical Environment – Section 4.4	Consultation – Section 5

Impacts and Risks Evaluation Summary														
	Environmental Value Potentially Impacted							***Evaluation***						
Source of Impact	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Operational flaring, exhaust emissions from fuel combust–on, fugitive emissions from the Pluto facility.				x				A	Air GHG - No attributable impact assigned Quality – F Localised	-	-	LCS GP PJ	Broadly Acceptable	EP O 10
Exhaust emissions from fuel combustion and incinerators on the ASV, MODU, installation and support vessels, and helicopters				x										
Contingent MODU flaring (well test non-routine) during well unloading for pressure test and clean up.				x										
Contingent venting of gas during drilling (e.g. well kick)				x										

Consideration of indirect GHG emissions associated with onshore processing, third party transportation, regassification and combustion by end users				x				B				LCS GP PJ RB A CV SV		EP O 11

Description of Source of Impact

Atmospheric emissions generated during the Petroleum Activities Program can be classified into two categories:

- Atmospheric pollutants (non-greenhouse gas emissions) are gases and particulates from an activity, or piece of machinery, which have a recognised adverse effect on human health and/or flora and fauna. The main emissions responsible for these effects include carbon monoxide (CO), oxides of nitrogen (NOx), sulphur dioxide (SO2), particulate matter less than 10 microns (PM10), non-methane volatile organic compounds (VOCs) including BTEX (benzene, toluene, ethylbenzene and xylenes).
- Greenhouse gas (GHG) emissions. GHG emissions refers to those gases within the atmosphere that absorb long-wave radiation, and thus trap heat reflected from the Earth's surface. The main gases associated with this effect include carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Other GHGs include perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF6). There are considered to be both direct and indirect GHG emissions.

In this section, atmospheric emissions estimates are developed in line with the National Pollutant Inventory (NPI) Emission Estimation Techniques (EET). GHG emissions are estimated using the National Greenhouse and Energy Reporting (NGER) Measurement Determination 2008 (Cth). The following section has been separated into Direct Emissions (Scope 1 & 2) and Indirect Emissions (Scope 3), aligned with the definitions of the GHG Protocol Corporate Standard (GHG Protocol 2015) and NGERS.

The main sources of GHG emissions associated with the PAP are shown in Table 3-5. GHG emissions sources that are not part of the PAP (e.g. GHG emissions from the onshore processing of Pluto gas) are included for consideration as indirect emissions. In the context of this EP, GHG emissions are classified as Direct and Indirect Emissions, as shown in Table 3-5.

The GHG Protocol 2015 defines indirect GHG emissions as emissions that are a consequence of the activities of the reporting entity but occur at sources owned or controlled by another entity. For the purposes of this EP the "reporting entity" is the Pluto offshore facility and therefore, onshore processing and support vessel/helicopter operations are considered indirect emissions sources.

Direct Atmospheric and Greenhouse Gas Emissions – Pluto Operations

Direct atmospheric emissions from the Pluto facility during the Petroleum Activities Program include emissions from flaring, equipment and generators, fugitives and process vents. Direct emissions and combustion products typically include CO_2, water vapour, NO_x, SO_2, methane, refrigerant gases, particulates and VOCs.

The emissions estimates presented provide a representative estimate of activities and operations over the next 5-year period of the Pluto Facility Operations EP. Direct GHG emissions are estimated to average approximately 37,700 t CO_2-e p.a during this period.

Variance within the period may occur, due to a number of factors such as reservoir and production system performance outcomes, planned activities including shutdowns and maintenance activities and unplanned reliability events. Emissions estimates below are provided as a reasonable estimate to inform an impact and risk assessment associated with activities requiring emissions to air.

Greenhouse gas emissions associated from XNA-03 drilling and tie-back activities is estimated to be approximately 13,300 t CO_2-e.

Atmospheric Emissions – Flaring: Historical emissions, prior to Water Handling Module

Prior to the water handling module start up, flaring has been the largest source of combustion emissions from the riser platform. The combustion of hydrocarbon gas by flaring is an essential practice, primarily for safety requirements. Operational flaring is comprised of two elements:

- normal operational flaring typically associated with flare system purge and pilot and process flows from produced water separation system.
- non-routine flaring that may result from activities such as planned shutdowns, ESD testing and pigging, and un-planned shutdowns and ESDs, production restarts, equipment outage/failures, subsea flowline depressurisation and well remediation activities.

During flaring, the burnt gas generates mainly water vapour and CO2. Gas flaring has the potential to increase the volumes of GHGs emitted to the atmosphere. Flaring also consumes natural gas, a non-renewable resource. The efficiency of the facility flare is estimated to be approximately 98%. Incomplete combustion under certain scenarios may also generate dark smoke.

During normal operations, approximately 540 tonnes of gas are flared per year due to purging and maintenance of a pilot (based on data between 2020 - 2024).

Atmospheric Emissions – Flaring: Water Handling Module Normal Operations

Additional sources will be routed to flare as a result of normal water handling module operations with sources from the produced water degasser and the Horizontal Induced Gas Flotation (HIGF) processes. Following commencement of water handling module operations, combined continuous low pressure flows to flare are estimated to result in approximately 3500 tonnes flaring per annum.

Atmospheric Emissions – Intermittent flaring required to operate of the Water Handling Module and integrated subsea system

It is estimated that intermittent flaring may total approximately 4500 tonnes of gas per year associated with operation of the water handling module and integrated subsea system. Flaring will vary as a result of production rates and non-routine activities, outages and shutdowns, and is key to safe operation of the facility and integrity management of the subsea system (particularly pressure management in case of upset to prevent hydrate formation) as outlined in Section 3.7.1.

Atmospheric Emissions – Flaring: Non-routine Flowline Pigging

Flaring to facilitate round-trip pigging of the flowlines is an integral part of operation and maintenance of the facility and occurs as required (approximately once every four years). Non-routine flowline pigging is expected to result in approximately 8300 tonnes of flaring in order to transport flowline pig(s) through the subsea flowline system.

Atmospheric Emissions – Fuel Consumption

Diesel for fuel combustion has been used for the operation of the crane, power generators and survival craft prior to the installation of the water handing module. Diesel usage on the facility (excluding support vessels) between 2016 and 2023 ranged between 202 tonnes and 488 tonnes. The 2016-2017 period (330 tonnes) represented a typical NNC year, while the 2022-2023 period reflects an increased diesel use year as a result of ongoing topside modifications and continuous crewing of the NNC facility associated with the tie-in of the water handling module.

The installation of the water handling unit requires additional power generation and fuel usage when operational. To accommodate this, installation of the Water Handling Module during 2023 included adding a fuel gas generator, and changed the main source of power on PLA from the two existing diesel generators to the gas engine generator. The two existing diesel engine generators remain on the platform for backup power generation. Once under stable operation with the PWH module operating, the fuel gas generator is expected to consume an estimated 147 kg/hr (1286t/y fuel gas).

Diesel use will continue for operation of supporting diesel generators, the crane and survival craft. Upon achieving stable operation of the Water Handling Module, annual emissions from diesel combustion are expected to decrease.

The current arrangement for power generation is as follows:

- Gas Engine Generator
- Diesel Engine Generators

Grid Stability Module (contingent power supply)

There are several operating conditions that will use various arrangements for power generation as outlined in Table 6-21 below. Emissions estimates from these different modes and sources are summarised in Table 6-22 and Table 6-23.

Table 6-21: Power generation configuration list

No.	Scenarios	Configuration
1	Uncrewed Normal Production	Gas Engine Generator priority 1 x generator online 2 x generators offline standby 1 x grid stability module online
2	Flowline depressurised	Gas Engine Generator priority 2 x generators online
3	Production recovery	
4	Start-Up (warm-up) Production Recovery from ESD	

5	Normal Production Pumping	1 x generator offline standby 1 x grid stability module online
6	Campaign Maintenance	
7	Campaign Maintenance, UPS discharge test	
8	Shutdown Maintenance	

Emissions Estimates

The following sections provide direct emissions estimates associated with annual fuel combustion for power generation, routine and non-routine flaring, and fugitives required in the operation of the Pluto offshore facility.

Table 6-22: Estimated annual atmospheric emissions consumed in PLA operations for power generation

Emission Type	Estimated annual emissions from diesel combustion	Estimated total annual emissions from gaseous fuel combustion[1]
Source / Fuel	330	1,286
CO_2 (t/yr)	1,032	3,558
CH4 (tCO_2-e/yr)	1	7
N2O (tCO_2-e/yr)	3	2
Total CO_2-e (t/yr)	1,036	3,567
NO_x (t/yr)	5	120
SO_x (t/yr)	0	0
VOCs (t/yr)	2	3
PM10 (t/yr)	2	0
CO (t/yr)	5	16

1 Based on combustion of 1286 tonnes of fuel gas required for gas engine generator operation during normal operations (yearly).

Table 6-23: Estimated annual atmospheric emissions from routine and non-routine flaring sources

Activity	Routine	Non-routine	
	Routine operations flared gas combustion	Flaring during shutdown, blowdown and start-up events (includes blowdown, warm-up, and infrequent flowline depressurisation)	Estimated emissions from flared gas combustion required for infrequent flowline pigging
Total Gas (t/yr)	3,957	4,532	8,300
CO_2 (t/yr)	10,684	12,236	22,410
CH_4 (tCO_2-e/yr)	526	603	1,104
N_2O (tCO_2-e/yr)	103	118	216
Total CO_2-e (t/yr)	11,313	12,957	23,730
NO_x (t/yr)	6	7	12
SO_x (t/yr)	n/a (NPI EETM)		
VOCs (t/yr)	59	68	25
PM10 (t/yr)	n/a (NPI EETM)		

CO (t/yr)	34	39	72

Non-Routine Venting of Process Hydrocarbons via Flare System

During normal operations, hydrocarbon gas is flared via the flare system. The system is maintained to effectively combust hydrocarbons as a critical component for the safe operation of the facility. In the unlikely event that the flare is extinguished or unavailable (such as following a major shutdown prior to system ramp-up), the hydrocarbon gas discharged via the flare system may initially not be combusted during the period required to maintain safety purge flows to the flare system and intervention to re-establish flare ignition. This may result in the short term (days) low-rate contingent release of hydrocarbon gas to the atmosphere. Intermittent non-routine venting from the riser platform represents only a minor source of atmospheric emissions and is not considered to pose a risk beyond the routine air emissions described in this section.

Fugitive Emissions

Fugitive emissions can occur from pressurised equipment and are inherent in design. Fugitive emissions may occur due to infrequent operational activities or unintentional equipment leaks. Sources can include valves, flanges, pump seals, relief valves, vents, sampling connections, process drains, open-ended lines, casing, tanks, produced water and other potential leak sources from pressurised equipment. Fugitive emissions are quantified and reported as requirements set under the National Greenhouse and Energy Reporting Scheme (NGERS).Fugitive methane emissions are anticipated to be a very small GHG contributor at Pluto-A as safe operation of the facility relies on the effective containment of hydrocarbons. The amount of routine and non-routine fugitive emissions are considered to be small, and is inherently controlled by design and operations/maintenance practices. The facility has limited topsides processing and relatively few potential leak-points, is well-maintained using good practice operations and maintenance tightness validation. Furthermore, the facility is monitored with safety gas detection systems, and produced water discharges are processed through a degasser to remove associated entrained methane. Facility safety-related controls, produced water operations and implementation strategy measures provide proportional management of potential fugitive emissions for PLA. Potential unplanned hydrocarbon releases to the atmosphere associated with accidents, incidents and emergency situations are described in Sections 6.7 and 6.8). The National Greenhouse and Energy Reporting (Measurement) Determination 2008 estimates fugitive emissions based on typical 'shallow water offshore platforms' to be 1,747 t CO_2-e/yr of methane and 7 t CO_2-e/yr of carbon dioxide. Fugitive emissions associated with produced water production at the PLA PWH module maximum design rate is estimated to be approximately 1,140 t CO_2-e/yr based on accepted NGERs methodologies. Discrete relatively small volumes of packed gases and charged systems, including non-ozone depleting refrigerant gases, are used across the facility and vessels which have potential for small volume leaks (typically less than 100 kg per isolatable inventory). Such gases are used in the HVAC and refrigerant systems on the facility and vessels.

The facility is fitted with several portable fire extinguishing units utilising CO_2. The facility does not have any gaseous fire extinguishing systems containing synthetic GHGs or ozone depleting substances.

Indirect Emissions

Tie-back Activities: MODU, Vessel and Helicopter Operations

Atmospheric emissions during tie-back activities are generated by installation and support vessels from internal combustion engines (including all equipment and generators) and incineration activities (including onboard incinerators) during the Petroleum Activities Program for standard operations, excluding drilling waste.

Atmospheric emissions generated during these operations will include SO_x, NO_x, particulates and VOCs. SOx and particulate matter emissions are heavily influenced by the fuel used and its relative sulphur content, MGO usually having a lower sulphite content than marine diesel oil (MDO) or heavy fuel oil (HFO).

NO_2 emissions from routine MODU power generation for an offshore project were modelled previously by another operator (BP Azerbajan, 2013). NO_2 was the focus of the modelling, on account of the larger predicted emission volumes compared to the other atmospheric emissions, and the potential for NO_2 to impact on human health (as a proxy for environmental receptors). The model demonstrated that atmospheric emissions generated by MODU operations may increase ambient NO_2 concentrations by 1 µg/m^3 (0.001 ppm) within 10 km of the source and 0.1 µg/m^3 (0.0001 ppm) within 40 km of the source. This represents an increase of 2% over typical background concentrations within 40 km, with air quality remaining well below the WHO air quality guideline for NO_2 of 40 µg/m^3 annual mean. As NO_2 is the main emission that poses a threat to receptor health, it is considered conservative to use the above studies to justify potential impacts to receptors. As such, studies into the attenuation of other gasses emitted are not evaluated.

A moored MODU may be used for the drilling campaign resulting in less fuel needed for station keeping, however a hybrid MODU may be used. Other vessels required for the Petroleum Activities Program (e.g. installation vessels) may use DP to conduct installation or intervention activities. Based on fuel consumption information from the DPS-1 MODU on previous Woodside drilling campaigns and the expected activity duration plus mobilisation, it is estimated that a hybrid MODU will consume approximately 44 t/d of fuel when compared to similar scenarios. Based on the information available it is expected that up to approximately 2,640 tonnes of fuel may be used from MODU activities (60 total days for the drilling and completions of the single well). Other DP vessels associated with the subsea

installation and contingent well intervention activities may use up to 315 t (based on 21 days and a rate of 15 t/day). GHG emissions from the MODU, vessel and helicopter operations are expected to be approximately 8,042 t CO_2-e.

Support vessels, refuelling vessel and helicopters will support the Petroleum Activities Program, although emissions produced will be substantially less than those produced by the MODU/installation vessels. Total fuel consumption for support vessel activities (based on four general offshore supply vessels on standby at 2.5 t/day) is expected to be up to 1,669 tCO_2-e for anchor handling, drilling activities, subsea installation, well start-up and contingent well intervention activities. Helicopter operations during drilling activities may consume up to 84 tCO_2-e, based on ~1.5 t/day. The potential for multiple helicopter runs has been considered in GHG emissions summations.

Well Kick

During drilling of the well and contingent well intervention activities, a kick may occur. A kick is an undesirable influx of formation fluid into the wellbore. The resultant effect would be a release of a small volume of GHGs via the degasser to the atmosphere during well control operations, known as 'venting'. Venting is required to ensure well integrity is maintained in the event of a kick thereby avoiding an emergency condition. The total estimated, expected volume of GHG emissions from well kicks and venting is estimated to be approximately 378 tCO_2-e.

Well Flowback (Flaring) and Contingency Activities (Venting)

The preferred well unloading method for the tie-back activities is to direct all fluids to the onshore LNP plant via the Pluto facility. However, if this activity is not practicable, contingent well unloading to the MODU may result in gas, condensate, base oil and methanol in the wellbore to be flared and efficiently burned. The flare may be extinguished due to water ingress, lack of pilot (propane), weather impact or equipment failure resulting in cold venting of gas from the flare for several minutes. After the objectives of the well testing and flowback are achieved, the flow is stopped and the well may be cleaned using a brine that can include several chemicals, such as biocide and surfactant. Across approximately 48 hours a volume of ~31 mmscf of gas, 534 bbl condensate may be flared, or 1918 tCO_2-e.

Mud Degassing

Methane emissions may be released during the period of intersection with the reservoir. Small amounts of gases such as methane may dissolve in drilling fluids and be released to the atmosphere as fluids are degassed and recirculated. These emissions have been estimated using American Petroleum Institute factors and are negligible over the activity.

Venting of residual gas

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

- Riser disconnect – Riser will be disconnected at the end of well intervention activities. Pressurised gas will be vented to the atmosphere.
- Wireline tool string and tool change – During the well intervention activities it is estimated that there will be 3 to 5 tool changes per well requiring intervention. Tool changes will cause a small quantity of venting to the atmosphere via the wireline lubricator.
- Surface returns – Small volumes of hydrocarbon gas from annular spaces will be cold vented via a choke manifold in a controlled and safe manner from the WIV.

Table 6-24: Greenhouse gas emissions and sources associated with tie-back activities

Source	GHG Emissions (t CO_2-e)
Anchor handling Activities	
Anchor Handling Operations	273
Support Vessel (Anchor handling)	136
MODU Activities	
MODU Operations	7140
Support Vessel (MODU Operations)	818
Helicopter Operations	84
Subsea Installation activities	
Primary Installation Vessel Operations	858
Support Vessel (PIV Operations)	286
Well Start Up and performance testing	
Support Vessel	286

Contingent Scenarios - Intervention / IMMR activities	
Intervention Vessel / IMMR vessel	858
Support vessel Operations	143
Contingent flaring	4
Well Kick & Flowback	1918
Vented per well	378
Venting – Riser disconnect (~1800PSI)	176
Venting - Tool change (5 changes)	<1
Venting – Surface returns	<1
Venting – Removal of tree cap	<1

Greenhouse Gas and Atmospheric Emissions associated with Support Vessels and Helicopters

Indirect GHG and atmospheric emissions will be generated by various support vessels, and helicopters supporting Pluto. Vessel emissions include those from internal combustion engines and fugitives. Incinerators may be used onboard vessels to dispose of flammable domestic wastes such as cardboard. Incinerators are typically used infrequently, with wastes generally segregated and transported to shore for disposal.

The figures provided below are estimates of key vessel and helicopter emissions. Atmospheric and GHG emissions from support vessels vary depending on the nature of activities being undertaken; for example, travelling or "steaming" to a destination at low speed uses less fuel and generates lower atmospheric and GHG emissions than high speed steaming. Emissions generated during safety related vessel standby activities, holding station using DP during loading and unloading of materials to the facility or undertaking subsea IMMR work also vary. PLA is not expected to require routine vessel support except on occasion when an intervention visit is required (planned or reactive maintenance). This is estimated to occur as frequently as 6 – 8 times per year.

Vessel Masters control day to day operations that determine support vessel emissions. Woodside has the potential to influence fleet level approaches to support vessel emissions through contracting activities. Refrigerant gases are used onboard supply vessels in small quantities.

Expected annual GHG emissions for vessel and helicopter activities have been estimated to be:

- 827 tCO_2-e for support vessels, based on MDO consumption.
- 1035 tCO_2-e for IMMR vessels, based on MDO consumption.
- 80 tCO_2-e for helicopters, based on Jet A1 fuel consumption.

Indirect emissions from these sources are expected to be relatively constant throughout the EP period.

Greenhouse Gas Emissions associated with Accommodation Support Vessels

Accommodation support vessels generate emissions dependent on several factors including: Sea state conditions, size of the vessel, environmental conditions and crewing and activity requirements. It is expected that there is variation in the fuel requirements dependent on these factors, ranging from ~6 to ~48 tonnes per day. Estimated ASV GHG emissions is approximately 12,760 tCO_2-e for ASVs, based on a 90-day campaign.

GHG Emissions associated with Processing Onshore and Product End-use associated with Pluto

Indirect emissions associated with Pluto Operations result from hydrocarbon processing (onshore), third party transport of products, regassification, distribution and combustion by end users. Key influences impacting indirect GHG associated with Pluto production include:

- Total production – indirect emissions are proportional to total production, which varies reservoir, well and production system performance, maintenance and shutdown activities, and well tie-backs and technical and commercial operating requirements.
- Composition of produced gas – such as variability due to technical constraints, inert gas optimisation, and separation of reservoir CO_2.

Downstream feed gas and product demands – the proportion of hydrocarbons attributed to Pluto sold as LNG, condensate, domestic gas and other products varies. Each product requires differing amounts of energy to process to the point of sale and varies based on reservoir composition, field contribution and commercial reasons.

End location, and use of sold products by third parties varies with national and international pathways for valuable energy and resource produces. Wide potential for end use of sold products can result in variable emissions intensities.

For the purposes of framing potential indirect emissions, the total assumed GHG emissions associated with annual production and from transport and customer combustion are estimated in Table 6-25 below. Estimates are conservatively framed, as they do not include possible abatement or offsets applied voluntarily or through regulatory

mechanisms in Australia and across the value chain and product lifecycle, including international. Indirect atmospheric emissions (non-GHG) are discussed in **Section 6.7.11.**

Table 6-25:Estimated direct and potential indirect GHG emissions associated with Pluto offshore activity production

Source of emissions	Annual estimated emissions (MtCO2-e)	Total possible emissions for EP period (MtCO2-e)
Direct Emissions		
Pluto Offshore Operations (including fuel, flaring and fugitives)	0.038	0.189
Indirect Emissions		
Project vessels, MODU and helicopters during XNA03 drilling, Installation, Hook-up and Commissioning	0.013	0.013
Vessels and helicopters during Operations	0.002	0.01
Onshore hydrocarbon processing[1]	2.36	9.52
Third party transport of products, regassification, distribution and end use[2]	23.1	91.3

[1] Estimated onshore processing emissions envelope based on potential positive reservoir and production outcomes, processed through onshore PLP and KGP LNG facilities. Typical of most oil and gas activities, reservoir performance carries a wide uncertainty range, and production varies with market demand and downstream processing performance. The annual estimated emissions presented in Table 6-26 represent the year with highest expected production/GHG emissions in the duration of the 5 year prior to acceptance of this EP. Total emissions presented do not consider net reduction by way of voluntary and regulatory abatement/offsets.

[2] Source: EcoInvent 3.5 database and National Greenhouse and Energy Reporting (Measurement) Determination 2008. EcoInvent v3.5 represents a large collection of inventory data, used as an approximation of third-party lifecycle LNG use for cargos delivered to China. It has been recognised as emission factor source for the European Union Renewable Energy Direction greenhouse gas methodology and is aligned to the principles of the NGERs methodology. Total emissions presented do not consider potential third-party net reduction by way of voluntary and regulatory abatement/offsets.

The precise shape and pace of the energy transition is uncertain. It is expected to vary across countries because they have different starting points, development requirements, resources and capabilities. However, the scale of the transition is clearer, as it will take many trillions of dollars, invested over decades. Today, Woodside has a portfolio of oil and gas assets. We are also diversifying our portfolio by investing in new energy products and lower carbon services that can avoid or reduce customer emissions. We see an ongoing role for gas from the Pluto facility to support our customers' plans to secure their energy needs, while they reduce their emissions.

Impact/Risk Assessment

Air Quality

Facility, tie-back activities and vessel routine and non-routine emissions, predominantly flaring, have the potential to result in localised, temporary reduction in air quality, generation of dark smoke and contribution to GHG emissions. Potential impacts of emissions depend on the nature of the emissions, as well as the location and nature of the receiving environment.

Facility design (including the rapidly dispersive characteristics of the gas turbine exhausts, flare and other emissions), the estimated level of pollutants in the emissions, and the absence of elevated background ambient levels have been considered in estimating the potential for interaction with human and environmental sensitivities. The PAA is in a remote offshore location, with no expected adverse interaction with populated areas or sensitive environmental receptors associated with air emissions.

The PAA overlaps the breeding BIA for the wedge-tailed shearwater, roseate tern, and fairy tern (see Section 4.6.4); as such, these seabirds may occur near to the facility airshed. Birds (including migratory birds) are also known to opportunistically roost on the riser platform. Given the highly dispersed nature of facility air emissions, no adverse impacts to birds are anticipated due to air emissions.

Potential impacts are expected to be temporary, localised air quality changes, limited to the airshed local to the riser platform. Air emission impacts are not expected to have direct or cumulative impacts on sensitive environmental

receptors, or above National Environmental Protection (Ambient Air Quality) measures and are expected to disperse well before reaching the nearest populated area (Dampier).

The flare and potential black smoke resulting from emissions may impact visual amenity. The offshore location of the Platform is not directly visible from the nearest landfall (Montebello Islands, 43 km south). Hence, no impacts to visual amenity for residential communities are expected. Visual amenity impairment to tourism activities is not expected.

Assessment of Potential Climate Change Impacts

Greenhouse gas emissions associated with Pluto are estimated to be up to 180 Mt CO2-e till EOFL, of which approximately 17 Mt CO2-e may originate from extraction and processing in Australia. Peak projected annual extraction and processing GHG of approximately 2.4 MtCO2-e would represent ~0.5% of national Australian emissions (463.9 Mt CO2-e during 2022) (DCCEEW, 2023d). These emissions will not materially or substantially contribute to either Australia's GHG emissions or global GHG emissions. Further, net emissions associated with Pluto in Australia are set to be lower than these totals - with ongoing abatement via implementation of the NGERS Safeguard Mechanism which sets out an abatement trajectory consistent with achieving Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050 (DCCEEW, 2023e). In view of the direct and indirect GHG emissions associated with Pluto Facility and tie-back of Xena-03, Woodside considers it appropriate to include contextual evaluation relating to the accumulation of GHGs in the atmosphere and relationship with potential climate change impacts on the environment. Climate change impacts cannot be attributed to any one activity as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started. They do not take into account the net impact of each project or activity. Even if discounting the potential positive role gas can play towards customer commitments and plans to decarbonise through the energy transition; emissions associated with the project are negligible in the context of existing and future predicted global GHG emissions. The accumulation of net GHG emissions in the atmosphere is, in turn, influenced by global energy demand and the composition of the global energy mix. Although the direct and indirect GHG emissions associated with Pluto (as described above) cannot be linked to climate change impacts to the environment, the following context is provided:

GHG Emissions – Global and Australian Context

Climate science is a rapidly evolving field in which new observations continue to deepen understanding of the current and potential impacts of global warming, and the possible pathways for mitigation and adaptation (Woodside, 2023a). The IPCC is the United Nations body for assessing the science related to climate change, and is finalising the Sixth Assessment Report (AR6) which consists of three Working Group contributions and a Synthesis Report. A summary of outcomes of the working group's contributions comprises a range of matters, which amongst others include:

The AR6 Working Group I (AR6-WG1) report stated that it is unequivocal that there is human-induced warming. It also stated that increased atmospheric carbon dioxide (CO2) levels, generated by human activity, are the largest driver of warming over the longer term, and that there are a range of factors, including emissions of methane, which increase warming in the short-term.

The AR6 Working Group II (AR6-WG2) report stated that human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability. It stated that global warming, reaching 1.5°C in the near-term, would cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans. The report noted that societal choices and actions implemented in the next decade will determine the extent to which medium- and long-term pathways will deliver climate resilient development.

The AR6 Working Group III (AR6-WG3) report provided an updated global assessment of climate change mitigation progress and pledges, and examined the sources of global emissions. It explained developments in emissions reduction and mitigation efforts, and assessed the impact of national climate pledges in relation to long-term emissions goals. More than 2000 quantitative emissions pathways were submitted to the IPCC, of which 1202 scenarios included sufficient information for assessing the associated warming. The report found that there are many pathways in the literature that likely limit global warming to 2°C with no overshoot, or to 1.5°C with limited overshoot. These variations occur because, while climate science is able to calculate a 'carbon budget' of net emissions before any particular temperature outcome is reached, the allocation of this budget between different human activities requires additional judgements about for example technology, economics, consumer preferences and policy choices.

The AR6 Working Group I (AR6-WGI) report states "climate change is a global phenomenon, but manifests differently in different regions" (IPCC 2021b). IPCC projections for climate change in Australia from the AR6 Working Group II (AR6-WGII) report include:

- further climate change is inevitable, with the rate and magnitude largely dependent on the emission pathway (very high confidence)[66]
- ongoing warming is projected, with more hot days and fewer cold days (very high confidence)
- further sea level rise, ocean warming, and ocean acidification are projected (very high confidence)
- less winter and spring rainfall is projected in southern Australia, with more winter rainfall in Tasmania, less autumn rainfall in southwestern Victoria and less summer rainfall in western Tasmania (medium confidence), with uncertain rainfall changes in northern Australia
- more extreme fire weather is projected in southern and eastern Australia (high confidence)
- increased drought frequency is projected for southern and eastern Australia (medium confidence)
- increased heavy rainfall intensity is projected, with fewer tropical cyclones and a greater proportion of severe
- cyclones (medium confidence) (Lawrence et al., 2022).

The AR6-WGII also contains information about projected impacts to health and well-being for the Australasian region including, amongst others:

- detrimental effects on human health due to heat stress, changing rainfall patterns including floods and drought climate-sensitive air pollution (including that caused by wildfires) (high confidence) and vector-borne diseases (medium confidence)
- vulnerability to detrimental effects of climate change will vary with socioeconomic conditions (high confidence) (Lawrence et al. 2022).

For further information related to Woodside's approach to climate change, please see Section 5.3 'Managing Physical Risk' and Section 6.3 'A Just Transition' of Woodside's Climate Transition Action Plan and 2023 Progress Report (Woodside, 2024).

The AR6-WGII report identified nine key climate risks for the Australasian region:

- loss and degradation of coral reefs and associated biodiversity and ecosystem service values in Australia due to
- ocean warming and marine heatwaves (very high confidence)
- loss of alpine biodiversity in Australia due to less snow (high confidence)
- transition or collapse of alpine ash, snowgum woodland, pencil pine and northern jarrah forests in southern Australia due to hotter and drier conditions with more fires (high confidence)
- loss of kelp forests in southern Australia due to ocean warming, marine heatwaves, and overgrazing by climate-driven range extensions of herbivore fish and urchins (high confidence)
- loss of natural and human systems in low-lying coastal areas due to sea level rise (high confidence)
- disruption and decline in agricultural production and increased stress in rural communities in south-western, southern and eastern mainland Australia due to hotter and drier conditions (high confidence)
- increase in heat-related mortality and morbidity for people and wildlife in Australia due to heatwaves (high confidence)
- cascading, compounding and aggregate impacts on cities, settlements, infrastructure, supply-chains and services due to wildfires, floods, droughts, heatwaves, storms and sea level rise (high confidence)
- inability of institutions and governance systems to manage climate risks (high confidence) (Lawrence et al., 2022).

An earlier report by Australia's Biodiversity and Climate Change Advisory Group summarised the potential impacts of climate change to marine and terrestrial species, habitats and ecosystems across Australia (Steffen et al., 2009). The 2009 report identified examples of observed changes in Australia's biota that were considered consistent with the emerging climate change 'signal', as genetic constitution, geographic ranges, lifecycles, populations, ecotonal boundaries, ecosystems, and disturbance regimes (Steffen et al., 2009). The report also stated:

- "Biodiversity is one of the most vulnerable sectors to climate change".
- "Australia's biodiversity is not distributed evenly over the continent but is clustered in a small number of hotspots with exceptionally rich biodiversity", and that these "include the Great Barrier Reef, south-west Western Australia, the Australian Alps, the Queensland Wet Tropics and the Kakadu wetlands".

Further, it was stated that "many of the most important impacts of climate change on biodiversity will be the indirect ones at the community and ecosystem levels, together with the interactive effects with existing stressors" (Steffen et

[66] A level of confidence is expressed using five qualifiers: very low, low, medium, high, and very high. For a given evidence and agreement statement, different confidence levels can be assigned, but increasing levels of evidence and degrees of agreement are correlated with increasing confidence (Lawrence et al., 2022).

al., 2009). Future climate change (e.g., increased temperature and decreased, but more variable, rainfall) has the potential to have a range of impacts on ecological factors and threaten biodiversity in the Australian Mediterranean ecosystem (CSIRO, 2017).

Extensive modelling and monitoring studies over the last 20 years provide considerable evidence that global climate change is already affecting and will continue to affect species (Hoegh-Guldberg et al., 2018) however these impacts are likely to be highly species-dependent and spatially variable. The most frequently observed and cited ecological responses to climate-change include species distributions shifting towards the poles, upwards in elevation and shifts in phenology (earlier and later autumn life history events) (M. Dunlop et al., 2012). Climate change may not only change species distribution patterns but also life-history traits such as migration patterns, reproductive seasonality and sex ratios (Steffen et al., 2009).

Impacts of climate change such as altering temperature, rainfall patterns and fire regimes, are likely to lead to changes in vegetation structure across all terrestrial ecosystems within Australia (M. Dunlop et al., 2012; Steffen et al., 2009) . Increases in fire regimes will impact Australian ecosystems altering composition structure, habitat heterogeneity and ecosystem processes. Changes in climate variability, as well as averages, could also be important drivers of altered species interactions, both endemic and invasive species (M. Dunlop et al., 2012). Climate change could result in significant ecosystem shifts, as well as alterations to species ranges and abundances within those ecosystems (Hoegh-Guldberg et al., 2018).

The 'loss of climatic habitat caused by anthropogenic emissions of greenhouse gases' has been listed as a key threatening process under the EPBC Act (DCCEEW, 2021). The threatening process consists of reductions in the bioclimatic range within which a given species or ecological community exists due to emissions induced by human activities of greenhouse gases (DCCEEW, 2021). The process is considered to have a continental distribution, including both terrestrial and marine areas. Ecosystems in which the process occurs include: alpine habitats, coral reefs, wetlands and coastal ecosystems, polar communities, tropical forests, temperate forests, and arid and semi-arid environments (DCCEEW, 2021).

Coral reefs were recognised by both IPCC and the Australian Government as being at risk of climate change (Lawrence et al., 2022; DCCEEW, 2021). Protected coral reef areas in Australia include those within World Heritage listed sites, such as Ningaloo Coast, Shark Bay, or the Great Barrier Reef. Climate change has been identified as a threat for each of these World Heritage areas, with potential risks to coral reef as well as other environmental values (such as marine fauna) within these ecosystems (IUCN, 2020b, 2020c, 2020a).

Climate variability and change has been identified as a threat to some EPBC Act protected species, including marine turtles, whales, seabirds and migratory shorebirds:

The Recovery Plan for the Southern Right Whale (DCCEEW, 2024) states that 'modelling the links between krill and whale population dynamics with climate change, including changes in ocean temperature, primary productivity, and sea ice, suggests future ocean conditions are likely to have a negative impact on krill populations and in association the baleen whale species that feed on them.'

The Recovery Plan for Marine Turtles in Australia (CoA 2017) states that climate change is of particular concern to marine turtles because it is likely to have impacts across their entire range and at all life stages. Climate change is expected to cause changes in dispersal patterns, food webs, species range, primary sex ratios, habitat availability, reproductive success and survivorship".

The Conservation Management Plan for the Blue Whale (CoA 2015a) states: climate change is expected to cause changes in migratory timing and destinations, population range, breeding schedule, reproductive success and survival of baleen whales, including blue whale species and subspecies".

The Wildlife Conservation Plan for Seabirds (CoA 2022) states that "consequences to seabirds could include negative impacts from an increase in extreme weather events, reduced or changed prey abundance and distribution, and decrease in nesting habitat".

The Wildlife Conservation Plan for Migratory Shorebirds (CoA 2015) states that "such changes have the potential to affect migratory shorebirds and their habitats by reducing the extent of coastal and inland wetlands or through a poleward shift in the range of many species".

The North-west Marine Parks Network Management Plan 2018 (DNP, 2018) identifies climate change as a pressure that may impact marine park values. The management plan states that "the impacts of climate change on the marine environment are complex and may include changes in sea temperature, sea level, ocean acidification, sea currents, increased storm frequency and intensity, species range extensions or local extinctions, all of which have the potential to impact on marine park values" (DNP, 2018).

Within the Marine Bioregional Plan for the NWMR (DSEWPaC, 2012), pressures related to climate change are assessed as 'of potential concern' for species of marine turtle, inshore dolphins, sawfish, sea snakes, whale shark, dugong, and seabird and shorebird, as well as the KEFs and shipwrecks known to occur in the NWMR.

Summary

The availability of gas from Pluto to markets is anticipated to have a role to play towards customer commitments and plans to decarbonise through the energy transition. Emissions associated with Pluto are not predicted to contribute materially or substantially to Australia's total GHG emissions.

Climate change impacts cannot be attributed to any one activity or one project, including Pluto, as they are instead the result of global GHG emission, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started. Therefore, the impact level of GHG emissions associated with Pluto operations has not been assigned.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Vessel operations comply with Marine Order 97 (Marine Pollution Prevention – Air Pollution).	F: Yes. CS: Minimal cost. Standard practice.	Marine Order 97 is required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class. Marine Order 97 reduces air pollution from vessels.	Control based on legislative requirements – must be adopted.	Yes C 10.1
National Greenhouse and Energy Reporting Scheme (NGERS) and National Pollutant Inventory (NPI) reporting – estimation of GHG, energy and criteria pollutants.	F: Yes. CS: Minimal cost. Standard practice.	Control based on legislative requirements to provide the national reporting framework for the reporting and dissemination of information related to emissions, hazardous wastes, GHG emissions, greenhouse gas projects, energy consumption and energy production to meet the objectives and desired outcomes of the legislation(s) such as: the maintenance and improvement of air and water quality, minimisation of environmental impacts associated with hazardous wastes; and an improvement in the sustainable use of resources; and act as the single framework to inform policy, meet reporting requirements, avoid duplication, and to ensure that facility net greenhouse gas emissions are managed within applicable baselines.	Control based on legislative requirements – must be adopted.	Yes C 10.2
Apply for and manage net direct and indirect GHG emissions to within the relevant	F: Yes CS: Minimal Cost. Standard Practice.	Control based on legislative requirement utilising the national reporting framework for the	Control based on legislative requirements – must be adopted.	Yes C 10.3

[67] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
baseline under the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015		reporting of information related to GHG emissions. The Safeguard Mechanism requires Operators to abate carbon emissions in excess of the relevant baseline using appropriate credit units.		
XNA-03 Drilling: Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: accepted WOMP, which describes the well design and barriers to be used to prevent a loss of well integrity, specifically: all permeable zones penetrated by the well bore, containing hydrocarbons or over-pressured water, shall be isolated from the surface environment by a minimum of two barriers (primary and secondary) (a single fluid barrier may be implemented during the initial stages of well construction if appropriateness is confirmed by a shallow hazard study) discrete hydrocarbon zones shall be isolated from each other (to prevent cross flow) by a minimum of one barrier where deemed required all normally pressured permeable water-bearing formations shall be isolated from the surface by a minimum of one barrier. The barriers shall: be effective over the lifetime of well construction (fluid barriers) remain monitored and provide	F: Yes. CS: Minimal cost. Standard practice.	Drilling activities undertaken in accordance with an accepted WOMP will manage the risk of well kicks, reducing the likelihood of occurrence. No reduction in consequence will occur.	Control based on legislative requirements – must be adopted	Yes C 10.4

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
sufficient pressure to counter pore pressure during well construction (cementing barriers, including conductor, casing and liners) conform to the relevant minimum standards set out in the Woodside Engineering Standard – Well Cementation. Verification: effectiveness of primary and secondary barriers shall be verified (physical evidence of the correct placement and performance) during the drilling of the well.				
XNA-03 Drilling: As-built checks that shall be completed during well operations to establish a minimum acceptable standard of well integrity is achieved.	F: Yes CS: Minimal cost. Standard practice	Reduces the likelihood of occurrence. No reduction in consequence will occur.	Benefits outweigh cost/sacrifice	Yes C 10.5
XNA-03 Drilling: Subsea BOP installed and tested during drilling operations. The BOP shall include: • one annular preventer • two pipe rams (excluding the test rams) • a minimum of two sets of shear rams, one of which must be capable of sealing • deadman functionality • the capability of ROV intervention • independent power systems.	F: Yes CS: Standard practice. Required by Woodside standards.	BOP testing reduces the volume of gas vented in the event of a well kick.	Benefits outweigh cost/sacrifice	Yes C 10.6
XNA-03 Drilling: Process conducted to calculate, update and monitor kick tolerance for use in well design	F: Yes CS: Standard practice. Required by Woodside standards.	Processes will reduce the volume of gas vented in the event of a well kick.	Benefits outweigh cost/sacrifice	Yes C 10.7

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
and while drilling, including: The BOP shall be closed upon detecting a positive well influx. The shut in procedure shall be according the rig contractor procedures or as the well conditions dictate. Kick tolerance calculations will be made for drilling all hole sections based on the weakest known point in the well. Kick detection techniques will be adjusted based on the level of kick tolerance through a management of change (MOC). The manual also includes requirements for kick tolerance management in the event of down-hole losses.				
XNA-03 Drilling: Well control bridging document (WCBD) for alignment of Woodside and the MODU Contractor in order to manage the equipment and procedures for preventing and handling a well kick.	F: Yes CS: Standard practice. Required by Woodside standards.	Implementing equipment and procedures in the well control bridging document will reduce the volume of gas vented in the event of a well kick.	Benefits outweigh cost/sacrifice	Yes C 10.8
Good Practice				
Forecast, measure, monitor and/or estimate facility GHG emissions (in accordance with NGERS/NPI) to inform optimisation management practices and minimise environmental impact of direct Pluto and indirect onshore processing emissions.	F: Yes CS: Minimal cost. Standard practice.	Minimises environmental impact of emissions through planning, ongoing review, governance and optimisation. It combines with good operating practice to maximise production and reduce flaring emissions (Pluto) and fuel emissions at the LNG plant to manage cost, which improves energy intensity (e.g. cleaner production), optimising emissions from the project. Fuel and flared gas are potential product streams,	Control is WMS requirement – must be adopted.	Yes 10.9

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
		as such, Woodside applies routine short and long term optimisation and opportunity management framework to identify and prioritise enhancement opportunities. On Pluto to date this has been limited to reduced flaring (e.g. flare purge rates); however overall system efficiencies (such as well and composition optimisation) and LNG Plant opportunities are also considered in this process. Annual flare and emissions target setting and monthly review of performance is completed for Pluto. The LNG Plant also applies flare and emissions target setting and tracking for emissions management. Daily production meetings allow for optimisation as an integrated production system, considering impacts of variables such as maintenance activities and temperature influence on production rates.		
Contracting strategy and evaluation for hire of support vessels includes consideration of vessel emissions parameters and low carbon/alternate fuels	F: Yes CS: Fuel cost over the five year contract is considered in the evaluation of responses, allowing for competitive consideration of low carbon alternatives	Minimises costs and emissions through eco-efficiency approach recognising cost of fuel and carbon emissions over the contract term	Control effectively allocates a cost to emissions to recognise that higher emitting fuel sources with other lower operating costs do not represent overall best value.	Yes C 10.10
XNA-03 Drilling: Well unloading acceptance criteria that define the well objectives will be established	F: Yes. CS: Standard practice.	Eliminates unnecessary flared volumes and corresponding emissions (light and GHG).	Benefits outweigh cost/ sacrifice.	Yes C 10.11
XNA-03 Drilling: Assess opportunities to eliminate well flowback flaring to MODU. The assessment will consider factors such as: HSE considerations	F: To be decided. The decision on whether to unload to the MODU or Pluto will be based on technical study outcomes. CS: Cost effective but introduces	Minimises environmental impact through the reduction of GHG emissions. Well flowback may be avoided entirely. In this case the wells are instead flowed back to the eventual host facility (the Pluto	Benefits potentially outweigh cost/ sacrifice.	Yes C 10.12

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
Well performance Proof of completions success Solids and liquids handling Potential eventual other impacts to the topsides.	additional risks to the production facility (i.e. risk of equipment and subsea system failures due to solids).	Facility), resulting in a small increase to expected bean-up flaring for the well but resulting in a net overall flaring decrease.		
Woodside supporting customers and suppliers to reduce their GHG emissions by: Promote global measurement and reporting by participating in industry collaboration initiatives to mature, harmonise and advocate for transparent measurement and reporting Advocacy for policy frameworks that enable a stable approach to carbon emissions management. Working with the natural gas value chain to reduce methane emissions in third party systems (e.g. regasification and distribution), such as through the adoption of the Methane Guiding Principles. Promoting the role of LNG in displacing higher carbon intensity fuels. Supporting the development of new technologies to reduce higher carbon intensive energy sources. Monitoring the global energy outlook including the demand for lower carbon intensive energy such as LNG and displacing higher carbon intensive fuels.	F: Yes CS: Moderate cost. Standard practice	Woodside to support customers and suppliers to reduce their GHG emissions.	Potential benefit outweighs cost/sacrifice.	Yes C 11.1

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
Professional Judgement – Elimination				
Eliminate flaring by venting un-combusted hydrocarbons.	F: No. Routine hydrocarbon venting is not considered good industry practice, as unburnt methane poses potential for greater environment impact compared to combustion emissions. The ability to flare hydrocarbons is a key safety feature on the facility. Removing the ability to flare hydrocarbons may result in unacceptable safety risks on the facility. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
Eliminate flaring by reinjecting un-combusted hydrocarbons	F: No. Routine hydrocarbon reinjection, as opposed to transport to onshore facilities, would not be consistent with the approved Pluto Field Development Plan (FDP) which seeks to optimize hydrocarbon recovery while fulfilling gas supply commitments. As such, gas reinjection would not meet concept screening criteria to warrant option evaluation. CS: not assessed, control not feasible.	Not assessed, control not feasible	Not assessed, control not feasible	No
XNA-03 Drilling: Do not vent during well kick.	F: No. Venting is a critical safety activity required in the event of a kick to reduce pressure build up.	Not considered – control not feasible.	Not considered – control not feasible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
	CS: Not considered – control not feasible.			
Professional Judgement – Substitution				
Fuel for energy generation on the riser platform is selected for lowest indirect emissions generation practicable: Fuel gas used in preference to diesel for power generation	F: Yes, fuel gas is the primary fuel source, with diesel as back up fuel used when gas production is shut down. CS: Cost effective	Gas turbines reduce CO2 emissions for a given unit of power and reduces spill risk associated with diesel bunkering activities.	Cost effective. Minimises fuel bunkering risks	Yes. Solution permanently implemented. This improvement was made as part of the recent produced-water-handling module upgrades, with gas engine commissioned in 2023.
Professional Judgement – Engineered Solution				
Maintain flare to maximise efficiency of combustion and minimise venting, incomplete combustion waste products and smoke emissions.	F: Yes. CS: Minimal cost. Standard practice.	Flare tip integrity and ignition system functionality minimises potential for venting, incomplete combustion waste products and smoke emissions.	Fuel	Yes C 10.13
Installation of flare gas recovery systems to reduce emissions entering the atmosphere from flaring	F: Yes CS: Significant additional cost associated with the design and installation of flare gas recovery systems, including significant retrofitting of multiple stages of compression systems, coupled with associated ancillaries, valving and piping, platform modification and weight considerations. The safe addition of required rotating equipment also poses significant production sacrifice and potential domestic gas supply impacts due to the initial design	Small to negligible environmental benefit from reducing atmospheric emissions from flaring. The environmental benefit gained from the recovery of flaring emissions would be limited to only a portion of flare system flows due to process safety constraints and flare system operation over a wide design envelope (associated with flow and pressure variations and related flowline integrity management). Furthermore, required retrofitting of multiple stages of compressions (e.g. for LP/HP streams) would offset any environmental benefits through increased power generation emissions. The retrofitting interaction with the safety critical flare system and continued	Given the increased safety risk and the very low, if any, environmental benefit provided when increased power generation emissions are taken into consideration, the installation of flare gas recovery systems is considered grossly disproportionate to the environmental benefit it would provide.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
	layout, space and safety constraints.	operation and maintenance of gas compression would also increase the NNC'd platform safety risks.		

Discussion of ALARP

Atmospheric emissions

On the basis of the environmental risk assessment outcomes and the use of the relevant tools appropriate to decision type A, Woodside considers the adopted controls appropriate to manage the impacts of Pluto facility, tie-back activities and vessel atmospheric emissions. 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.

GHG emissions

Risk Based Analysis

Application of Woodside's Risk Management Procedures, implementation of the GHG Emissions and Energy Management Procedure and Production Optimisation and Opportunity Management Procedure reduces GHG emissions risk to ALARP (Section 7.2). This includes a system of continual review and improvement of key emissions sources from the Pluto assets as an integrated system, including the Pluto-A offshore platform, e.g. installation of a gas engine on PLA which replaces the primary method of power generation from diesel to gas. Further opportunities are implemented at the Pluto LNG Plant to reduce indirect emissions associated with production from Pluto offshore fields.

Societal Values

Consultation was undertaken for this program to identify the views and concerns of relevant persons, as described in Section 5 and Appendix F Consultation Summary Tables. Some stakeholders expressed strong views on GHG emissions associated with Pluto operations, which were responded to accordingly. This included provision of further information on direct and indirect GHG emissions, discussion of controls and Woodside's corporate position, targets and controls via the 2024 Climate Transition Action Plan and 2023 Progress Report (Woodside, 2024).

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 and B for direct and indirect emissions respectively), Woodside considers the adopted controls appropriate to manage GHG emissions from the Pluto facility and indirect emissions sources that Woodside can practicably influence, including support vessels, during the five year term of this EP. The adopted controls meet legislative requirements including:

- Marine Order 97 for support vessels
- NGERS and NPI reporting for direct emissions attributed to Pluto
- National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015.

Indirect GHG emissions from onshore processing at PLP are managed under the Pluto Greenhouse Gas Abatement Program, and at Karratha Gas Plant (KGP) are managed under the Karratha Gas Plant Greenhouse Gas Management Plan. These facilities are also subject to complying with the Federal Safeguarding Mechanism (SGM) to manage net emissions under the scheme in line with Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050.

The Federal Safeguarding Mechanism (SGM)68 requires Australia's highest greenhouse gas emitting facilities to reduce or limit their emissions in line with Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050. Direct GHG emissions from the Pluto Offshore Facility, indirect emissions associated with onshore processing of gas from Pluto as well as indirect emissions associated with the transportation and end use of gas within Australian safeguard facilities are subject to the SGM, and net emissions from these sources must be kept below a specified limit or baseline.

Safeguard facilities that exceed their baseline must manage their excess emissions, such as by surrendering acceptable quality offsets suitably classified as Australian Carbon Credit Units (ACCUs) or Safeguard Mechanism

[68] Further information about the SGM and SGM Baselines can be found at the Clean Energy Regulator website: https://cer.gov.au/schemes/safeguard-mechanism and https://cer.gov.au/schemes/safeguard-mechanism/safeguard-baselines

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)67***	***Benefit in Impact Reduction***	***Proportionality***	***Control Adopted***
Credits (SMCs) which is the other eligible compliance unit. Each are representative of one tonne of CO2-e per credit, so that net emissions under the scheme are brought in line with the baseline. So that sufficient credits are available and that there is a means to comply, safeguard facilities that exceed their baseline are able to buy Government-held ACCUs from the Clean Energy Regulator via the Cost Containment Measure implemented as part of recent reforms. Safeguard Mechanism (SGM) obligations for the Pluto facility as defined under SGM will be met by emissions abatement via operational controls as first preference (described above). Options to manage residual net emissions in excess of baseline include surrendering ACCUs or SMCs, applying to become a trade-exposed baseline-adjusted facility, applying to borrow baseline from the following year or applying for a multi-year monitoring period. Surrendered carbon credits may be generated from Woodside projects, purchased from the market or purchased from the Government through the Cost-Containment Mechanism. Woodside is supporting customers and suppliers at a corporate level to manage indirect emissions associated with customer use of gas from the Pluto offshore fields. 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
Atmospheric Emissions Given the adopted controls, atmospheric emissions represent a negligible impact that is unlikely to result in greater than isolated impacts with close proximity of the Pluto facility, in an unpopulated area approximately 160 km northwest of the nearest community receptor, Dampier. The adopted controls are considered good oil-field practice/industry good practice and meet requirements of Australia Marine Orders and National Pollutant Inventory reporting. 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 atmospheric emissions to a level that is broadly acceptable. ***Greenhouse Gas Emissions*** To assess and determine that impacts from GHG emissions will be of an acceptable level, Woodside considered corporate commitments, principles of Ecologically Sustainable Development, Company Values and Societal Values. Principles of Ecologically Sustainable Development Giving consideration to economic development that safeguards the welfare of future generations, Pluto offshore operations is considered to align with the following core objectives of ESDev (e.g. intergenerational equity) by: • gas having the potential to contribute to an incremental reduction in global GHG emissions by displacing more carbon intensive power generation (e.g., coal), firming up renewables, or in hard-to-abate sectors • committing to management and mitigation measures for GHG emissions within operational control of the facility, given the uncertainty about future climate change trajectories • committing to mitigation measures for direct GHG emissions • continue to provide LNG as a source of fuel for global markets and pursue the development of lower carbon energy sources with reference to the UN Sustainable Development Goal 7, Affordable and Clean Energy • Marketing gas to customers within countries that have ratified the Paris agreement, where each country is responsible for accounting for, reporting and reducing emissions that physically occur in its jurisdiction. ***Internal Context*** The Petroleum Activities Program is consistent with Woodside corporate polices, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Environment and Biodiversity Policy • Woodside Risk Management Policy • Woodside Climate Policy • Woodside Climate Transition Action Plan and Progress Report • Woodside being a signatory to several global initiatives which are complementary to our corporate approach to methane emissions management, which include OGMP 2.0 (2024), Oil and Gas Climate Initiative Aiming

for Zero Methane Emissions (OGCI Near-Zero) and the Methane Guiding Principles (MGP, 2022), which are voluntary, international multi-stakeholder partnerships between industry and non-industry organisations.

- WMS requirements such as the GHG emissions and Energy Management Procedure, Production Optimisation and Opportunity Management Procedure and Methane Guiding Principles Management Guideline (Section 7.2). Deployment is being applied on a risk-based approach at portfolio level. This is achieved by implementing tools to identify, evaluate, implement and review emissions reductions projects and develop, govern and report on plans to reduce methane fugitive emissions.

External Context

GHG emissions are a global concern, and as such Woodside has undertaken an impact assessment of GHG associated with the Pluto facility and identified key measures to manage GHG emissions to an acceptable level.

According to Wood Mackenzie Energy Research Consultancy, LNG from Woodside operated facilities is amongst the lowest carbon intensity in the world delivered into North Asia69.

The global consensus on climate change led to the implementation of the Paris Agreement. The aim of the Paris Agreement, as stated in the Article 2.1(a) is to hold the increase in global average temperature to well below 2°C above pre-industrial levels. The Agreement also aims to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change.

Paris Agreement text extract70:

“Article 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change; This was reaffirmed in December 2023 in the COP28 decision text on the First global stocktake71. The text further recognised that the transition away from fossil fuels in energy systems is to be done in a just, orderly and equitable manner accelerating action in this critical decade, so as to achieve net zero by 2050 in keeping with the science72. It also recognises that transitional fuels can play a role in facilitating the energy transition while ensuring energy security73.

The Paris Agreement establishes a framework where countries make Nationally Determined Contributions (NDCs) to manage and reduce their own emissions.

Australia has ratified the Paris Agreement and has set a target to reduce emissions by 43% below 2005 levels by 2030 and to reach net-zero emissions by 2050. Australia’s emissions projections under a ‘with additional measures’ scenario is projected to be 43% below 2005 levels by 2030 and to reach net zero emissions by 2050 (DISER, 2022a). Australia’s emissions projections demonstrate that it is on track to reduce emissions by up to 43% below 2005 levels by 2030 (DCCEEW, 2022; DISER, 2022a). Pluto Offshore (direct GHG) and indirect onshore 3rd party processing facilities are also subject to complying with the Federal Safeguarding Mechanism (SGM) to manage net emissions under the scheme in line with Australia’s emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050.

Australia’s Long-Term Emissions Reduction Plan (DISER, 2021) presents Australia’s whole-of-economy plan to achieving net zero emissions by 2050 with priority technologies estimated to achieve 85% reduction and yet-to-be identified emerging technologies abating the remainder. The plan identified LNG as a critical transition fuel and expects growth in the sector with higher use in 2030 than it is today but acknowledging that growth will depend on the preferences of customers and the pace of international action (DISER, 2021).

Climate science has drawn a link between cumulative emissions of greenhouse gases and global temperature levels. The link between cumulative emissions and temperature levels allows a carbon budget to be calculated. This is the remaining amount of net emissions (i.e. all global sources of emissions minus all global sinks of emissions) that can occur before today’s concentration of greenhouse gases increases to the concentration associated with potential temperature outcomes.

[69] Export from Wood Mackenzie LNG Carbon Emissions Tool available from: https://www.woodside.com/docs/default-source/our-business---documents-and-files/pluto---documents-and-files/wood-mackenzie-lng-carbon-e

[70] Paris Agreement: https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf

[71] FCCC/PA/CMA/2023L.17 (Draft decision distributed 13 December 2023) First global stocktake text extracts https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf (Section I, Clause 3)

[72] FCCC/PA/CMA/2023L.17 (Draft decision distributed 13 December 2023) First global stocktake text extracts https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf (Section II, Subsection A, Clause 28 (d))

[73] FCCC/PA/CMA/2023L.17 (Draft decision distributed 13 December 2023) First global stocktake text extracts https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf (Section II, Subsection A, Clause 29)

However, the distribution of this carbon budget across different human activities requires additional judgements about a wider range of social, economic and technological factors and consumer and policy choices. Strategies to achieve emissions reductions include transitioning from fossil fuels without CCS to very low-or zero-carbon energy sources, such as renewables or fossil fuels with CCS, demand side measures and improving efficiency, reducing non-CO2 emissions, and deploying carbon dioxide removal (CDR) methods to counterbalance residual greenhouse gas emissions. Pathways to limit warming therefore show different combinations of sectoral mitigation strategies consistent with a given warming level.

As a result the demand for oil and gas in climate-related scenarios that could limit global warming to 1.5°C or 2°C is uncertain. For example in the AR6-WG3 report, the IPCC stated that in pathways that limit warming to 1.5°C (with a greater than 50% probability and with no or limited overshoot) the potential global use of gas in 2050 ranges from 30% above 2019 levels to 85% below them with a median 45% decline.

The demand for oil and gas remains through the remainder of this century in all of these pathways, but to varying degrees. The Pluto Facility will provide an incremental volume of hydrocarbons to Australian and international markets during its estimated remaining field life. Woodside considers that this development is aligned with the goals for supporting the energy transition and is compatible with the Paris Agreement goal to limit global warming to below 2°C.

To complement the approach to methane emissions management across the natural gas supply chain, Woodside is a member of, and aligns to the following global initiatives which are multi-stakeholder partnerships between industry and non-industry organisations.

- Oil and Gas Decarbonisation Charter (signed at COP28, OGDC, 2023). The charter reflects principles that we believe will contribute to supporting the aims of the Paris Agreement.
- OGMP2.0 (2024). Supports accurate, transparent, measurement-based methane emission reporting.
- Oil and Gas Climate Initiative Aiming for Zero Methane Emissions (Near-Zero, 2022). Initiative focuses on avoiding methane venting and flaring, repair of detected leaks, and supports development of methane detection and quantification technologies.
- Methane Guiding Principles (MGP, 2018). MGP focuses on the following priority areas for action along the natural gas supply chain:
    - Continually reducing methane emissions at our operational assets through delivery of Methane Action Plan activities.
    - Advancing strong methane performance across gas value chains via outreach and collaboration with other organisations.
    - Improving accuracy of methane emissions data via technology trials.
    - Increasing transparency through improved reporting.

The integrated Pluto facility operations embody the above principles.

Other requirements (includes laws, polices, standards and conventions):

Legislation and other requirements considered relevant for this aspect, and a demonstration of how these requirements are met, are described below.

Requirement	Demonstration
Marine Order 97 Gives effect to Annex VI of MARPOL 73/78	The requirements of Marine Order 97 are incorporated into the key control measures.
National Greenhouse and Energy Reporting (NGER) scheme Annual GHG reporting for facilities	The requirements of NGER reporting scheme are incorporated into the key control measures
National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 Emission intensity for reservoir carbon from new gas fields	The requirements of NGER Safeguard Mechanism are incorporated into the key control measures.
National Pollutant Inventory (NPI) Reporting Annual air pollutant reporting	The requirements of annual NPI reporting are incorporated into the key control measures.
Conservation Management Plan for the Blue Whale 2015–2025 Management action A3.1: Continue to meet Australia's international commitments to reduce greenhouse gas emissions and regulate the krill fishery in Antarctica Conservation Advice Balaenoptera borealis Sei Whale	As described above, the predicted atmospheric and GHG emissions from the Pluto Facility are considered de minimis, with no link to climate change impacts on Australian or International receptors. Therefore, the Pluto Facility is not considered to be inconsistent with the Conservation Management Plan for the Blue Whale 2015–2025 (CoA, 2015a),

Conservation action: Continue to meet Australia's international commitments to reduce greenhouse gas emissions and regulate the krill fishery in Antarctica Conservation Advice Balaenoptera physalus Fin Whale Conservation action: Continue to meet Australia's international commitments to reduce greenhouse gas emissions and regulate the krill fishery in Antarctica National Recovery Plan for the Southern Right Whale action area A3.1: Continue to meet Australia's international commitments to address causes of climate change, including greenhouse gas emissions Recovery Plan for Marine Turtles in Australia Management action A2.1: Continue to meet Australia's international commitments to address the causes of climate change.	Conservation Advice for Sei Whale (TSSC, 2015a), Conservation Advice for Fin Whale (TSSC, 2015b), National Recovery Plan for the Southern Right Whale (DCCEEW, 2024) Recovery Plan for Marine Turtles in Australia (CoA, 2017).
Conservation Advice Rhincodon typus Whale Shark No specific strategies or actions identified Recovery Plan for the White Shark (Carcharodon carcharias) No specific strategies or actions identified Wildlife Conservation Plan for Seabirds No specific strategies or actions identified Wildlife Conservation Plan for Migratory Shorebirds No specific strategies or actions identified Marine bioregional plan for the North-west Marine Region No specific strategies or actions identified North-west Marine Parks Network Management Plan No specific zone rules identified	N/A

Acceptability Statement: Greenhouse Gas Emissions

As per Section 2.6.1 decision type B, GHG emissions are acceptable if "ALARP" is demonstrated using good industry practice and risk-based analysis, if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained. In addition, acceptability is assessed against the above criteria. Further opportunities to reduce the impacts have been investigated (refer ALARP demonstration discussion).

Indirect GHG emissions associated with the Pluto facility are managed to an acceptable level by meeting (where they exist) legislative requirements, industry codes and standards, applicable company requirements, and industry guidelines, and these have been adopted as key controls.

The adopted controls are considered good oil-field practice/industry best practice and are consistent with Woodside's internal requirements. The potential impacts are considered acceptable if ALARP is demonstrated. As described above, the predicted GHG emissions associated with the Pluto Facility are considered negligible, and will not materially or substantially contribute to Australia's net GHG emissions or net Global GHG emissions levels.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 10 Pluto facility GHG emissions shall achieve GHG reductions under reformed Safeguard	C 10.1 Contract vessels complying with Marine Order 97 (Marine Pollution Prevention – Air Pollution).	PS 10.1 Support vessels contracted whose practices comply with Marine Order 97 as applicable to vessel size, type and class.	MC 10.1.1 Marine verification records.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
Mechanism (inclusive of legislated net zero emissions by 2050). No impact to air quality from atmospheric emissions during the Petroleum Activities Program greater than a consequence level of No lasting effect[74].	C 10.2 NGERS and NPI reporting – estimation of GHG emissions, energy and criteria pollutants.	PS 10.2 Pluto activity emissions reported annually in accordance with NGERS and NPI.	MC 10.2.1 NGERs and NPI reporting records.
	C 10.3 Apply for and manage net direct and indirect Pluto GHG emissions to within the relevant baseline under the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015	PS 10.3 Manage net direct and indirect Pluto GHG emissions from the Pluto offshore facility to within the accepted baseline, under the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015	MC 10.3.1 Records demonstrate implementation
	C 10.9 Forecast, measure, monitor and or estimate facility fuel and flare emissions (in accordance with NGERS and WMS procedures named in Section 7.2.16) to inform optimisation management practices and minimise environmental impact of emissions.	PS 10.9.1 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P31 – Environmental Emissions Monitoring and Controls, to: provide means of detection of environmental releases, emissions and discharges to prevent MEEs from manifesting over time, and/or as required to assure compliance monitoring and reporting equipment.	MC 1.17.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure.
		PS 10.9.2 Fuel and flare targets tracked, as required by WMS procedures named in Section 7.2.16.	MC 10.9.1 Records demonstrate performance against annual fuel and flare targets.
		PS 10.9.3 Implement Production Optimisation and Opportunity Management Procedure for the Pluto facility	MC 10.9.2 Records demonstrate annual process is applied.
	C 10.10 Contracting strategy and evaluation for hire of support vessels includes consideration of vessel emissions parameters and low carbon / alternative fuels	PS 10.10 Evaluation of tenders for support vessels considers emissions parameters	MC 10.10.1 Records demonstrate that emissions were considered in tender evaluations

[74] *Defined as 'no lasting effect (<1 Month); localised impact not significant to environmental receptors' as in Table 2-3, Section 2.6.3.*

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	C 10.13 Maintaining flare tip integrity and ignition system to support efficiency of combustion and minimise venting, incomplete combustion waste products and smoke emissions (equipment within scope of P31)	PS 10.9.1. Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P31 – Environmental Emissions Monitoring and Controls, to: provide means of detection of environmental releases, emissions and discharges to prevent MEEs from manifesting over time, and/or as required to assure compliance monitoring and reporting equipment.	MC 1.17.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure.
EPO 11a Woodside to support customers and suppliers to reduce their GHG emissions by Woodside complying with relevant Corporate Woodside policies, including those designed to monitor market developments related to hydrocarbons in the energy transition.	C 11.1 Woodside supporting customers and suppliers to reduce their GHG emissions by: Promote global measurement and reporting by participating in industry collaboration initiatives to mature, harmonise and advocate for transparent measurement and reporting Advocacy for policy frameworks that enable a stable approach to carbon emissions management.. Working with the natural gas value chain to reduce methane emissions in third party systems (e.g. regasification and distribution), such as through the adoption of the Methane Guiding Principles. Promoting the role of LNG in displacing higher carbon intensity fuels. Supporting the development of new technologies to reduce higher carbon intensive energy sources. Monitoring the global energy outlook including the demand for lower	PS 11.1 Support customers and suppliers to reduce their GHG emissions, is implemented.	MC 11.1.1 Progress will be reported in Woodside's annual disclosures, to industry standard, for example ISSB or equivalent

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	carbon intensive energy such as LNG and displacing higher carbon intensive fuels.		

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 11b No impact to air quality from atmospheric emissions during Tie-back activities under the Petroleum Activities Program greater than a consequence level of No lasting effect.[75]	C 11.1 Vessel operations comply with Marine Order 97 (Marine Pollution Prevention – Air Pollution).	PS 11.1 Contracted support vessels comply with Marine Order 97, as applicable to vessel size, type and class.	MC 11.1.1 Marine verification records.
	C 11.2 Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011: accepted WOMP, which describes the well design and barriers to be used to prevent a loss of well integrity, specifically: all permeable zones penetrated by the well bore, containing hydrocarbons or over-pressured water, shall be isolated from the surface environment by a minimum of two barriers (primary and secondary) (a single fluid barrier may be implemented during the initial stages of well construction if appropriateness is confirmed by a shallow hazard study) discrete hydrocarbon zones shall be isolated from each other (to prevent cross flow) by a minimum of one barrier where deemed required all normally pressured permeable water-bearing	PS 11.2 Well drilled in compliance with the accepted WOMP, including implementation of barriers to prevent a loss of well integrity.	MC 11.2.1 Acceptance letter from NOPSEMA demonstrates the WOMP and application to drill were accepted by NOPSEMA prior to the drilling activity commencing. MC 11.2.2 Records demonstrate minimum of two verified barriers (a single fluid barrier may be implemented during the initial stages of well construction if appropriateness is confirmed by a shallow hazard study) were in place for all permeable zones penetrated by the wellbore. MC 11.2.3 Records demonstrate composition and weight of drilling fluids were applicable to down hole conditions.

[75] *Defined as 'no lasting effect (<1 Month); localised impact not significant to environmental receptors' as in Table 2-3, Section 2.6.3*

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	formations shall be isolated from the surface by a minimum of one barrier. The barriers shall: be effective over the lifetime of well construction (fluid barriers) remain monitored and provide sufficient pressure to counter pore pressure during well construction (cementing barriers, including conductor, casing and liners) conform to the relevant minimum standards set out in the Woodside Engineering Standard – Well Cementation. Verification: Effectiveness of primary and secondary barriers shall be verified (physical evidence of the correct placement and performance) during the drilling of the well.		
	C 11.3 As-built checks shall be completed during well operations to establish a minimum acceptable standard of well integrity is achieved.	PS 11.3 Achieve a minimum acceptable standard of well integrity.	MC 11.3.1 Records show Well Acceptance criteria developed for well.
	C 11.4 Subsea BOP installed and tested during drilling operations. The BOP shall include: • one annular preventer • two pipe rams (excluding the test rams) • a minimum of two sets of shear rams, one of which must be capable of sealing • deadman functionality • the capability of ROV intervention • independent power systems.	PS 11.4 Subsea BOP specification, installation and testing compliant with internal Woodside Standards and international requirements (API Standard 53 5th Edition) as agreed by Woodside and MODU contractor.	MC 11.4.1 Records demonstrate that BOP and BOP control system specifications and testing were in accordance with minimum standards for the expected drilling conditions as agreed by Woodside and MODU contractor.
	C 11.5	PS 11.5	MC 11.5.1

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	Process conducted to calculate, update and monitor kick tolerance for use in well design and while drilling, including: The BOP shall be closed upon detecting a positive well influx. The shut in procedure shall be according the rig contractor procedures or as the well conditions dictate. Kick tolerance calculations will be made for drilling all hole sections based on the weakest known point in the well. Kick detection techniques will be adjusted based on the level of kick tolerance through a management of change (MOC). The manual also includes requirements for kick tolerance management in the event of down-hole losses.	Kick tolerance is calculated, managed, monitored and updated while drilling.	Records demonstrates well kick tolerance is calculated, managed, monitored and updated while drilling.
	C 11.6 Well control bridging document (WCBD) for alignment of Woodside and the MODU Contractor in order to manage the equipment and procedures for preventing and handling a well kick.	PS 11.6 Well is drilled in accordance with the contractor WCBD to reduce the likelihood of emissions to air from a well kick during drilling operations.	MC 11.6.1 Records demonstrate well drilled in accordance with WCBD.
	C 11.8 Well unloading acceptance criteria that define the well objectives will be established.	PS 11.8 Flaring restricted to a duration necessary to achieve the well objectives.	MS 11.8.1 Records demonstrate flaring was restricted to a duration necessary to achieve the well objectives.
	C 11.9 Assess opportunity to eliminate well flowback flaring to MODU.	PS 11.9.1 Study assessing unloading to MODU vs. Pluto undertaken.	MC 11.9.1 Records demonstrate study on unloading to MODU vs Pluto undertaken.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	The assessment will consider factors such as: HSE considerations Well performance Proof of completions success Solids and liquids handling Potential eventual other impacts to the topsides	PS 11.9.2 No well unloading to the MODU, where considered technically feasible and ALARP.	MC 11.9.2 Records demonstrate no well unloading to the MODU, where considered feasible and ALARP.

6.7.11 Routine Atmospheric Emissions: Indirect Emissions from Gas Processing Onshore

Context		
Pluto Facility Operations Overview - Section 3.1.1 Location - Section 3.2 Process and Production Description – Section 3.5.4	Cultural Features and Heritage Values – Section 4.9	Consultation – Section 5

Impact/Risk Evaluation Summary

Source of Impact/Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (inc. odour)	Ecosystems/Habitat	Species	Socio-economic	Decision Type	Impact/Consequence	Likelihood	Current Risk Rating	ALARP Tools	Acceptability	Outcome
Consideration of potential indirect impact from atmospheric emissions associated with onshore processing of Pluto gas.				✓			✓	B	Air Quality – Negligible, no lasting effect. Heritage – No attributable impact	-	-	L C S G P PJ	Broadly Acceptable	**EPO 13,14**

Routine Atmospheric Emissions – Indirect emissions from gas processing onshore

Description of Source of Impact/Risk

Background

The processing of gas from Pluto at onshore processing facilities will result in the release of atmospheric emissions. These emissions, and their potential indirect effects, have been raised by stakeholders as a concern and as such are evaluated within the Pluto Facility Operations EP.

This section provides contextual evaluation of consideration for potential indirect impacts, particularly the potential for air emissions associated with the PAA to cause a reduction in ambient air quality impacting human health and the potential to contribute to accelerated weathering of rock art on the Burrup Peninsula and within the Dampier Archipelago (i.e. Murujuga). These potential indirect impacts cannot be considered in isolation as they are the result of cumulative airshed conditions generated from various sources.

No other indirect impacts or risks from the release of atmospheric emissions are considered within this Environment Plan.

Murujuga Rock Art Strategy

The WA State Government (DWER) have established a Murujuga Rock Art Strategy (MRAS) in partnership with MAC as the Traditional Owners and custodians of Murujuga.

DWER has primary responsibility for the day-to-day implementation of the strategy in partnership with MAC. This includes working with MAC to oversee the development and implementation of a world's best practice monitoring and

analysis program that will determine whether the rock art on Murujuga is subject to accelerated change (for further information see Murujuga Rock Art | Western Australian Government (www.wa.gov.au)).

The results from studies underway will guide management and protection of Murujuga rock art, with State environmental protection and heritage legislation in place as the applicable regulatory framework.

The MRAS states that:

"The data currently available from previous monitoring projects does not allow for a conclusive answer on whether anthropogenic emissions are impacting Murujuga's rock art. The Murujuga Rock Art Strategy is therefore essential to fill these gaps in knowledge.

Although it is not known whether the rock art is being impacted currently, there are feasible impact pathways by which emissions from industrial activities and other local sources could cause accelerated weathering of the rock art. The strategy is examining these potential pathways and the condition of the rock art to understand whether change is occurring, and whether there is a need to set a future limit on emissions to ensure accelerated weathering does not occur."

As a causal link between industrial air emissions and anthropogenic-induced change to rock art on Murujuga has not been established, nor sources and potential pathways defined, it is not yet practicable to attribute impact and risk level posed by the Pluto Offshore Operations PAA. The scientific uncertainty that persists is addressed by an adaptive and precautionary management framework in place by way of the MRAS and the associated Murujuga Rock Art Monitoring Program (MRAMP) / together with the State *Environmental Protection Act 1986* (WA) and associated regulatory framework, approvals and licences.

Onshore processing emission context

Gas from Pluto is transported to shore through the trunkline to be processed at the Pluto LNG Facility. A portion of annual gas supply from Pluto offshore may also be processed at the Karratha Gas Plant (KGP) via the interconnector pipeline. Products from Pluto gas are then sold as LNG and delivered to customers via ship or road, or distributed to customers via pipeline for domestic consumption for purposes such as heating, electricity generation or industrial processes such as the production of LNG, ammonia, urea or hydrogen.

This section relates to atmospheric emissions that are associated with the processing of gas exported from Pluto to onshore facilities. While the operation of these onshore processing facilities are outside the scope of this Environment Plan, the atmospheric emissions associated with processing Pluto gas at these facilities is addressed in this section. The processing facilities addressed in this section are considered as the primary recipients of Pluto gas, being the Pluto LNG facility, and a smaller portion of gas supplied to KGP.

Source of Atmospheric Emissions from Onshore Processing

The principal atmospheric emissions from onshore processing in terms of potential for air quality impacts arise from the combustion of gas in fuel turbine generators and compressors as well as gas conditioning process vents at onshore facilities. Gas processing and liquefaction can also result in flaring of some gas and incidental venting of un-combusted gas. The most significant by-products of gas combustion, flaring and venting of gas from Pluto will include oxides of nitrogen (NOx), carbon monoxide (CO), methane and non-methane volatile organic compounds (VOCs) including BTEX (benzene, toluene, ethylbenzene and xylenes).

Ozone is not typically emitted directly from gas consumption or processing but is formed through anthropogenic sources via chemical reactions between oxides of nitrogen and other emissions such as VOCs and CO in the presence of ultraviolet light. Ventilation readily disperses CO emissions relative to criteria. There may also be traces of particulate matter (PM) and sulphur dioxide (SO_2) but such emissions are generally considered negligible from the onshore processing of Pluto gas, due to the fact it has a very low sulphur content and absence of products that are precursors to the formation of particulate pollution. Emissions of PM from the consumption of gas from Pluto is negligible in comparison to background and other industrial sources.

Sources of Emissions within the Murujuga Airshed

Potential indirect impacts from processing of gas from Pluto could arise via a contribution to the cumulative effect of all emissions in the airshed. The Murujuga airshed encompasses the entire Burrup Peninsula and includes the population centres of Dampier and Karratha and surrounding areas. Industrial facilities that currently release or have approval to emit into the Murujuga airshed include[76] :

[76] https://www.epa.wa.gov.au/sites/default/files/EPA_Report/EPA%20Report%201727%20-%20North%20West%20Shelf%20Extension%20Project%20-%20assessment%20report.pdf

- Woodside Operated North West Shelf Venture's Karratha Gas Plant (KGP)
- Woodside Operated Pluto LNG Facility
- Yara Pilbara Fertilisers Pty Ltd Ammonia Plant
- Yara Pilbara Nitrates Pty Ltd Technical Ammonium Nitrate Production Facility (TANPF)
- Perdaman Urea Project
- Pilbara Iron Yurralyi Maya Power Station
- Santos Devil Creek Power Station
- ATCO Karratha Power Station
- EDL West Kimberley Power Plant (Maitland LNG Plant).

Atmospheric Emissions into the Murujuga Airshed from Onshore Processing of Gas from Pluto

Emissions associated with onshore processing of gas from Pluto are emitted and combined with similar emissions from natural sources and other industrial activities in proximity of the Murujuga region. Assessment of potential impacts considers cumulative impacts within the airshed rather than estimating emissions influence associated with processing gas from Pluto in isolation. Further, estimating ground level concentrations of atmospheric constituents as related to human health and deposition relies on complex non-linear photochemical modelling, underpinned by biochemical and physical forcing systems such as regional meteorological forcing model.

Therefore, risk assessment is based on a cumulative airshed modelling inclusive of contribution from onshore processing of Pluto gas, and other material sources.

In 2021, DWER commissioned Ramboll Australia Pty Ltd to undertake a *Study of the Cumulative Impacts of Air Emissions in the Murujuga Airshed*[77]. The resulting report, (Ramboll 2022) considered a "complete emission inventory" including air emissions from existing and proposed future industries, shipping, and aggregated sources in the Pilbara region. The air dispersion modelling was used to obtain predicted maximum ground level concentrations (GLCs) for a range of air pollutants of concern, including NO_x, Ozone, SO_x, CO, VOCs, particulates and others.

Emission estimates in the Ramboll 2022 study were based on a range of data sources, including publicly available datasets, engineering design estimates (maximum and averages) and facility level monitoring data. The scenarios investigated as part of this study included a baseline (2014) scenario that included all industrial, mobile, domestic and commercial as well as natural sources, a scenario that included point and area sources for heavy industry including railways and shipping in the region, and a proposed future scenario indicative of all 2030 emissions. Both the baseline and 2030 scenarios included operation of onshore processing facilities at capacity which covers the portion associated with ongoing processing of Pluto gas.

Woodside provided inputs to the Ramboll 2022 study aligned with DWER's original data request and the scenario descriptions and assumptions described in the North West Shelf Project Extension Environmental Review Document Appendix E Air Quality Impact Assessment[78], Section 4, Scenarios 3 and 4 with existing, approved and referred facilities operating - which included (amongst others):

- Airshed baseline;
- NWS Extension Project with NO_x improvement opportunities;
- Pluto LNG as operating, and future expansion of Pluto (Train 2, and T1 backfill) fed by Scarborough gas;
- Perdaman Urea project; and
- Indicative Methanol Plant in the region.

Ramboll (2022) indicated that NO_x loads to the airshed from industrial sources are estimated to be 13,937 tonnes per year and are forecast to reduce to 12,052 tonnes per year by 2030, when calculated over a 1.33 km grid. A significant contribution to this cumulative airshed reduction is associated with commitments by the NWSJV to reduce NO_x emissions from the Karratha Gas Plant by 40% by 2030. Ramboll (2022) did not predict NO_x air concentrations in excess of current air quality standards in any modelled scenario.

The assumptions for Murujuga airshed NO_x emissions underpinning the Ramboll (2022) study are suitably conservative for reviewing KGP and Plutos' contribution for the onshore processing of Pluto gas using information provided by the respective facilities and are aligned with latest information.

Based on the estimated total regional airshed emissions used in Ramboll (2022) and NO_x contribution to the airshed outlined within the Pluto Air Quality Management Plan (approved in accordance with Ministerial Statement 757), it is estimated that NO_x emissions associated with the processing of Pluto gas via the Pluto LNG facility, and an

[77] Study of the Cumulative Impacts of Air Emissions in the Murujuga Airshed: https://www.wa.gov.au/system/files/2023-03/Study-of-the-cumulative-impacts-of-air-emissions-in-the-Murujuga-airshed.pdf

[78] NWS Extension Environment Review Document Appendices: https://www.woodside.com/docs/default-source/current-consultation-activities/australian-activties/north-west-shelf-project-extension---appendices.pdf

approximate 1/5th proportion supply of Train 4 or Train 5 capacity at KGP accounts for approximately 13% currently, declining to less than 6% of the total estimated 2030 NO_x load in the Murujuga region

Where Pluto gas is processed at KGP, it proportionally displaces other sources of gas processed at this facility (as assumed in the Ramboll (2022) model, which did not need to account for the source of gas); Pluto gas therefore does not result in a net increase in KGP or total airshed NO_x, relative to those presented in the Ramboll 2030 projections.

Continued processing of gas from Pluto is therefore not anticipated to cause an increase of NO_x within the Murujuga airshed beyond historic maximum levels; which, as described in section 4.9.5 has resulted in no conclusive evidence for anthropogenic change to rock art on Murujuga. The reduction in future NO_x load within the Murujuga airshed presented in Ramboll 2022 is reflective of commitments made by third party proponents that are publicly disclosed either in Ministerial Statements or Air Quality Management Plans.

Existing Regulatory Framework

Facilities associated with the onshore processing of LNG are not subject to the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth). Assessment and management of these emissions is required pursuant to various State and Commonwealth legislative frameworks. Impacts associated with atmospheric emissions are subject to an appropriate level of independent assessment by regulatory agencies and management measures are in place which are sufficient to ensure the environment performance outcome of this PAP can be achieved.

A summary of the relevant legislation, approvals and governance measures in place to manage atmospheric emissions from onshore processing facilities such as Pluto LNG facility, KGP and Perdaman Urea facility are outlined below.

Environmental Protection (EP) Act 1986 (WA)

The EP Act is the principal legislation in WA that provides for "the prevention, control and abatement of pollution and environmental harm" and for "the conservation, preservation, protection, enhancement and management of the environment".

The object of the EP Act is to protect the environment of Western Australia, having regard to a number of principles, including:

- the precautionary principle, which holds that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions are to be guided by:
- careful evaluation to avoid, where practicable, serious or irreversible damage to the environment
- an assessment of the risk-weighted consequences of various options
- the principle of intergenerational equity, which holds that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- the principle of waste minimisation, which holds that all reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment
- principles relating to improved valuation, pricing and incentive mechanisms, which include the 'polluter pays principle' whereby those who generate pollution and waste should bear the costs of containment, avoidance or abatement.

Assessment of Proposals under Pt IV of the EP Act

In Western Australia, it is the role of the independent Environment Protection Authority (EPA) to assess proposals against the requirements of the EP Act and EPA objectives.

Section 15 of the Act establishes the objectives of the EPA (Authority): It is the objective of the Authority to use its best endeavours to protect the environment; and to prevent, control and abate pollution and environmental harm. The object and principles guide the overall application of the powers of the Act. The principles are matters to which the EPA is required to have regard as a condition of the valid exercise of its powers to assess and report on proposals and schemes under the Act. The EPA only recommends that the Minister approve a proposal if it can be demonstrated the proposal is aligned with the Act including any relevant objectives.

Under the EPA's Air Quality Environmental Factor Guideline, the EPA has an objective to*o maintain air quality and minimise emissions so that environmental values are protected*[79] (Air Quality Objective). The Air Quality Environmental Factor Guideline identifies that this objective recognises the fundamental link between good air quality and the environmental values it supports. It also recognises the principle of waste minimisation as set out in the EP Act. In the context of this factor and objective, the EPA recognises that maintaining good air quality and minimising emissions protects human health and amenity, as well as the broader environment. When considering the significance

[79] EFG - Air Quality - 03.04.2020.pdf (epa.wa.gov.au)

of potential impacts to air quality, the EPA may have regard to the various matters outlined in Section 5 of the Statement of Environmental Principles, Factors and Objectives[80], including the Air Quality Objective.

Environment Protection and Biodiversity Conservation Act 1999 (Cth)

The EPBC Act is the Australian Government's key environmental legislation providing for the protection of the environment and the conservation of biodiversity. The EPBC Act requires approval for activities with a significant impact on a number of matters of national environmental significance including for example, National Heritage places and listed threatened species or endangered communities.

The NWS Project Extension (a proposal to extend operation of the NWS Project beyond 2030) has been assessed under the EPBC Act by the WA EPA under an accredited process and recommended for approval (Refer EPA Report 1727). The controlling provision for the proposed action is 'National heritage places', and the Project is subject to assessment by accredited assessment under Part IV of the EP Act at the level of Public Environment Review. The Commonwealth Minister for the Environment will make an approval decision once the State process has completed.

Aboriginal Heritage

Aboriginal sites are of cultural heritage importance to both the Aboriginal and wider community. The Aboriginal Heritage Act 1972 (AH Act) is the principal legislation providing for the preservation of Aboriginal sites and objects in WA. All Aboriginal heritage sites or places to which s.5 of the AH Act applies are protected, whether or not they are registered with the Department of Planning, Lands and Heritage (DPLH). It is an offence under the AH Act to excavate, destroy, damage, conceal or in any way alter any Aboriginal site unless the consent of the Registrar or the Minister for Aboriginal Affairs is first obtained.

Approvals under Pt V of the EP Act

DWER regulates certain premises through a works approval and licensing process to prevent, control, abate and mitigate pollution and environmental harm, under Part V of the EP Act.

Woodside currently holds the following licences for facilities operated on the Burrup Peninsula:

- Pluto Liquefied Natural Gas (LNG) Project (L8752/2013/2)[81]
- Woodside Onshore Gas Treatment Plant (L5491/1984/18)[82]

The abovementioned licences specify air emission limits for individual emission points, Woodside is required under these licences to submit an Annual Audit Compliance Report identifying compliance with the conditions of the licences. Copies of the Annual Audit Compliance Reports are available on the DWER's website.

Other Regulatory Measures in Place for Management of Atmospheric Emissions

National Environmental Protection (Ambient Air Quality) Measure (Cth)

The National Environment Protection Council (NEPC), comprising Commonwealth, State, and Territory Ministers, finalised the NEPM (Ambient Air Quality), on 26 June 1998. The National Environment Protection Council Act 1994 (Cth) allows the National Environment Protection Council to make National Environment Protection Measures (NEPMs). NEPMs are a special set of national objectives designed to assist in protecting or managing particular aspects of the environment. The NEPM [Ambient Air Quality] outlines ambient air quality monitoring protocol that allows for the adequate protection of human health and well-being.

National Environment Protection (National Pollutant Inventory) Measure 1998 (Cth)

The National Pollutant Inventory (NPI) is a public database that provides information on 93 selected air pollutants and their emissions, produced as a result of industry, transport, commercial premise, and household activities, and emitted to air, land, and water in Australia. The NPI is a Commonwealth Government initiative and each state and territory is responsible for implementing the program. The objective of the NPI is to inform the community about emissions to water, air, and land and acceptable emissions levels. It also provides information for policy and decision making, environmental planning and management, and minimising waste.

The Woodside operated facilities on the Burrup Peninsula have been reporting emission data to the NPI from the NWS Project since the 1998/1999 reporting period and Pluto since the commencement of operations in 2012. Other facilities located on the Burrup Peninsula including Yara Pilbara Fertilisers Pty Ltd have reported since 2005.'

Other Relevant Frameworks and Programs

Program: Murujuga Rock Art (Western Australian Government)

The Western Australian Government publish on their aboriginal heritage conservation website a summary of their Murujuga Rock Art Program, the partnership with Murujuga Aboriginal Corporation, and the Murujuga Rock Art Strategy. The description of the program is provided in the box below, courtesy of Govt of Western Australia Website: https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-heritage-conservation/program-murujuga-rock-art

[80] Statement of environmental principles, factors, objectives and aims of EIA (epa.wa.gov.au)
[81] https://www.der.wa.gov.au/component/k2/item/download/4517_d69d5c4f5e6e32e9687a81cd206801d1
[82] https://www.der.wa.gov.au/component/k2/item/download/6862_f7458bf91f1480d35d8f604ed3b129e0

Program Murujuga Rock Art

Background:

Murujuga (which means 'hip bone sticking out' in the Ngarluma-Yaburara language) comprises the Burrup Peninsula and the Dampier Archipelago 1,300 km north of Perth, Western Australia. The Government of Western Australia (State Government) recognises Murujuga as a unique ecological and archaeological area containing one of the largest collections of Aboriginal engraved rock art in the world.

Murujuga is also home to industry that contributes to the local, state and national economy and employment. Concerns the rock art could be damaged by industrial air emissions have led to several independent scientific studies and rock art monitoring initiatives since the mid 2000s.

Murujuga Rock Art Strategy:

The purpose of the Murujuga Rock Art Strategy (MRAS) is to protect the Aboriginal rock art by providing a long-term framework that builds on previous work to deliver an improved approach to monitoring, analysis and management.
The Murujuga Rock Art Strategy will be reviewed at least every five years. This will ensure it remains current, supports appropriate governance arrangements, and that the best scientific knowledge and management practices are used to protect the rock art.

Scope:

The department has primary responsibility for the day-to-day implementation of the strategy in partnership with MAC. This includes working with MAC to oversee the development and implementation of a world's best practice monitoring and analysis program that will determine whether the rock art on Murujuga is subject to accelerated change.
The scope of this strategy is to:

1. *establish an environmental quality management framework, including the derivation and implementation of environmental quality criteria*
2. *develop and implement a robust program of monitoring and analysis to determine whether change is occurring to the rock art on Murujuga*
3. *identify and commission scientific studies to support the implementation of the monitoring and analysis program and management*
4. *establish governance arrangements to ensure that:*
    - *monitoring, analysis and reporting are undertaken in such a way as to provide confidence to Traditional Owners, the community, industry scientists and other stakeholders about the integrity, robustness, repeatability and reliability of the monitoring data and results*
    - *government is provided with accurate and appropriate recommendations regarding the protection of the rock art, consistent with legislative responsibilities*
5. *develop and implement a communication strategy in consultation with stakeholders.*

The consultation summary report summarises the comments received on the draft strategy. The consultation ran from September 2017 to May 2018. There were 27 written submissions received.

[continues over…]

[…continued]

Monitoring Program [Murujuga Rock Art Monitoring Program – MRAMP]:

A best practice monitoring and analysis program commenced in 2020. It will provide reliable information on changes and trends in the condition of the rock art and whether the rock art is showing signs of accelerated change.
The program includes:

- *installation of air quality monitoring stations across Murujuga*
- *regular field measurements of selected rock art panels using a variety of methods*
- *detailed laboratory investigation of rock samples, including the microorganisms living on the rock surface.*

The results from these studies will guide management and protection of the rock art. Reports produced as part of the monitoring program are regularly published in the Murujuga Rock Art Strategy document collection.

The monitoring program is overseen by the department and MAC, in consultation with national and international subject matter experts, a panel of independent peer reviewers and stakeholders.
MAC has developed the Murujuga Research Protocols as a set of governing principles and guidelines to ensure research is conducted in a respectful and culturally appropriate manner.

The monitoring program is being implemented by Calibre Group and experts from Curtin University until early 2026. Curtin University has also developed a training program for MAC Rangers to build their skills and knowledge in monitoring and analysis techniques. Once Rangers are qualified, MAC will be well placed to implement the monitoring from 2026 onwards.

Conceptual models of the rock art system were published in 2021 to share the current understanding of the system and interactions that are likely to be occurring. These models inform the development of the monitoring studies plans and the development of an environmental quality management framework.
The monitoring studies data collection and analysis plan, published in April 2022, is crucial to the design of the Murujuga Rock Art Monitoring Program, and the scope and quality of the science to monitor, evaluate and report on changes and trends in the integrity of the rock art on Murujuga.

The first Monitoring Studies Technical Report was published in December 2023, following an independent peer review process. View the Summary Monitoring Studies Report. View all reports from the Murujuga Rock Art Monitoring Program.

Key milestones and status:

Year	***Program key milestone and status***
2020-2021	• *Review of weathering/alteration/degradation processes that have the potential to cause change in the rock art* ***(completed)*** • *Delivery of a stakeholder workshop* ***(completed)*** • *Development of conceptual models and monitoring studies plan* ***(completed)*** • *Determination of optimal monitoring sites* ***(completed)*** • *Peer review of conceptual model and monitoring studies plan* ***(completed)***
2022	• *MAC and the department's approval of the monitoring studies plan* ***(completed)*** • *State Government commitment to funding dedicated MAC Ranger positions and to support training and capacity building for MAC* ***(announced May 2022)*** • *Completion of fieldwork and laboratory monitoring studies* ***(2022 studies completed)*** • *Commencement of Ranger training needs analysis, Ranger training and capacity building* ***(completed)***

[continues over…]

[…continued]

Key milestones and status:

Year	***Program key milestone and status***
[…]	
2023	• *Continuation of fieldwork and laboratory monitoring studies **(2023 fieldwork completed)*** • *Procurement and installation of air quality monitoring stations **(completed)*** • *Continuation of Ranger training and capacity building **(completed)*** • *Development of report on monitoring studies March 2022−March 2023 (peer reviewed) **(completed)*** • *Delivery of a stakeholder workshop **(completed)***
2024	• *Continue fieldwork and laboratory monitoring studies* • *Report on monitoring studies April 2023–April 2024 (peer reviewed)* • *Design ongoing monitoring program* • *Develop interim Environmental Quality Criteria (EQC) based on field and laboratory (chamber) studies* • *Implement the ongoing monitoring program* • *Commence reporting against interim EQC* • *Continue Ranger training and capacity building (Curtin University micro credentials)* • *Develop Environmental Monitoring Programme Regulations under the Environmental Protection Act 1986* • *Independent review of the Murujuga Rock Art Strategy*
2025	• *Report on monitoring studies April 2024–April 2025 (peer reviewed)* • *Design final monitoring program* • *Develop final EQC* • *Report on monitoring program 2024–2025* • *Commence progressive handover monitoring and reporting program to Murujuga Aboriginal Corporation (with support from the department)* • *Independent review of the monitoring program*
2026 (and beyond)	• *Ongoing monitoring program managed by the Murujuga Aboriginal Corporation and the Department of Water and Environmental Regulation* • *Ongoing monitoring and reporting against final EQC*

Stakeholder Reference Group:

The Murujuga Rock Art Stakeholder Reference Group is an advisory group that was established by the previous Minister for Environment, Hon. Stephen Dawson MLC, in September 2018. The group facilitates engagement between the Murujuga Aboriginal Corporation (MAC) and key government, industry and community representatives on the development and implementation of the strategy.
Professor Stephen van Leeuwen is the independent chair of the stakeholder reference group, which meets on a quarterly basis. Visit the document collection to read summaries of meetings and community forums.
The Terms of Reference are reviewed regularly in consultation with MAC and the Independent Chair to ensure the group remains effective in achieving its purpose.

[end]

Murujuga Rock Art Monitoring Program

In recognising the high level of stakeholder concern and scientific uncertainty regarding the links between anthropogenic emissions and risks to rock art (see Appendix F), in 2019 the Department of Water and Environmental Regulation (DWER) produced the Murujuga Rock Art Strategy[83] (MRAS), which builds on the research to date, and according to DWER will establish a world's best practice program to monitor, evaluate and report on factors that could affect the condition of Murujuga rock art. This is being undertaken in consultation with the Murujuga Aboriginal Corporation, a team of national and international experts in relevant disciplines and is funded by industry, including Woodside. The MRAS describes a risk-based approach for the management of impacts to the rock art that is consistent with the State Government's responsibilities under the EP Act.

A program being executed as part of the MRAS is the Murujuga Rock Art Monitoring Program (MRAMP) which will monitor, evaluate, and report on changes and trends in the integrity of the rock art, specifically to determine whether anthropogenic emissions are accelerating the natural weathering, alteration, or degradation of the rock art. This will enable timely and appropriate management responses by the Western Australian Government, industry and other stakeholders to emerging issues and risks. The following extract from the WA Government website MRAS website outlines this. (Govt of Western Australia (December 2023) https://www.wa.gov.au/service/aboriginal-affairs/aboriginal-heritage-conservation/program-murujuga-rock-art#frequently-asked-questions):

How will the Murujuga Rock Art Strategy provide protection for the rock art?

The initial studies will allow the scientific team to determine the levels of various air emissions that may cause accelerated weathering of the rock art. These levels will not necessarily be identified during the field studies on Murujuga Country, in which case they will be informed by laboratory tests.

The research will inform an environmental quality management framework. Specifically, the levels of air emissions at which accelerated weathering is deemed to occur will be used to inform environmental quality criteria. The ongoing monitoring program, administered by MAC and the department, will gather data and ensure that emissions do not exceed the criteria. Industry will also be regulated to ensure their emissions will not cause the criteria to be exceeded.

There are two types of environmental quality criteria under the framework: environmental quality standards and environmental quality guidelines. Guidelines provide early warning of potential environmental effects, while standards indicate where the level of risk is no longer acceptable, triggering a management response to prevent environmental harm. In the case of the rock art, an exceedance of the standard means there is a high risk of permanent loss or damage to the rock art.

While environmental quality criteria have been used successfully in other contexts, it is important to remember that there are no environmental quality standards or guidelines values currently available anywhere in the world that can be applied to engraved rock art.

[… and…]

What is the connection with World Heritage listing?

The World Heritage nomination for Murujuga includes a comprehensive and effective management framework that outlines how the potential 'Outstanding Universal Value' of the area will be protected, conserved and monitored. As part of this framework, the State Government and MAC will demonstrate how they are working closely together to protect the rock art through the Murujuga Rock Art Strategy and the Murujuga Rock Art Monitoring Program.

The DBCA website has more information on the World Heritage nomination

In recent EPA assessment reports for industrial facilities on the Burrup Peninsula, the EPA has recommended a condition mandating relevant facilities to comply with air quality standards such as those derived from the MRAMP.

In the EPA's North West Shelf Project Extension Assessment Report 1727 (EPA Report 1727), the EPA recommends the 'Air Quality Outcome' for recommended condition 3 be 'to ensure that no air emissions from the proposal have an adverse impact accelerating the weathering of rock art within Murujuga beyond natural rates.'

[83] https://www.wa.gov.au/system/files/2020-07/DWER-Murujuga-rock-art-strategy.pdf

Recommended condition 3-3 states that if the Minister notifies the proponent in writing of one or more air quality standards to be met (including standards derived from the results of the Murujuga Rock Art Monitoring Program) and the proponent complies with all those standards, and any amendments to the standards the proponent is taken to have achieved the Air Quality Outcome.

EPA Report 1727[84] specifies that the proponent is to achieve compliance with any detailed air quality standards to ensure that there are no adverse impacts accelerating the weathering of rock art within Murujuga beyond natural rates. The EPA expects that this will include environmental quality objectives and environmental quality standards derived from the results of the MRAMP. While the North West Shelf Project Extension Proposal has not yet been approved, the Ministerial Statement for the Perdaman Urea Project (MS 1180) includes the same air quality outcome condition that is proposed in EPA Report 1727.

The Pluto LNG Facility has a Cultural Heritage Management Plan and Air Quality Management Plan (AQMP) (required under Ministerial Statement 757). Statements and commitments made by Woodside within the North West Shelf Air Quality Management Plan and the Pluto LNG Facility Air Quality Management Plan commit to manage potential impacts to Aboriginal rock art on the Burrup Peninsula in accordance with the MRAS and as a member of the Murujuga Rock Art Stakeholder Reference Group. Woodside actively supports the implementation of the Murujuga Rock Art Strategy through membership of the Murujuga Rock Art Reference Group and provides funding associated with the Murujuga Rock Art Monitoring Program. Woodside also supports the coordinated approach for an atmospheric deposition monitoring program to be established under the Strategy, and currently provides data to the program from the Woodside Atmospheric and Ambient Air Quality Monitoring Programs.

Onshore Facility Air Emission Design Mitigations

Under the regulatory Conditions and Part IV Air Quality Management Plans of onshore processing facilities on the Burrup, operators are required to implement a number of controls and risk management practices related to air emissions, including the demonstration of best practice design, and monitoring and abatement programs.

Condition 11-1 of Ministerial Statement 757 required the development of an Assessment of Best Practice for Minimising Emissions to Air from Major Plant (Best Practice Report) for the Pluto LNG Facility and condition 11-2 required the development of the Pluto LNG Facility Air Quality Management Plan to demonstrate that best available practicable and efficient technologies are used to minimise and monitor air emissions from the plant. This demonstration was required to meet the requirements of the Minister for the Environment on advice of the EPA prior to Woodside applying for and obtaining a Works Approval to construct the Pluto LNG facility. In 2019, these reports were updated to include Pluto Train 2 and subject to an independent peer review commissioned by the EPA, before being approved by the Minister for Environment in 2020 on advice of the EPA.

Best practice technologies to minimise air emissions implemented in Pluto LNG design and operation include:

- Dry Low NO_x emissions control systems on gas turbines
- Specification of activated methyldiethanolamine (aMDEA) in the acid gas removal system to reduce co-absorption of benzene, toluene and xylene (BTX) and other hydrocarbons.
- installation of a regenerative thermal oxidiser on the acid gas removal unit
- flare design integrated smokeless flaring technologies implemented for the storage and loading flare system, cold dry flare, warm wet flare and common spare flare.

The NWS Extension Environment Review Document[85] details how the most recent LNG trains (trains 4 and 5) constructed at the existing North West Shelf Project are already equipped with lower NO_x technology for gas turbines than trains 1-3. In addition, EPA Report 1727 includes recommended conditions requiring the minimisation of air emissions from the NWS Project Extension proposal by the adoption of practicable technologies, and, as a minimum, a substantial reduction of both total NO_x and VOC emissions from the proposal baseline by 31 December 2030

Detailed Impact Assessment

Indirect Emissions from Gas Processing Onshore – Assessment of Potential Impacts

Contribution to Accelerated Weathering of Murujuga Rock Art

The Dampier Archipelago, including the Burrup Peninsula and surrounds, traditionally referred to as Murujuga (which means 'Hip Bone Sticking Out' in the Ngarluma-Yaburara language) is located in the Pilbara region of WA. With more than one million images, Murujuga is home to one of the largest, densest and most diverse collections of rock art in the world[86] .

[84] North West Shelf Project Extension Proposal (epa.wa.gov.au)
[85] https://www.epa.wa.gov.au/sites/default/files/PER_documentation2/NWS%20Project%20Extension%20-%20Environmental%20Review%20Document.pdf
[86] https://www.wa.gov.au/system/files/2020-07/DWER-Murujuga-rock-art-strategy.pdf

The presence of industry on the Burrup Peninsula has generated concerns from some stakeholders that these emissions may lead to an accelerated weathering of rocks on which rock art is present which may reduce the visibility or destroy the rock art. Research to date on the impacts of emissions on rock art has not been conclusive, and there are currently no set air quality thresholds for the protection of rock art.

As outlined in **Section 4.9.5**, industrial emissions on the Burrup Peninsula are subject to extensive scientific studies to understand any potential pathway to impact on rock art, including wet and dry deposition which may alter the pH of rocks as well as the supply of nutrients which may promote microbial activity, the metabolic by-products of which may interact with rock surfaces.

The history of research on this subject, set out in more detail in **Section 4.9.5** may be broadly divided into four periods. The earliest period, from 2002 to 2009, aligns with the studies conducted by the Burrup Rock Art Monitoring Management Committee (BRAMMC) but also includes work conducted by others, primarily Bednarik who identified potential impact pathways through acid formation and microbial impacts. During this period MacLeod (2005) also took some comparative pH samples between in-situ rocks and museum samples. None of this parallel work established that industrial emissions were impacting rock art, or the levels of emissions at which impacts may be expected to occur. This period concluded with the 2009 BRAMMC report which stated that "there is no scientific evidence to indicate that there is any measurable impact of emissions on the rate of deterioration of the Aboriginal rock art in the Burrup" (BRAMMC 2009) but recommended the establishment of the Burrup Rock Art Technical Working Group (BRATWG) to conduct ongoing monitoring.

The second period of research aligns with this monitoring from 2010 to 2017. A significant component of this monitoring involved the monitoring of rock art colour. In 2016 Black and Diffey produced an unpublished paper critiquing the statistical methods applied by the CSIRO, which led to a review by Data Analysis Australia (DAA) which also raised "substantial doubts about the reliability of the data". A final report from the CSIRO adapted its statistical methods to respond where possible to the conclusions from DAA but the results were described as "not fully conclusive". Also during this period, the BRATWG also commissioned an extreme condition weathering study which found that the dissolution of chemicals began at lower pH levels than previously estimated, however this work was only preliminary and should not be relied upon in setting thresholds for potential impacts.

The third research period, although overlapping with the conclusion of the BRATWG and initial years of the MRAS and MRAMP, is marked by the absence of any results from a coordinated, well-resourced research program and instead comprises a number of independent studies between 2017 and 2023. As a result, it is difficult to characterise these studies consistently. Some (Black et al 2017a, Dorn 2020; Smith 2022a) critiqued or re-stated conclusions of previous studies. Black et al 2017b repurposes historic pH data and concludes that "theoretical evaluation using electrochemical equilibrium principles" indicates impacts to rock art will result from an decreased pH since pre-industrial times; CGB Solutions 2020's analysis of historic pH and contemporary measurements found that pH was not decreasing and that any correlation between acidity and LNG production sites could not be statistically supported. Both studies suffer from significant issues with the available data.

Other studies (Black et al 2018; Gleeson et al 2018) discuss possible impact pathways but stop short of drawing conclusions on whether impacts to rock art are resulting from industrial emissions. Smith et al (2022b) does hypothesise that industrial emissions may be responsible for some reported impacts but acknowledges that the methodologies applied are subject to considerable errors that prevent a definitive conclusion being drawn. A series of studies by MacLeod (2020, 2021, MacLeod and Fish 2021) report on the results of monitoring conducted for Yara Pilbara Nitrates. The outcomes of these reports are inconsistent. Solo reports by MacLeod (2020, 2021) both state that "There is unequivocal evidence that the changes in colour contrast are affected by the changes in the mean and in the minimum pH observed on the rock art sites at the reference positions" though the results include increased acidity correlating in some places with increased contrast and elsewhere with decreased contrast. MacLeod and Fish (2021) then state that "there is presently no adverse impact on the rock engravings from industrial pollution owing to a lower NO_x level than when the studies commenced 14 years ago". This conclusion is critiqued by Smith et al (2022a).

As noted in the MRAMP conceptual model, "*while many of these studies form useful datasets to include in subsequent analyses, in general these studies have been inconclusive or failed to show any significant impact of anthropogenic impact on the rock art or chemical/biological species composition and abundance (Commonwealth of Australia, 2018). Nor have they produced any definitive relationships to inform a conceptual impact model, which is instead reliant on fundamental scientific studies in other regions to inform the likely processes occurring at Murujuga (e.g. Dorn, 2020*[87]*)."*

In December 2023, the first interim report of MRAMP[88] was published (refer to **Section 4.9.5**), marking the start of a fourth period of research. The report states that results remain inconclusive with regards to whether industrial air emissions are resulting in anthropogenic change to rock art and recommends that further scientific studies are required. The MRAMP report noted that while some spatial trends in electrochemical parameters (such as pH) and rock surface elemental composition have been found, more work is required to determine causal relationships for

[87] https://www.wa.gov.au/system/files/2023-12/murujuga-rock-art-monitoring-program-conceptual-models.pdf
[88] https://www.wa.gov.au/system/files/2023-12/murujuga-rock-art-monitoring-program-monitoring-studies-repo2023.pdf

these trends (as relationships were not as expected). Spatial trends were also identified as appearing for several measured air pollutants such as NO_2 that are generally consistent with earlier air quality modelling by Ramboll (2022).

The MRAMP monitoring report outlined that similar trends exist for the pH measurements taken in March–April 2022 and the measured NO_2 levels generally. This relationship was the reverse of what would be expected to confirm the acid deposition hypothesis in previous literature as MRAMP found pH values in March–April 2022 were highest where NO_2 concentrations are highest; whereas with acid deposition, pH is expected to be lower where NO_2 is higher, as NO_2 is often a precursor to the formation of nitric acid, which has a low pH. Neutral pH is around 7, with low pH indicating potentially acidic conditions. The results in the MRAMP monitoring report have been reinterpreted by Smith (2024) in addition to original research but fails to address this unexpected correlation. Smith (2024) claims that "the damaging impact of acidic emissions on the rock surfaces is not in doubt" but does not provide adequate detail on the original research to allow its reliability to be considered, nor does it provide reason to question the conclusions of the MRAMP report, which stress that the available data is insufficient to draft any meaningful conclusions.

Throughout this ongoing period of research, new information will continue to be considered and responded to. However, the resourcing, scope and expertise available to MRAMP make it by far the most significant source of research on the cultural impacts of industrial emissions on Murujuga. MRAMP is also co-managed by MAC and emphasises Indigenous decision making and management, aligned with international guidance and standards, including the United Nations Declaration on the Rights of Indigenous Peoples and ICOMOS Charter for the Protection and Management of the Archaeological Heritage. For these reasons, the results of the MRAMP are prioritised in understanding the potential for emission to impact Murujuga's rock art.

The contribution of emissions from processing of Pluto gas to the Murujuga airshed is relatively small over the remaining life of Pluto Offshore Operations. Further, there is inconclusive evidence for any causal link between industrial air emissions and anthropogenic change to rock art on Murujuga. Given this, and that downstream facilities are subject to separate regulatory assessment outcomes, the risk of processing of Pluto gas at onshore facilities adversely impacting rock art on Murujuga is considered to be low, and no impact classification assigned.

Potential Impacts to Human Health

It is recognised that gaseous emissions causing a reduction in ambient air quality have the potential to impact human health as regulated by the NEPM. Both the Pluto LNG Facility and NWS Project Air Quality Management Plans have modelled and assessed the potential impacts of industrial emissions on human health in accordance with the requirements of Western Australian regulatory requirements and international standards (e.g. World Health Organisation). Ambient air quality monitoring programs are in place which demonstrate that current air pollution levels were well below standards set to protect human health and well-being[89]. The magnitude of emissions from processing Pluto gas are insufficient to lead to the exceedance of any relevant health criteria on the Burrup Peninsula or surrounding region.

Both Pluto LNG facility and the NWS Project have committed to maintaining an ongoing air quality monitoring program that is in place to monitor the ambient ground-level concentrations of relevant gases on the Burrup Peninsula, with comparisons being made against the NEPM standards and reported to DWER.

Ambient air quality monitoring results from Pluto and NWS Project will be summarised in the relevant facilities' Annual Environment Report, including any observed exceedances of ambient air quality standards.

As part of the NWS Extension proposal, the EPA assessed the residual impact to human health and amenity from the proposal's nitrogen dioxide (NO_2), SO_2, NH_3, ozone (O_3), and particulate (as PM_{10} and $PM_{2.5}$) emissions at sensitive receptors both in isolation and in a cumulative context with other existing and future emission sources. Predicted ground level concentrations (GLCs) at Dampier, Karratha, Hearson Cove, and Deep Gorge (Ngajarli) remain below applicable current and future proposed air quality criteria at 'standard operating conditions' and 'worst case' cumulative impact scenarios, with the exception of annual PM_{10} and $PM_{2.5}$ GLCs at Hearson Cove and Deep Gorge (Ngajarli), which slightly exceed the applicable criteria due to high levels of natural background dust. Subject to recommended conditions, the impact of the proposal was considered as being consistent with the EPA's objective for air quality in respect of human health.

Noting the absence of any current impacts to human health from industrial activity on Murujuga and presence of a comprehensive regulatory regime including monitoring program, the risk of processing of Pluto gas to human health is assessed as Negligible (F) based on slight effect to overall cumulative air quality in context of defined air quality criteria.

[89] Pluto Air Quality Management Plan, Rev 2

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
MRAS and associated MRAMP in place by DWER and MAC to protect the Aboriginal rock art by providing a long-term framework that builds on previous work to deliver an improved approach to monitoring, analysis and management. The MRAS describes an approach for the management of impacts to the rock art that is consistent with the State Government's responsibilities under the Environmental Protection Act 1986 (WA)	F: Yes CS: Aligned with existing practice	Benefit as defined in sections detailed above: - Program: Murujuga Rock Art (Western Australian Government) - Murujuga Rock Art Monitoring Program Further studies governed by DWER/MAC are required to provide greater scientific certainty in light of stakeholder concerns.	Control based on State Government Process, the outcomes of which are currently, or expected to be, implemented via current Regulatory regimes.	Yes. **C14.1**
Onshore processing facilities (i.e. Pluto LNG, NWS Karratha Gas Plant) are subject to regulatory assessment and compliance under the Environmental Protection Act 1986 (WA)	F: Yes. CS: Aligned with existing practice	Implementation of activities and associated controls to ALARP and acceptable levels supports the maintenance of cultural features and heritage values.	Control based on legislative requirements – must be adopted.	Yes. **C 14.2**
Good Practice				
Onshore processing facilities enact Environment Quality Criteria or the Environment Quality Management Framework (EQMF) recommended as an outcome of the Murujuga Rock Art Strategy	F: Yes CS: Substantial costs	Allows management of air emission criteria in accordance with legislative requirements, expert advice and community expectations.	Control based on regulatory commitment – must be adopted.	Yes **C 14.2**
Forecast, measure and or estimate facility emissions (in accordance with NPI) to inform optimisation management practices and minimise environmental impact of direct Scarborough emissions.	F: Yes CS: Minimal cost. Standard practice.	Minimises environmental impact of emissions through planning, ongoing review, governance and optimisation. It combines with good operating practice to maximise production and reduce flaring and fuel emissions from Pluto onshore processing to manage cost, which improves energy intensity (e.g., cleaner production), optimising emissions. Fuel and flared gas are potential product streams, as such, Woodside	Control is WMS requirement – must be adopted.	Yes **C 6.5**

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/ Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		applies routine short and long term optimisation and opportunity management framework to identify and prioritise enhancement opportunities. Annual fuel and flare target setting and monthly review of performance will be completed for Pluto which includes onshore LNG processing facilities..		
Professional Judgement – Eliminate				
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solutions				
No additional controls identified beyond best-practice measures demonstrated as required by MS757.				

ALARP Statement:

On the basis of the environmental risk assessment outcomes and the use of the relevant tools appropriate to decision type B for indirect emissions from gas processing onshore, Woodside considers the adopted controls appropriate to manage the risk.

Air emissions from onshore processing at Pluto LNG Facility are managed under Ministerial Statement 757.

Air emissions from onshore processing at the NWS Project have been assessed and approved in accordance with Ministerial Statement 536 (and others). Air emissions from onshore processing at the NWS Project Extension (i.e. an extension of the life the NWSV beyond 2030) have been assessed by the EPA under Assessment Report 1727. Both facilities are subject to the provisions of Commonwealth and State legislation to ensure unacceptable environmental impacts are avoided.

As no reasonable additional/alternative controls were identified that would further reduce the impacts without being grossly disproportionate the impacts and risks are considered ALARP.

Societal Values

Consultation was undertaken for this program to identify the views and concerns of relevant stakeholders. Industrial air emissions on the Burrup Peninsula are being managed by the EPA as part of the EP Act Part IV assessment process and DWER as part of their EP Act Part V process and via the MRAS. It is important to note that operators of the Pluto LNG Facility and Northwest Shelf Karratha Gas Plant have both made public commitments to supporting the outcomes of MRAS.

Summary of ALARP Statement:

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision type B for indirect emissions), the adopted controls are appropriate to manage the indirect impacts of air emissions related with processing Pluto gas onshore. The adopted controls meet legislative requirements including:

- EPBC Act
- EP Act.

As no reasonable additional/alternative controls were identified that would further reduce the impacts without being grossly disproportionate sacrifice, the impacts and risks are considered ALARP.

Demonstration of Acceptability
Acceptability Criteria and Assessment
Acceptability Statement: Indirect Atmospheric Emissions The impact assessment concludes that indirect atmospheric emissions from the onshore processing of Pluto gas contribute only a minor portion to the overall industrial emission airshed load on the Burrup Peninsula. Atmospheric emissions within the Murujuga airshed from both Pluto LNG, NWS Project Extension have undergone independent assessment by the WA and agencies and have been considered acceptable, if subject to conditions. Based on the implemented controls and the inconclusive evidence for any causal link between industrial air emissions and anthropogenic change to rock art, uncertainty and precaution are addressed by the existing State regulatory processes including the MRAS, which can apply adaptive management and mitigation measures as further scientific knowledge of potential pathways and indirect links to rock art are established. Therefore, impacts from indirect air emissions as a result of onshore processing of Pluto gas are considered Negligible and of an ALARP and Acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria			
EPO	***Adopted Control(s)***	***EPS***	***MC***
EPO 14 Undertake the Petroleum Activities Program in a manner that will not result in accelerated weathering of Murujuga rock art or impact to human health from air emissions produced at Pluto gas onshore processing facilities.	**C 6.5** Forecast, measure, monitor and or estimate facility fuel and flare emissions (in accordance with NGERS/NPI and WMS procedures named in Section 7.2.16) to inform optimisation management practices and minimise environmental impact of Pluto facility emissions.	**PS 6.5.1** Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: • P31 – Environmental Emissions Monitoring and Controls, to: provide means of detection of environmental releases, emissions and discharges to prevent a significant environmental event from manifesting over time, and/or as required to assure compliance monitoring and reporting equipment.	**MC 6.5.1** Records demonstrate implementation of SCE technical Performance Standard(s) and Safety Critical Element Management Procedure
	C 14.1 The Murujuga Rock Art Strategy and Monitoring Program (MRAS/MRAMP), run by DWER and MAC, is in place to protect the Aboriginal rock art by providing a long-term framework that builds on previous work to deliver an improved approach to monitoring, analysis and management. Woodside will maintain its support of the	PS 14.1 Pluto PAA activities process gas through Burrup onshore facilities where a functioning MRAS and MRAMP framework is in place **(**or subsequent position on risk/impact and applicable program or controls if relevant).	MC 14.1 Annual review of existence of MRAS/MRAMP (or subsequent applicable program or controls) associated results, and applicability for managing the associated risk. MC 29.2.1 Records demonstrate Change Management and Management of Knowledge processes have been followed where new controls or management measures identified

Environmental Performance Outcomes, Standards and Measurement Criteria			
EPO	***Adopted Control(s)***	***EPS***	***MC***
	MRAS/MRAMP, monitor the outcomes and assesses relevance to this activity as part of the implementation strategy of this EP.		
	C 1314.12 Onshore processing facilities (i.e. Pluto LNG, NWS Karratha Gas Plant) are subject to assessment and compliance demonstration under the Environmental Protection Act 1986 (WA)	**PS 1314.12.1** Verify onshore processing facilities (Pluto LNG, NWS Karratha Gas Plant) are subject to assessment under the Environmental Protection Act 1986 (WA)	**MC 1314.12.1** Ministerial statement(s) applicable to onshore processing facilities, and compliance demonstrated via required annual compliance report(s).

6.7.12 Routine Light Emissions: Light Emissions from Facility Operations and Xena-03 Tie-back Activities

Context		
Platform Lighting – Section 3.6.1 Operational Flaring – Section 3.5.5 Xena-03 Tie-back Activities – Section 3.11	Protected Species – Section 4.6	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Impact	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Light emissions from the Pluto Facility, ASV, MODU, installation and support vessels.						x		A	F	-	-	GP PJ	Broadly Acceptable	EPO 12
Light emissions during flaring.						x		A	F	-	-			

Description of Source of Impact

Operations

When the riser platform is not crewed, lighting is limited to essential navigational and aviation requirements to communicate the presence of the riser platform and vessels to other marine users (i.e. navigation lights). Navigational lights are also located on the facility's tallest structures (i.e. crane boom). Helideck lighting is provided to assist helicopter landings.

When crewed, which is generally ten times per year for approximately 14 days at a time, the platform and support vessels have adequate lighting to allow safe working conditions during 24-hour operations. Lights are not normally directed outwards away from work areas except when necessary for safe operations outboard, such as lifting operations, and deployment/retrieval of equipment from IMMR activities. A relatively small quantity of gas is required to be continuously flared associated with purge and pilot of the flare system and produced water treatment system low pressure gas streams that are not able to be recovered to the process. Intermittent flaring may occur during facility shutdowns/blowdown, pigging, restart, flowline depressurisation for subsea system integrity management and in case of emergency.

The distance to the horizon at which components of the facility will be directly visible can be estimated using the formula below:

$$horizon\ distance\ = 3.57 \times \sqrt{height}$$

Where horizon distance is the distance to the horizon at sea level in kilometres and height is the height above sea level of the light source in metres. Using this formula, the approximate distances at which the production deck and flare tower top will be visible at sea level are (based on the weather deck height above sea level of 47.4 m and flare tower height of 44 m – given an angle of 30°):

- weather deck: approximately 25 km from riser platform
- flare tower tip: approximately 34 km from riser platform

The ASV has the majority of its lighting sources located on the main accommodation decks below the bridge at heights extending from ~47 m to ~100 m above sea level (whilst at operating draft). Therefore, the majority of the lighting is approximately at, or below, the level of the most significant light source on the riser platform (the flare tower

tip). Accordingly, cumulative light from the ASV and riser platform will not be visible beyond approximately 36 km from the facilities.

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

Xena-03 Tie-back activities

The MODU and project vessels will have external lighting to support safe navigation and safe operations at night. This lighting typically consists of bright white (i.e. metal halide, halogen, fluorescent) lights, and is not dissimilar to lighting used for other offshore activities, including fishing and shipping. Lighting is required for the safe operation of the MODU and project vessels cannot be reasonably eliminated.

The extent of potential impact for this activity is restricted to the line of sight for each source emitting light. Based on other previous work undertaken by Woodside this is about 30 km from the MODU during drilling activities and 30 km from vessels (Woodside, 2014). For contingent well flowback, specifically flaring, the distance at which the flare will be visible is expected to be less than 50 km from the source, and potentially around a further 10 km during emergency flaring (Woodside Energy Limited, 2011). Contingent well flowback activities would be intermittent and of a short duration, where alternate options for reservoir fluids during well unloading activities cannot be achieved (i.e., directed to the onshore LNG plant via the Pluto Facility).

Whilst the line of sight may extend tens of kilometres from the source, the light density (measured in Lux – which represents the intensity of light that arrives at or leaves a surface, as perceived by the human eye) rapidly decreases as distance increases from the source of the light. Monitoring undertaken as a part of Woodside's 2014 study indicated that light density (from navigational lighting) attenuated to below 1.00 Lux and 0.03 Lux at distances of 300 m and 1.4 km, respectively, from the source (a MODU). Light densities of 1.00 and 0.03 Lux are comparable to natural light densities experienced during deep twilight and during a quarter moon. Navigational lighting from vessels is less than lighting on a MODU. Therefore, light emissions from the MODU and installation vessel are expected to be below 1.00 Lux within 300 m from the source during Xena-03 Tie-back activities.

Cumulative light sources

Cumulative increases in light levels will occur during the tie-back activities and commissioning/maintenance visits where the facility will be crewed and may also be utilising an ASV (up to 90 days per campaign). There will be additional lighting for safe operations of the MODU and installation and support vessels present in these periods. These scenarios will be short term (~12 weeks for tie-back activities). Light emissions are also likely from flaring, IMMR activities and vessel lighting from several nearby platforms including Wheatstone, Reindeer and Goodwyn (see Section 4.10.5) that are located within 50 km of Pluto and may result in slightly elevated ambient light levels.

Impact Assessment

Lighting from the facility, MODU, ASV, installation and support vessels may appear from direct unshielded light sources or through skyglow. Where direct light falls upon the ocean, this area of light is referred to as light spill. Skyglow 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 skyglow may be visible from the source is dependent on the lighting on the facility / vessel and environmental conditions.

Receptors that have important habitat present within a 20 km buffer of artificial light sources were considered as having potential for interaction, 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 (15 to 18 km) and fledgling seabirds grounded in response to artificial light 15 km away (Commonwealth of Australia, 2020).

Light emissions can affect fauna in two main ways:

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

The marine fauna within the PAA are predominantly pelagic fish and zooplankton, with a low abundance of species such as turtles and large whales transiting through the area. The Facility Operational Area and the Xena-03 Operational Area overlap the whale shark foraging BIA, flatback turtle internesting BIA and the wedge-tailed shearwater breeding BIA.

The Export Pipeline Operational Area is nearer the coastline and overlaps more BIAs (BIAs for the loggerhead turtle, green turtle, hawksbill turtle, and flatback turtle, and Habitat Critical to the green turtle, hawksbill turtle, and loggerhead turtle. Also the breeding BIA for the wedge-tailed shearwater, roseate tern, and fairy tern; see Section 4.6), but lighting in this region will be restricted to short-term periodic lighting from vessels conducting IMMR activities.

Seabirds

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). Foraging wedge tailed shearwaters may be attracted to artificial light sources to feed upon fish drawn to the light; however, the species feeds predominantly during the day in association with pelagic predators (Catry et al., 2009; Whittow, 1997). The majority of foraging trips are short, with single day foraging trips significantly more common than any other length trip, with birds returning to nesting/roosting sites between trips (Congdon et al., 2005). As such, the numbers of wedge-tailed shearwaters present in the Facility Operational Area or Xena-03 Operational Area at night is expected to be low relative to daylight hours, and any potential changes to behaviour would only affect a relatively low number of birds. Given the species' global distribution and primarily diurnal foraging behaviour, impacts to wedge-tailed shearwaters from artificial lighting are considered to be negligible.

The nearest potential seabird roosting habitat on natural emergent land, the Montebello Islands, lie approximately 32 km south of the Export Pipeline Operational Area and 64 km from the riser platform, at their closest points. The breeding BIA for the wedge-tailed shearwater overlaps the Facility, Xena-03 and Export Pipeline Operational areas, with the breeding period occurring from August to April. 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.

The breeding BIAs for the roseate tern and fairy tern overlap the Export Pipeline Operational Areas, with breeding occurring in June to March for the Australian fairy tern, and breeding varying throughout the year for the roseate tern.

Large numbers of migratory seabirds have been observed opportunistically roosting on the facility. If maintenance, process safety and/or health risks are identified associated with the presence of birds, it may be necessary to deter them from roosting on the riser platform by installing bird proofing/exclusion devices. The installation of bird proofing poses the potential risk of entanglement for individual birds. There have been no reported bird injuries or deaths at the facility, and consequently future adverse interactions are considered highly unlikely with no lasting effects on populations or impacts to critical habitat anticipated. If deterrents are installed birds will be likely to relocate to previous ranges (i.e. rather than landing on the platform), therefore no lasting effect is anticipated. The risk associated with collision from seabirds attracted to the light is considered to be low, given that lighting will be limited, except during intermittent periods when the riser platform is crewed and during IMMR and the Xena-03 Tie-back activities.

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 (Commonwealth of Australia, 2015). The risk associated with collision from seabirds or migratory shorebirds attracted to artificial lighting is considered to be low, impacts are expected to be limited to localised behavioural disturbance to isolated individuals, with no displacement from important habitat.

The most vulnerable life stages for seabirds and migratory shorebirds are nesting adults or fledglings. Nesting or fledgling seabirds and migratory shorebirds are vulnerable to artificial lighting within 20 km of the nesting location (Commonwealth of Australia, 2020). For shearwater species, fledglings are predominantly impacted by onshore lighting sources, which can override sea finding cues and attract fledglings further inland, preventing them from reaching the sea (Mitkus et al., 2018). Artificial light can also impact important behaviour of nesting adults (e.g. adult nest attendance, maintaining nest sites) or confuse shearwater species, resulting in injury or mortality as a result of birds colliding with structures (Cianchetti-Benedetti et al., 2018; Rodriguez et al., 2017). As the PAA is 32 km from the nearest emergent land, impacts to adult nesting or fledgling seabirds and migratory shorebirds are not expected. No nesting activity has been identified on the Pluto facility. Artificial light from the Petroleum Activities Program is not predicted to disrupt critical breeding behaviours within important nesting habitat or displace seabirds from nesting habitat.

Marine Turtles

Hatchlings

Light pollution is listed as a key threat to all marine turtle species, with advice to minimise light. The nearest potential nesting site in relation to the Xena-03 Operational Area is the Montebello Islands, approximately 43 km from the Xena-03 Tie-back and Pluto Facility Operational Area. Given this, platform lighting and the tip of the flare tower will not be directly visible from this potential nesting site.

Light emissions reaching turtle nesting beaches is widely considered detrimental owing to interference with important nocturnal activities including choice of nesting sites and orientation/navigation to the sea by post-nesting females and hatchlings (Lorne and Salmon, 2007; Salmon, 2003; Tuxbury and Salmon, 2005).

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).

Sky glow, particularly from flaring on the riser platform, is also unlikely to be visible at the closest nesting locations and is unlikely to cause behavioural impacts. In any case, the light source is located directly offshore in the same direction that emerging hatchlings would be heading in during normal sea-finding behaviour, meaning that no significant misorientation or disorientation would occur.

The weather deck is approximately 47.4 m above sea level, with the highest point of the facility (the top of the flare tower) reaching approximately 91.4 m above sea level. The distance to visible horizon is ~32 km – i.e., anything beyond this distance is below the horizon and direct light would not be visible. Therefore, direct light from facility will not reach any nesting location. Sky glow (particularly from flaring) is also unlikely to be visible at the closest nesting locations resulting in no behavioural impact (i.e., not biologically relevant). Even in the scenarios where these areas may be affected, the light source is located directly offshore in the same direction that emerging hatchlings would be heading in during normal sea-finding behaviour, meaning that no disorientation impacts would occur.

The maximum likely height for a derrick on a MODU contracted for the Petroleum Activities Program is ~50 m, and subsequently have a lesser visible reach than the facility flare tower. External lighting on vessels is typically lower than the facility lights, with vessel lighting usually reduced to improve night vision of bridge crew. During IMMR activities vessels may come closer to turtle nesting beaches, mainly within the Dampier Archipelago. However, given the low frequency and large spatial extent at which these activities occur, there is not likely to be significant impacts. As such, the potential for hatchling turtles to become disorientated by artificial lighting is considered remote.

Adults

Artificial lighting may affect the location that turtles emerge to the beach, the success of nest construction, whether nesting is abandoned, and even the seaward return of adults (Salmon et al., 1995a, 1995b; Salmon & Witherington, 1995). However, such lighting is typically from residential and industrial development overlapping the coastline, rather than offshore from nesting beaches. It is acknowledged that the Facility Operational Area and Xena-03 Operational Area overlaps a 40 km internesting buffer BIA for flatback turtles and that marine turtles may occur in low densities in this area. However, no impacts to nesting flatback turtles will occur due to light generated within this section of the PAA given the riser platform's NNC status and the distance to the nearest landfall.

Within the Export Pipeline Operational Area, a higher abundance of turtles may be present. The Export Pipeline Operational Area overlaps internesting and internesting buffer BIAs for green, hawksbill and loggerhead turtles. Given the very low occurrence of IMMR activities, no impacts to nesting turtles of these species will occur.

Fish

Lighting from the presence of the facility, MODU or project vessels may result in the localised aggregation of fish. These aggregations of fish are considered localised and temporary and any long-term changes to fish species composition or abundance is considered highly unlikely. This localised increase in fish extends to those comprising the whale shark's diet which has a foraging BIA that intersects majority of the PAA. However, given that a large proportion of the diet comprises krill and other planktonic larvae, it is unlikely that a light source would lead to a significant increase in whale shark abundance in the vicinity of the facility or vessels. Similarly, any localised impacts to marine fish are not expected to impact on any commercial fishers in the area.

Cumulative impacts

There is potential for overlap when the Pluto facility becomes staffed during commissioning and tie-back activities where cumulative light emissions would occur from lighting required for safe operations from the facility, MODU and project vessels. As outlined above, these scenarios will be short term. The cumulative impact is likely to be minor, due to the low light intensities of the vessel navigational lighting, MODU and facility lighting, short and intermittent nature of the impact, and is not anticipated to adversely affect any sensitive receptors.

Cumulative light impacts have the potential to occur from flaring, IMMR activities and project vessel lighting from several nearby gas platforms, however negligible detrimental impact to biological communities is expected.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)90***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
None Identified				
Good Practice				

[90] Qualitative measure

Implement a Seabird Management Plan that includes: Standardisation and maintenance of record keeping and reporting of seabird interactions Procedures on seabird intervention, care and management Regulatory reporting requirements for seabirds (unintentional death of or injury to seabirds that constitute MNES)	F: Yes. CS: Minimal.	Potential for slight reduction in the likelihood of seabird attraction to vessels and facility resulting in a reduced likelihood of bird strikes.	Potential benefits outweigh cost sacrifice.	Yes C 12.1
Lighting will be limited to the minimum required for navigational and safety requirements, with the exception of emergency events.	F. Yes. Lighting is typically appropriate for navigation and safety.	Given the potential impacts to turtles during this activity is insignificant, implementation of this control would not result in a reduction in consequence.	While the control does not result in significant reduction of impacts, it is good practice and not at significant cost.	Yes C 12.2
Well unloading acceptance criteria that define the well objectives will be established	F: Yes. CS: Standard practice.	Eliminates unnecessary flared volumes and corresponding emissions (light and GHG).	Benefits outweigh cost/ sacrifice.	Yes C 10.12
Professional Judgement – Eliminate				
No external lighting during Petroleum Activities Program.	F: No. Light management is consistent with that required to provide a safe working environment on-board the facility and support vessels. Lighting is required to enable monitoring of the platform from NRC. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Variation of the timing of the tie-back activities to avoid peak turtle internesting periods (December to January).	F: Yes CS: Significant cost and schedule impacts due to delays in securing vessels/MODU for specific timeframes.	Not considered – control not feasible.	Not considered, control not feasible.	No

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 facilities, etc, would result in considerable cost and time expenditure. Considerable logistical effort to source sufficient inventory of the range of light types onboard the facilities.	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 PAA, 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
No flaring during Petroleum Program activities.	F: No. The ability to flare hydrocarbons is a safety and integrity critical requirement for the facility. Note, Woodside is committed to reducing flaring, and has developed annual internal facility flare targets against which progress is monitored (see Section 7.2.166.7.10). 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 impact assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the potential impacts from routine light emissions from the facility, MODU and vessels to be ALARP. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.				

Demonstration of Acceptability
Acceptability Statement: The impact assessment has determined that, given the adopted controls, routine light emissions from external lighting on Pluto facility, MODU, ASV, installation and support vessels represent a localised impact /disturbance to marine fauna within the PAA, the majority of which will occur in the Facility Operational Area and Xena-03 Operational Area. The PAA overlaps with the whale shark foraging BIA as well as BIAs for the loggerhead turtle, green turtle, hawksbill turtle, and flatback turtle, and Habitat Critical to the green turtle, hawksbill turtle, and loggerhead turtle. The PAA also overlaps the breeding BIA for the wedge-tailed shearwater, roseate tern, and fairy tern. Conservation advice and the NLPG were taken into consideration during the impact evaluation. The Petroleum Activities Program is deemed consistent with the conservation advice and guideline. Further opportunities to reduce the impacts have been investigated above. The potential impacts are consistent with good oil-field practice/industry best practice and are considered to be broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts of light emissions to a level that is broadly acceptable and demonstrate the EPOs are met.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 12a No impact to protected species from artificial light emissions during the Petroleum Activities Program greater than consequence level of No lasting effect.[91]	C 12.1 Implement a Seabird Management Plan	PS 12.1 Implementation of the Seabird Management Plan including: Minimise potential for light attraction Standardise and maintain record keeping and reporting of seabird interactions Provide procedures on seabird intervention, care and management Regulatory reporting requirements of seabird (unintentional death of or injury to seabirds that constitute MNES)	MC 12.1.1 Records demonstrate Seabird Management Plan implemented
	C 12.2 Lighting will be limited to the minimum required for navigational and safety requirements, with the exception of emergency events.	PS 12.2 Lighting will be limited to that required for safe work/navigation.	MC 12.1.2 Inspection verifies no excessive light being used beyond that required for safe work/ navigation.

[91] *Defined as 'no lasting effect (< 1 month); localised impact not significant to environmental receptors' as in Table 2-3, Section 2.6.5.*

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 12b No impact to protected species from artificial light emissions during the Petroleum Activities Program greater than a consequence level of No lasting effect[92]	C 12.1 Implement a Seabird Management Plan.	PS 12.1 Implementation of the Seabird Management Plan including: minimise potential for light attraction Standardise and maintain record keeping and reporting of seabird interactions Provide procedures on seabird intervention, care and management Regulatory reporting requirements of seabird (unintentional death of or injury to seabirds that constitute MNES)	MC 12.1.1 Records demonstrate Seabird Management Plan implemented
	C 12.2 Lighting will be limited to the minimum required for navigational and safety requirements, with the exception of emergency events.	PS 12.2 Lighting will be limited to that required for safe work/navigation.	MC 12.1.2 Inspection verifies no excessive light being used beyond that required for safe work/ navigation.
	C 10.8 Well unloading acceptance criteria that define the well objectives will be established. See Section 6.7.10	PS 10.8 Flaring restricted to a duration necessary to achieve the well objectives. See Section 6.7.10	MS 10.8.1 Records demonstrate flaring was restricted to a duration necessary to achieve the well objectives. See Section 6.7.10

[92] Defined as 'no lasting effect (< 1 month); localised impact not significant to environmental receptors' as in Table 2-3/ Section 2.6.5.

6.8 Unplanned Activities (Accidents, Incidents, Emergency Situations) – Major Environmental Events

For Woodside's production facilities, an analysis is undertaken to identify, classify and analyse Major Environmental Events (MEEs), as described in Section 2.7. This extra level of rigour is applied so that sufficient controls for operational activities are in place for risks with potential Major and above environment event related consequences as per Woodside's Risk Matrix.

MEEs are evaluated against credible worst-case scenarios that may occur when all controls are absent or have failed. The risks considered in this section have therefore been identified as MEEs due to the potential for significant consequence. These sources of risk are subject to additional consideration in accordance with the process described in Section 2.6.4. Risks associated with the Petroleum Activities Program that have been classified as MEE's are summarised in Section 6.8.1 and include a range of hydrocarbon spills. The quantitative spill risk assessment methodology used to assess the potential consequence of credible spills is outlined in Section 6.8.2. Credible hydrocarbon spills that have not been classified as MEE's have also been assessed in Section 6.8. Risks that do not meet the MEE definition, although screened out of the MEE process, are still evaluated for ALARP and risk acceptability using the methodology described in Section 2.8. These include credible hydrocarbon spills during drilling and tie-back activities, which are not classified as MEE's for the following reasons:

- Drilling and subsea installation activities are performed outside of operations asset controls and ownership. Ownership is only handed over in cold commissioning when the asset gains control of subsea systems and well control, as such a different set of controls and safety systems are used in the lead up to pre-commissioning.
- The vessel safety case contains safety systems that prevent the occurrence of hydrocarbon spills during drilling and subsea installation.
- Hydrocarbon spills assessed for the drilling and subsea installation phase align with vessel safety case risk assessments and mitigation to reflect controls proportionate to the short duration elevated risk activities.

Drilling and subsea installation activities conclude with the hand over to the asset along with the subsequent risk and consequence from the activities.

6.8.1 MEEs Overview

Section 2.7 outlines the process for additional analysis and evaluation of MEEs. The bowtie output for each MEE identified has been provided in Table 6-27.

Table 6-26: MEE events for the Pluto Facility Operations

No.	Hazard	Top Event
MEE-01	Hydrocarbons in reservoirs, wells, wellheads and xmas trees	Well loss of containment
MEE-02	Hydrocarbons in subsea equipment (pipelines, flowlines and risers)	Subsea equipment loss of containment
MEE-03	Hydrocarbons in subsea and topsides equipment	Loss of structural integrity
MEE-04	Hydrocarbons in subsea and topsides equipment and marine vessels	Loss of marine vessel separation with platform
MEE-05	Hydrocarbons in subsea and topsides equipment	Loss of control of suspended load from platform

Each section includes a summary of the hazard description, hazard management, emergency response, ALARP summary and a list of SCE barriers identified on the bowties. Each group of SCEs is listed under Technical Performance Standards, with consistent naming conventions used across

Woodside's process safety management processes (e.g., pipeline integrity SCEs are captured as P09 – Pipeline Systems).

Section 6.8.10 presents the generic SCE Failure and generic Human Error bowties that illustrate the causes, outcomes and controls/barriers in place to manage potential common cause event (CCE) failure mechanisms for MEE controls associated with generic SCE equipment failure (CCE-01), and also human error (CCE-02). Controls and specific measures are listed for both bowties. Human Error is managed via the WMS and the Generic Human Error bowtie is included in the MEE section for completeness.

ALARP is demonstrated through controls and barriers being analysed for selection based on their independence, prioritised in accordance with the Hierarchy of Controls where controls further up the hierarchy take precedence over controls further down, and further analysed to consider the type of effect the control provides. ALARP controls presented for MEE bowties are labelled in accordance with Type of Effect classifications presented.

Woodside has developed a tailored ALARP position for hydrocarbon spill response, including EPOs, EPSs and MC for preparedness and response. The response arrangements are a mitigative control that applies to all MEEs where a hydrocarbon release may credibly occur. The hydrocarbon spill response arrangements are described in Section 7.

Table 6-27: Barrier Hierarchy and Type of Effect

Type of Effect	Legend	Description
Elimination (Technical)		Elimination controls form the 'first line of defence'. They eliminate the underlying hazard and therefore are the most effective category of control measure. If practicable, they should be selected in preference to any other type, as their existence removes the need for any other controls (e.g. a corrosion-resistant metal could replace the original material of construction).
Elimination (Administration)		
Prevention (Technical)		Prevention controls are intended to remove certain causes of incidents or reduce their likelihood. The corresponding hazard remains, but the frequency of incidents involving the hazard is lowered (e.g. introduction of regular maintenance programs can prevent the development of events involving the hazard). Where hazards and causes could not be 'eliminated', controls are required to prevent them from leading to unwanted events and consequences.
Prevention (Administration)		
Detection (Technical)		Detection controls are those that identify a potentially hazardous scenario (e.g. a change in operating parameters), allowing initiation of procedures or systems to prevent the cause occurring. Controls that detect the occurrence of events are often critical to being able to respond with other control measures that reduce the propagation of the events. Detection controls themselves often provide no actual control other than the awareness of the need to respond.
Detection (Administration)		
Reduction/Control (Technical)		Reduction controls are intended to limit the scale and consequence of incidents. They include systems that detect incidents and take some action (e.g. to reduce the rate of leakage of a toxic gas) and also aspects such as inter-unit separation that prevent escalation of fire and explosion incidents. As there is always potential for controls to fail, additional measures are required to limit the scale and severity of any unwanted event or outcome that may arise, by providing the ability to intervene and limit the propagation of the events.
Reduction/Control (Administration)		
Mitigation (Technical)		Mitigation controls take effect in response to an incident. They include controls that lessen the significance or damage caused by

Mitigation (Administration)		an unwanted event. Such controls only take effect after the hazardous event and outcomes occur. Mitigation controls are generally those designed to protect personnel against the consequences of a hazard or to aid in recovering from the effects of the hazard.

6.8.2 Hydrocarbon Characteristics

A summary of the characteristics of the hydrocarbons used as the basis for the modelling studies and subsequently used to inform the assessment of credible hydrocarbon spills is provided in Table 6-28.

Additional detail on the characteristics of these hydrocarbons is also provided below.

Table 6-28: Characteristics of the hydrocarbon types used for modelling and ecotoxicological studies

Hydrocarbon Type	Density (g/cm3) at 15°C	Viscosity (cP) at 15°C	Component	Volatile (%)	Semi-volatile (%)	Low volatility (%)	Residual (%)	Aromatics (%)
			Boiling point (°C)	<180	180-265	265-380	>380	Of whole oil <380
Pluto Condensate (PLA02 Operations) (at seabed temperature and pressure)	0.699	0.7032	% of total	67.97	18.48	10.05	2.53	9.83
			% aromatics	6.93	1.88	1.02	-	-
Pluto Condensate (Trunkline Operations) (at seabed temperature and pressure)	0.733	0.583	% of total	76	14	9.5	0.5	-
			% aromatics	1.8	1.7	0	-	-
Eris-1 and Pluto analogues Condensate applicable to XNA03 drilling (at surface temperature and pressure)	0.819	4.922	% of total	14.97	48.43	26.6	10.01	9.85
			% aromatics	1.64	5.3	2.91	-	-
Eris-1 and Pluto analogues Condensate– applicable to XNA03 drilling (at seabed temperature and pressure)	0.746	0.68	% of total	65.99	21.6	9.02	3.39	9.84
			% aromatics	6.72	2.2	0.92	-	-
		4.00*	% of total	6	34.6	54.4	5.0	3.0

Marine Diesel (as Marine Gas Oil) *	0.829 *		% aromatics	1.8	1.0	0.2	-	-

** at 25°C*

6.8.2.1 Pluto Condensate (PLA02 Operations)

Pluto condensate (applicable to PLA02 Operations) is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In favourable conditions, about 68% of the oil mass should evaporate within the first 12 hours (boiling point < 180°C); a further 18.48% should evaporate within the first 24 hours (180°C < boiling point < 265°C); and a further 10.05% should evaporate over several days (265°C < boiling point < 380°C). About 2.5% of the oil is shown to be persistent. The aromatic content of the oil is about 9.83% (RPS Group, 2024b).

Soluble, aromatic, hydrocarbons contribute to approximately 9.83% mass of the total oil. A further 10.05% has low volatility and a further 18.48% is semi-volatile. These compounds dissolve more slowly but tend to persist in soluble form for longer. Discharge onto the water surface will favour the process of evaporation over dissolution under calm sea conditions, but increased entrainment of oil and dissolution of soluble compounds can be expected under breaking wave conditions (RPS Group, 2024b).

The mass balance forecast for the constant-wind case shows that approximately 85% of the oil is predicted to evaporate within 24 hours. Under calm conditions, most of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will then be subject to more gradual decay through biological and photochemical processes (RPS Group, 2024b).

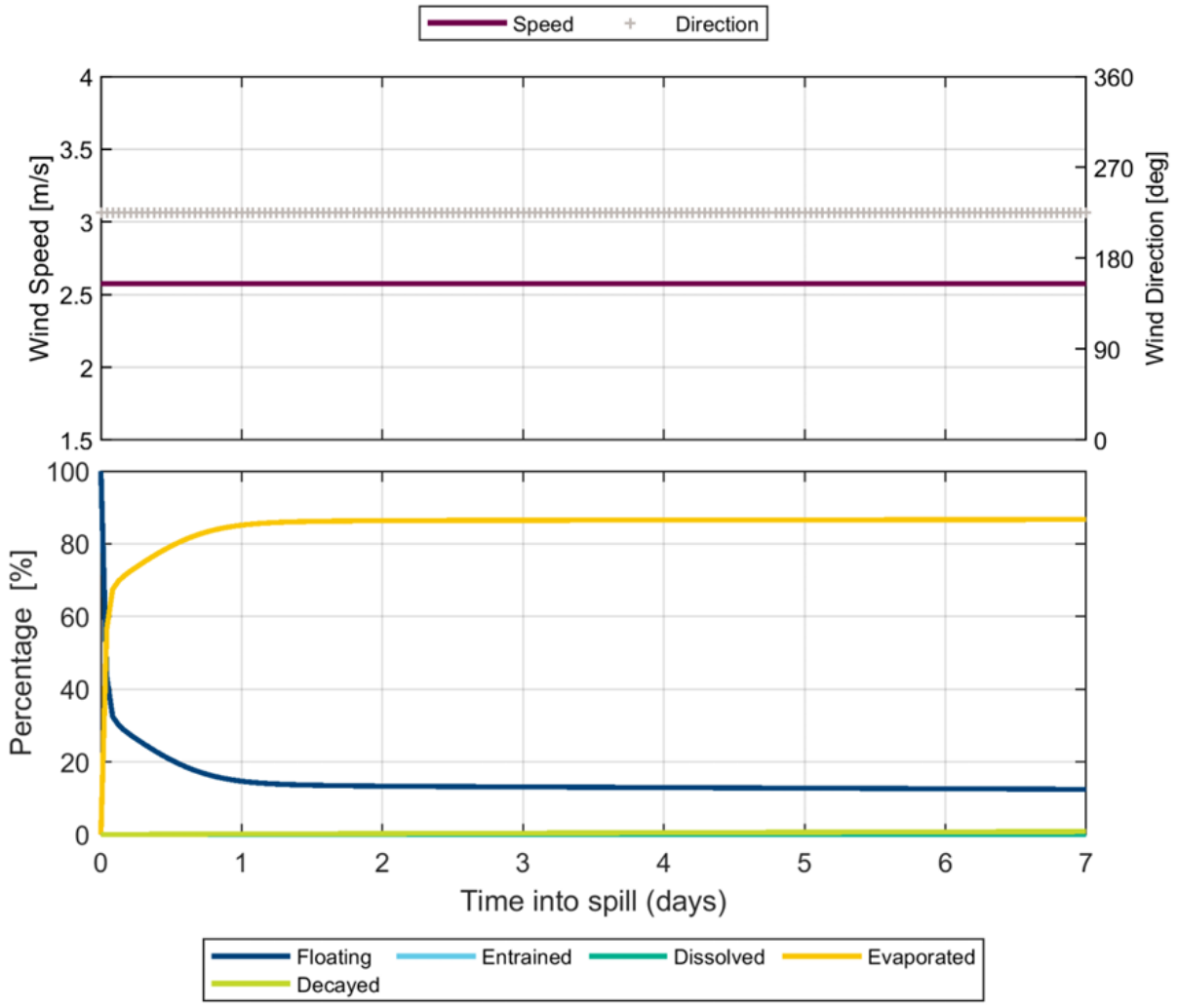


Figure 6-8: Proportional mass balance plot representing the weathering of Pluto Condensate spilled onto the water surface as a one-off instantaneous release (50 m3) and subject to a constant 5 kn (2.6 m/s) wind at 27°C water temperature and 25°C air temperature.

Under the variable-wind case, where the winds are of greater strength on average, entrainment of Pluto condensate into the water column is predicted to increase. Approximately 24 hours after the spill, around 16% of the oil mass is forecast to have entrained and a further 82% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<0.1%). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves (approximately >6 m/s) (RPS Group, 2024b).

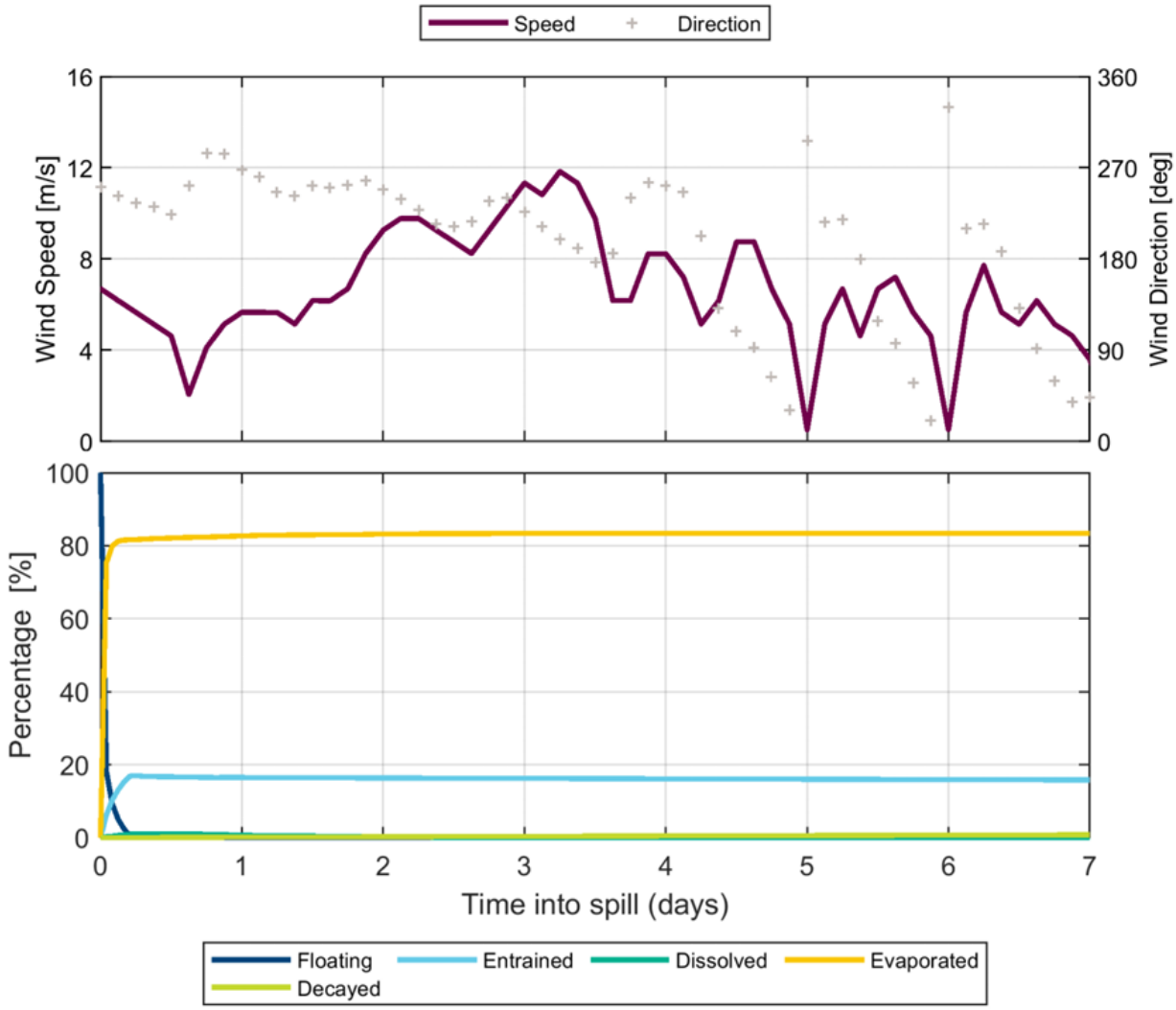


Figure 6-9: Proportional mass balance plot representing the weathering of Pluto condensate spilled onto the water surface as a one-off instantaneous release (50 m3) and subject to variable wind at 27 °C water temperature and 25 °C air temperature.

6.8.2.2 Pluto Condensate (Trunkline Operations)

Pluto condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In favourable conditions, about 76% of the oil mass should evaporate within the first 12 hours (boiling point < 180°C); a further 14% should evaporate within the first 24 hours (180°C < boiling point < 265°C); and a further 9.5% should evaporate over several days (265°C < boiling point < 380°C). About 0.5% of the oil is shown to be persistent (RPS Group, 2024c, 2024d).

Around 76% of the oil is highly soluble and highly volatile. A further 14% is semi-volatile, and a further 9.5% has low volatility. These compounds dissolve more slowly but tend to persist in soluble form for longer. Discharge onto the water surface will favour the process of evaporation over dissolution under calm sea conditions, but increased entrainment of oil and dissolution of soluble compounds can be expected under breaking wave conditions (RPS Group, 2024c, 2024d).

The mass balance forecast for the constant low-wind case for Pluto shows that approximately 90% of the oil should evaporate within 24 hours. Under calm conditions, most of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will

then be subject to more gradual decay through biological and photochemical processes (RPS Group, 2024c, 2024d).

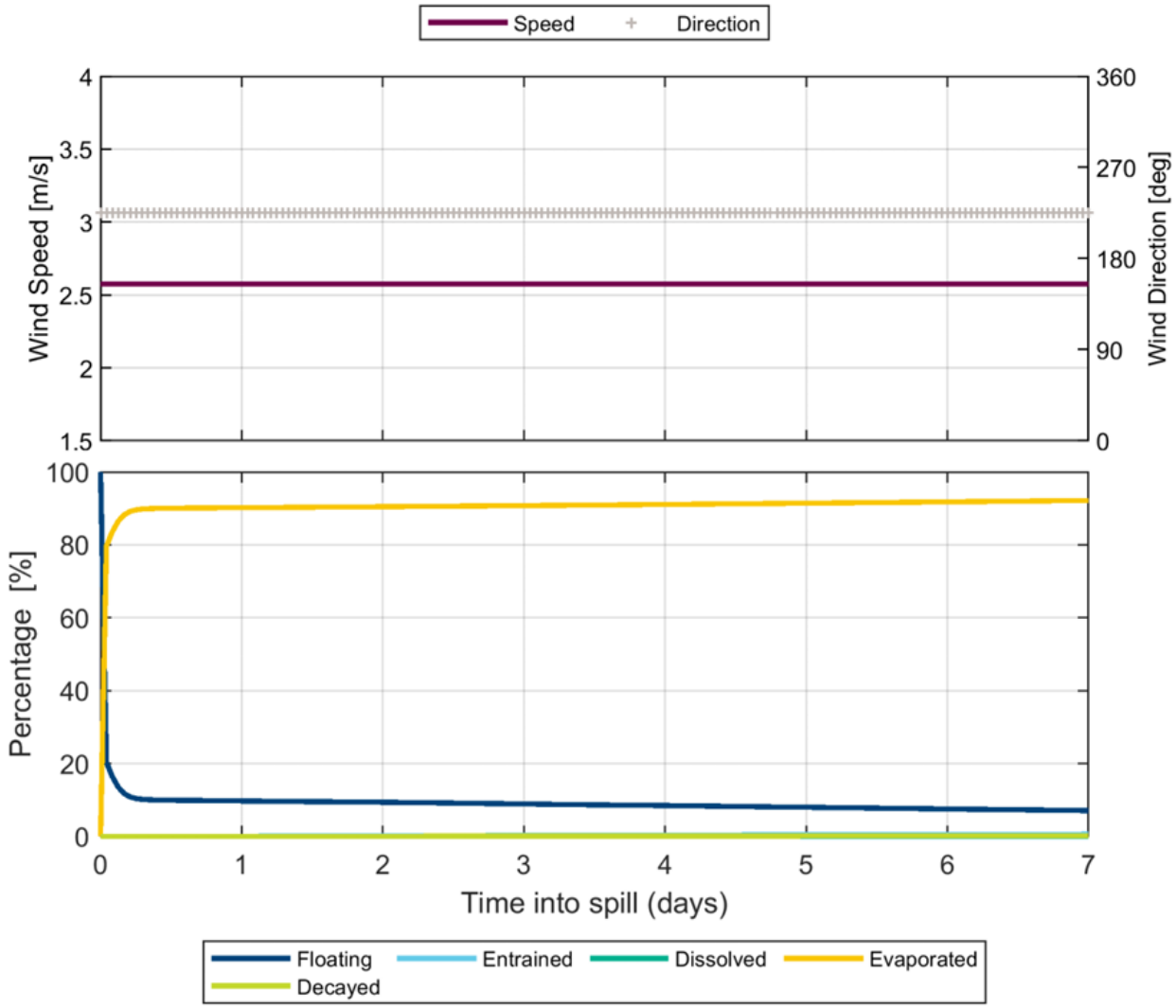


Figure 6-10: Proportional mass balance plot representing the weathering of Pluto Condensate spilled onto the water surface as a one-off instantaneous release (50 m3) and subject to a constant 5 kn (2.6 m/s) wind at 27 °C water temperature and 25 °C air temperature.

Under the variable-wind case, where the winds are of greater strength on average, entrainment of Pluto Condensate into the water column is predicted to increase. Approximately 24 hours after the spill, around 12% of the oil mass is predicted to have entrained and a further 87% is predicted to have evaporated, leaving only a small proportion of oil floating on the water surface (<1%). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves (approximately >6 m/s) (RPS Group, 2024c, 2024d).

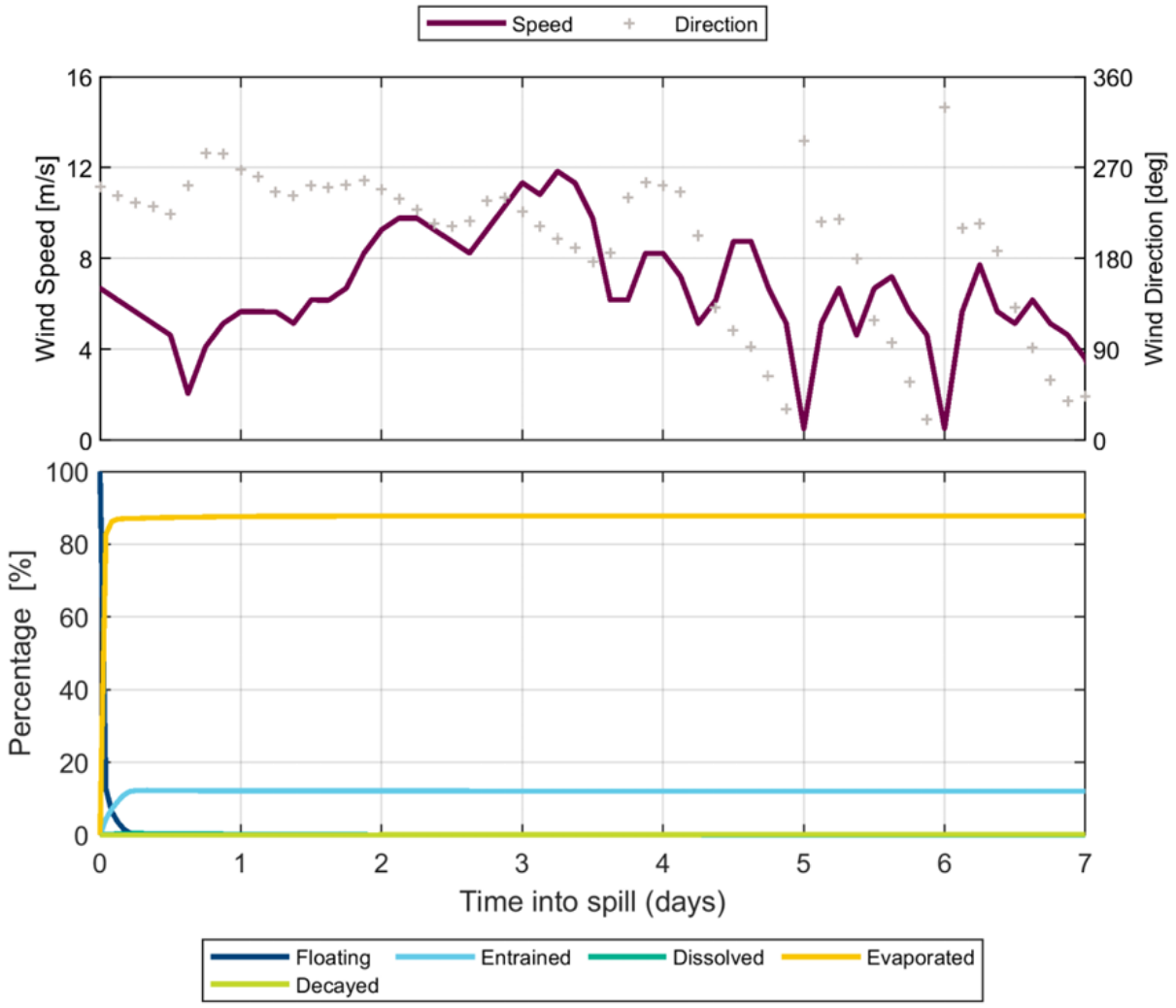


Figure 6-11: Proportional mass balance plot representing the weathering of Pluto Condensate spilled onto the water surface as a one-off instantaneous release (50 m3) and subject to variable wind at 27–°C water temperature and 25 °C air temperature.

6.8.2.3 Condensate - Eris-1 and Pluto analogues (surface and seabed)

Eris-1 and Pluto analogues Condensate (Eris-1), applicable for XNA03 hydrocarbon QSRA is a mixture of hydrocarbon compounds that would condense from the gas-phase on exposure to the lower pressures and temperatures of ambient conditions. As these conditions would differ, the hydrocarbon characteristics of the condensate at the surface and the seabed have both been accounted for.

Eris-1 Condensate released at the surface is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi-volatile components. In favourable conditions, about 15% of the oil mass should evaporate within the first 12 hours (boiling point < 180°C); a further 48.43% should evaporate within the first 24 hours (180°C < boiling point < 265°C); and a further 26.6% should evaporate over several days (265°C < boiling point < 380°C). About 10% of the oil is shown to be persistent. The aromatic content of the oil is about 9.85% (RPS Group, 2024a).

Soluble, aromatic, hydrocarbons contribute approximately 9.85% by mass of the whole oil. Around 14.97% is highly soluble and highly volatile. A further 48.43% is semi-volatile and a 26.6% has a low volatility. These compounds dissolve more slowly but tend to persist in soluble form for longer.

Discharge onto the water surface will favour the process of evaporation over dissolution under calm sea conditions, but increased entrainment of oil and dissolution of soluble compounds can be expected under breaking wave conditions (RPS Group, 2024a).

The mass balance forecast for the constant wind case for the Eris-1 Condensate (surface) shows that approximately 64% of the oil should evaporate within 24 hours. Under calm conditions, the majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation of the residual compounds will slow significantly, and they will then be subject to more gradual decay through biological and photochemical processes (RPS Group, 2024a).

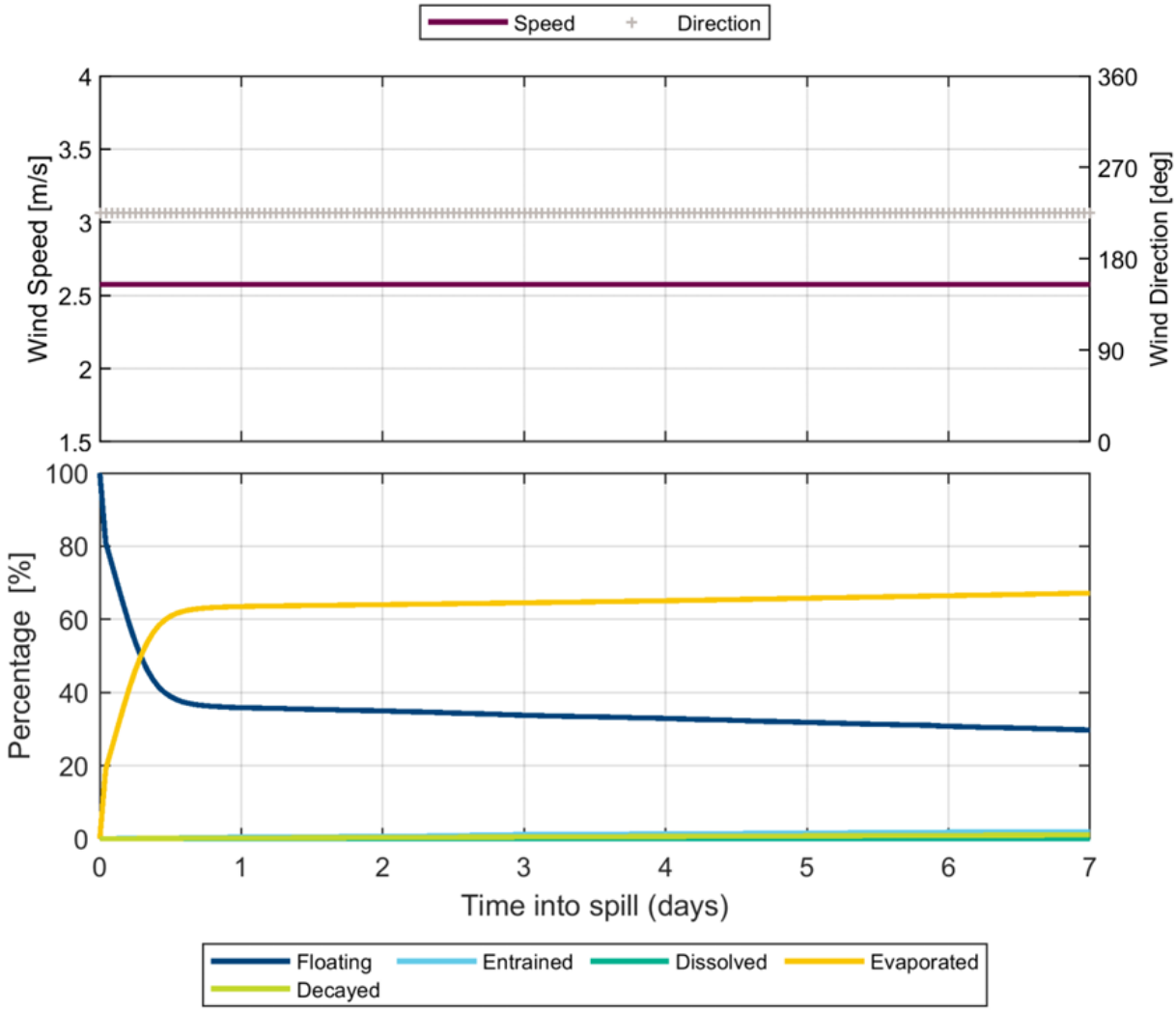


Figure 6-12: Proportional mass balance plot representing the weathering of Eris-1 Condensate spilled onto the water surface as a one-off instantaneous release (50 m3) and subject to a constant 5 kn (2.6 m/s) wind at 27 °C water temperature and 25 °C air temperature.

Under the variable-wind case, where the winds are of greater strength on average, entrainment of Eris-1 Condensate (surface) into the water column is predicted to increase. Approximately 24 hours after the spill, around 54% of the oil mass is expected to have entrained and a further 43% is forecasted to have evaporated, leaving only a small proportion of oil floating on the water surface (<15). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves (approximately >6 m/s) (RPS Group, 2024a).

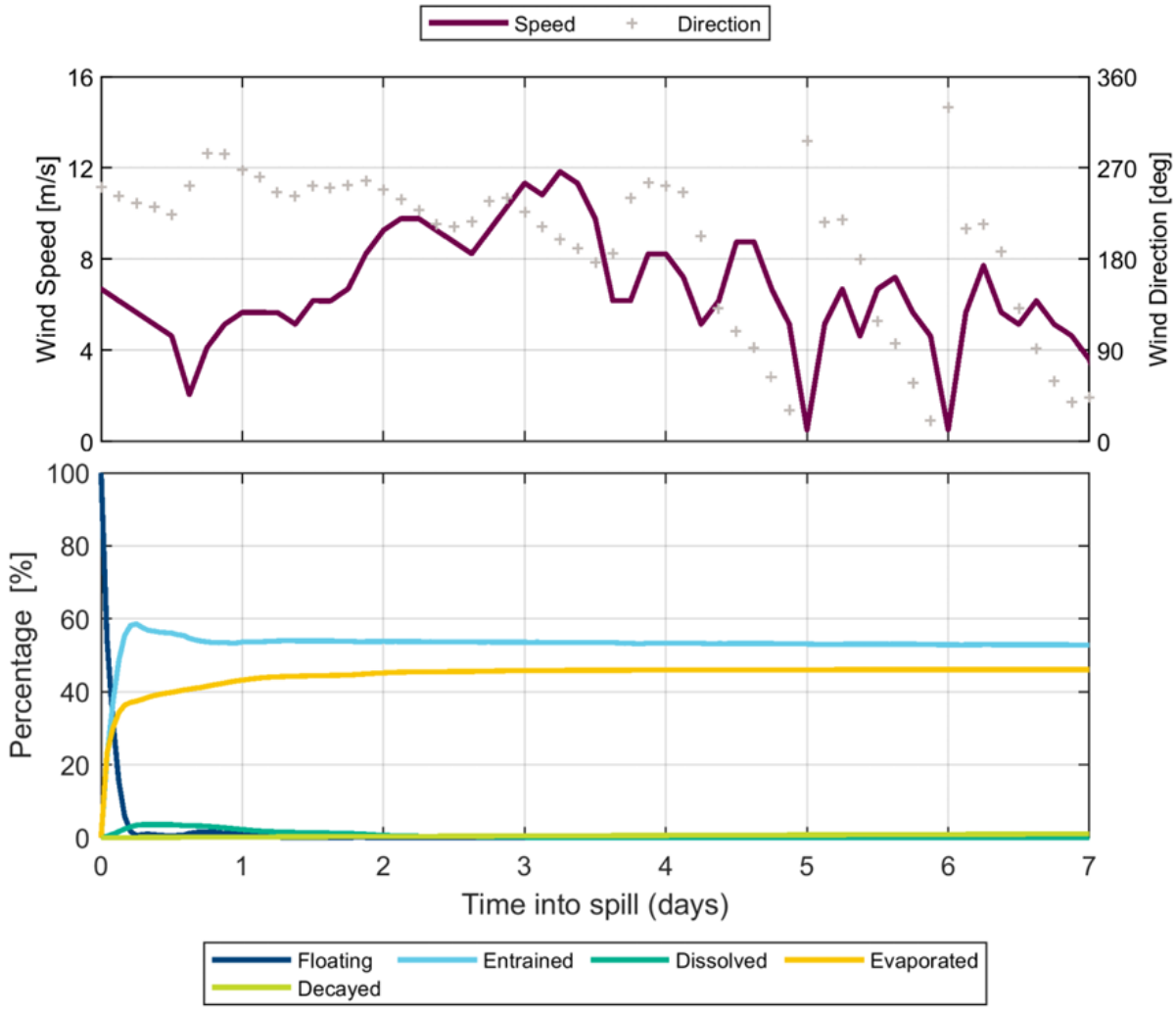


Figure 6-13: Proportional mass balance plot representing the weathering of Xena Fluid spilled onto the water surface as a one-off instantaneous release (50 m3) and subject to variable wind at 27 °C water temperature and 25 °C air temperature.

6.8.2.4 Marine Diesel

Marine diesel, 'Marine Gas Oil' (MGO) is a mixture of volatile and persistent hydrocarbons with low proportions of highly volatile and residual components. Modelling for marine diesel utilised information for a comparable Marine Gas Oil (MGO). In favourable conditions, about 6% of the oil mass should evaporate within the first 12 hours (boiling point < 180°C); a further 34.6% should evaporate within the first 24 hours (180°C < boiling point < 265°C); and a further 54.4% should evaporate over several days (265°C < boiling point < 380°C). About 5% of the oil is shown to be persistent. The aromatic content of the oil is about 3% (RPS Group, 2024e).

The mass balance forecast for the constant-wind case for MGO shows that about 38% of the oil is predicted to evaporate within 24 hours. Under these calm conditions the majority of the remaining oil on the water surface weathers at a slower rate due to comprising the longer-chain compounds with higher boiling points. Evaporation of the residual compounds slows significantly and is then subject to more gradual decay through biological and photochemical processes (RPS Group, 2024e).

Under the more realistic variable-wind case, where the winds are of greater strength, entrainment of MGO into the water column is indicated to be significant. About 24 hours after the spill, around 74% of the oil mass is forecast to have entrained and a further 26% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<1%). The residual compounds tend to remain entrained beneath the surface under conditions that generate wind waves (about >6 m/s).

The increased level of entrainment in the variable-wind case results in a higher percentage of biological and photochemical degradation. Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons decay and/or evaporate over time scales of several weeks to a few months. This long weathering duration extends the area of potential effect (RPS Group, 2024e).

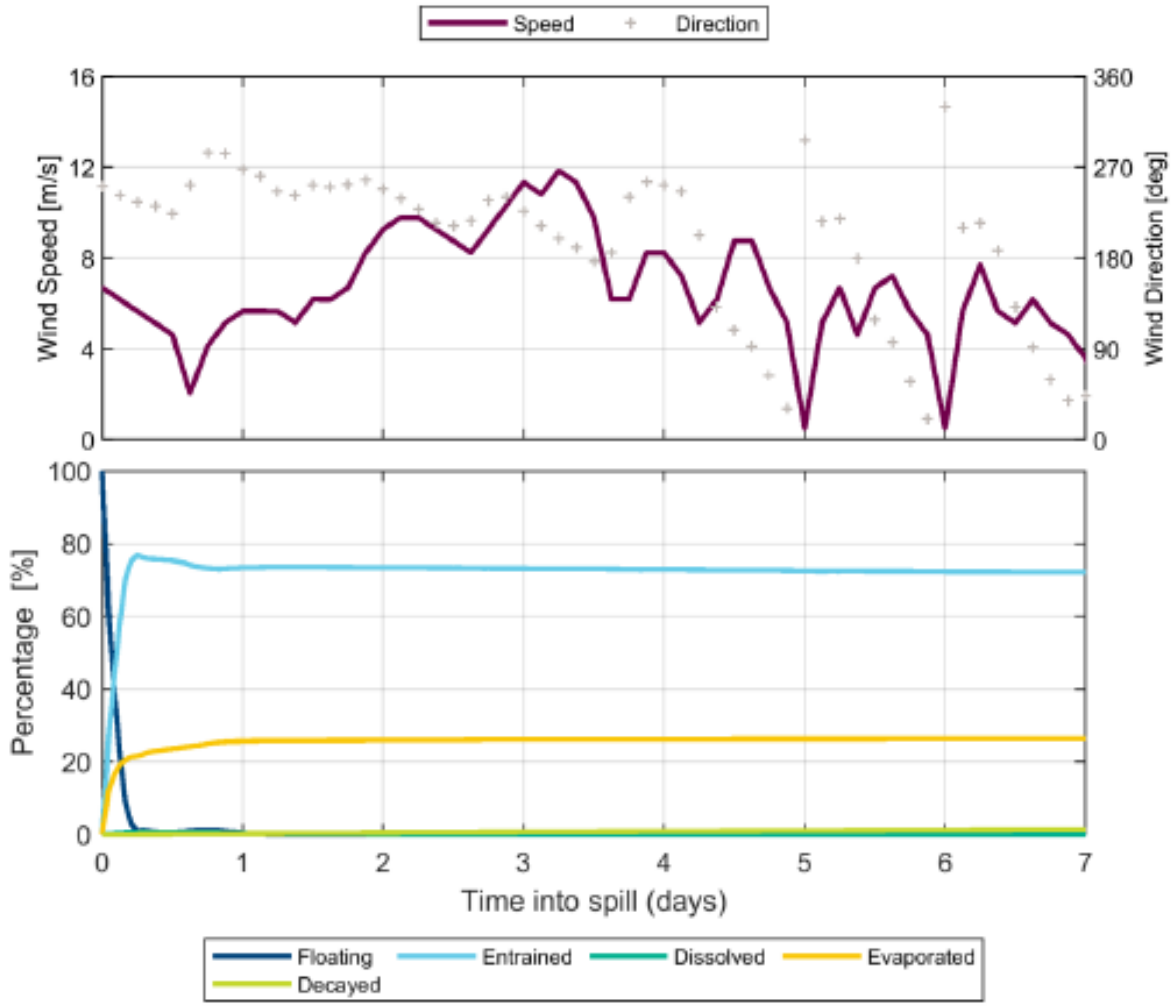


Figure 6-14: Proportional mass balance plot representing the weathering of marine gas oil spilled onto the water surface as a one-off release (50 m3 over one hour) and subject to variable wind at 27°C water temperature and 25°C air temperature.

6.8.3 Quantitative Spill Risk Assessment Methodology

As part of the risk identification process, Woodside identified the range of credible hydrocarbon spill scenarios that may occur during the Petroleum Activities Program. Scenarios that have been classified as MEEs are assessed in Sections 6.8.5 to 6.8.9. Scenarios that are not classified as MEEs are assessed in Section 6.9.

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

A stochastic modelling scheme was followed in this study, whereby SIMAP was applied to repeatedly simulate the defined credible spill scenarios using different samples of current and wind data. These data samples were selected randomly from an historic time-series of wind and current data representative of the study area. Results of the replicate simulations were then statistically analysed and mapped to define contours of percentage probability of contact at identified thresholds around the hydrocarbon release point.

The model simulates surface releases and uses the unique physical and chemical properties of a 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.

Hydrocarbon spill modelling assessments undertaken by RPS undergo initial sensitivity modelling to determine appropriate time to add to the simulation after the cessation of the spill. The amount of time following the spill is based on the time required for the modelled concentrations to practically drop below threshold concentrations anywhere in the model domain in the test cases. This assessment is done by post-processing the sensitivity test results and analysing time-series of median and maximum concentrations in the water and on the surface.

6.8.4 Environment that May Be Affected and Hydrocarbon Contact Thresholds

The outputs of the quantitative hydrocarbon spill modelling are used to assess the environmental consequence by delineating which areas of the marine environment could be exposed to hydrocarbon levels exceeding selected hydrocarbon threshold concentrations if a credible hydrocarbon spill scenario occurred. The summary of the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as the EMBA. 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.

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 hydrocarbon fate. Together, these EMBA have defined the spatial extent for the existing environment described in Section 4.

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/m2), with entrained and dissolved aromatic hydrocarbon concentrations expressed as parts per billion (ppb). A conservative approach to selecting thresholds was taken by adopting the guideline impact thresholds (NOPSEMA, 2019) for surface, entrained, dissolved and accumulated hydrocarbons to define the EMBA for condensate spills from a loss of well control and marine diesel spills. An additional threshold has been included to define the boundary within which socio-cultural impacts may occur, based on visible surface oil (1 g/m2) impacting on the visual amenity of the marine environment. Each of these hydrocarbon thresholds are presented in Table 6-29 and described in the sub-sections below.

Table 6-29: Summary of thresholds applied to the quantitative hydrocarbon spill risk modelling results

Hydrocarbon Type	EMBA				Socio-cultural EMBA
	Dissolved hydrocarbon (ppb)	Entrained hydrocarbon (ppb)	Surface hydrocarbon (g/m2)	Accumulated / shoreline hydrocarbon (g/m2)	Surface hydrocarbon (g/m2)
Condensate	50	100	10	100	1
Marine Gas Oil	50	100	10	100	1

6.8.4.1 Scientific Monitoring

A planning area for scientific monitoring is also described in the Oil Spill Preparedness and Response Mitigation Assessment. This planning area has been set with reference to the low exposure entrained value of 10 ppb detailed in the NOPSEMA (2019) bulletin Oil Spill Modelling.

A scientific monitoring program may be activated following a release event with the potential to contact sensitive environmental receptors. This would consider receptors at risk (ecological and socio-economic) and in particular, any identified Pre-emptive Baseline Areas (PBAs) for the worst-case credible spill scenario or other identified unplanned hydrocarbon releases associated with the operational activities.

6.8.5 Unplanned Hydrocarbon Release: Loss of Well Containment from Operating Wells (MEE-01)

Context		
Reservoir and Wells – Section 3.4.2	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Protected Places – Section 4.8 Socio-economic and Cultural – Section 4.9	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Release of hydrocarbons resulting from subsea well loss of containment		x	x	x	x	x	x	B	C	1	M	LCS GP PJ RBA CV SV	Acceptable if ALARP	EPO 13

Description of Source of Risk

During operations, the facility will receive hydrocarbons via the Pluto flowline from wells in the Pluto, Xena and Pyxis fields, as described in Section 3.

Loss of well containment can lead to an uncontrolled release of reservoir hydrocarbons and well fluids to the environment. Woodside has identified a loss of well containment (LOWC) as the scenario with the worst-case credible environmental outcome as a result of this event. A loss of well containment during operations could occur due to a variety of causes including:

- internal corrosion;
- external corrosion;
- erosion;
- overpressure of the annuli;
- fatigue;
- loss of control of suspended load from vessel (operating near subsea wells) (MEE-04; Section 6.8.8)
- loss of well system structural integrity.

A number of common failure causes due to human error and SCC failures are presented in the generic Human Error and SCE Failure bowties in Section 6.8.10.

The LOWC scenario that may occur during the drilling and any MODU-based well test of Xena-03 is considered separately in Section 6.9.1.

Loss of Well Control – Credible Scenario

The Petroleum Activities Program includes production from a series of subsea wells (Section 3.4.2). To assess the potential consequences, a worst credible hydrocarbon release scenario has been defined for a Pluto well (PLA02). The Pluto well scenario is based on a loss of containment from a well which represents the overall characteristics of the Pluto reservoir and is a high producing well, thus representing a worst credible volume release and potential

environmental impact, for current Pluto, Pyxis and Xena wells. Future wells (PLA-08 and XNA-03) were considered but the existing PLA02 scenario is considered to be worst case.

The LOWC was assumed to have a release duration of 77 days. This duration is based on the estimated time required to successfully drill an intervention well (refer to Appendix H for additional discussion of relief well timing). The characteristic of the release scenario is summarised in Table 6-30. The characteristics of Pluto condensate was used as the basis in the modelling the LOWC scenario (RPS, 2024b); refer to Section 6.8.2 and 6.8.3 for additional information on modelling methods, hydrocarbon characteristics and environmental impact thresholds.

Table 6-30: Summary of worst-case loss of well containment hydrocarbon release scenarios

Scenario	Hydrocarbon	Average Rate (m3/day)	Duration (days)	Depth (m)	Latitude	Longitude	Total Condensate Release Volume (Sm3)
Scenario 2: Well blowout at seabed PLA02	Pluto Condensate	4,848	77	829	19° 54' 48.266" S	115° 7' 54.151" E	59,459

Decision Type, Risk Analysis and ALARP Tools

Woodside implements industry standard practice in well design and construction. In the company's recent history, it has not experienced any well integrity events that have resulted in significant releases or significant environmental impacts. Woodside has never experienced a worst-case loss of well containment in its operational history.

Decision Type

Decision Type B has been applied to this risk under the Guidance on Risk Related Decision Making (Oil and Gas UK 2014). This reflects the complexity of the risk, the higher potential consequence and stakeholder implications should the event be realised. To align with this decision type, a further level of analysis has been applied using risk based tools including the bowtie methodology (described in Section 2.7.3) and hydrocarbon spill trajectory modelling. Company and societal values were also considered in the demonstration of ALARP and acceptability, considered through internal reviews, and stakeholder consultation (Section 5).

The release of hydrocarbons as a result of well loss of containment is considered a Major Environment Event (MEE-01). The hazard associated with this MEE is hydrocarbons in reservoirs, wells, wellheads and xmas trees tied back to the facility.

Quantitative Spill Risk Assessment

Spill modelling of the worst-case credible loss of well containment spill scenario was undertaken by RPS, to determine the fate of hydrocarbons released based on the assumptions. Modelling was undertaken over all seasons to address year-round operations (RPS, 2024b). This is considered to provide a conservative estimate of the EMBA and the potential impacts from the identified worst-case credible release volumes for all loss of well containment scenarios.

Hydrocarbon Characteristics

Hydrocarbon characteristics of Pluto Condensate are provided and described in more detail in Section 6.8.2.

Subsea Plume Dynamics

The subsea loss of well containment scenario would result in a buoyant plume of hydrocarbons, which has been modelled using the OILMAP-Deep numerical model.

Table 6-31: Near-field subsurface discharge model parameters for loss of well containment scenario

Scenario	Hydrocarbon	Rate (m3/hr)	Duration (days)	Depth (m)
Well blowout at seabed (PLA02)	Pluto Condensate	202	77	829

Likelihood

In accordance with the Woodside Risk Matrix, a worst-case loss of well containment has been defined as a 'highly unlikely' event as it 'has occurred once or twice in the industry' (experience based likelihood) and aligns with a frequency of a '1 in 10,000 to 1 in 100,000 year' event. Information to support this likelihood determination is outlined below.

The blowout likelihood was evaluated using Blowout and Well release Frequencies based on SINTEF offshore blowout database as analysed in the IOGP, 2019 Study "Risk Assessment Data Directory Blowout Frequencies – Report 434-02" (September 2019). This uses data from 1980-2014 to determine likelihood for well blowouts and

releases. For a gas well, the IOGP study calculated gas blowout frequency during production as 7.20 x10-5 per year per well.

Given consideration for up to 13 subsea gas wells and using SINTEF/IOGP database, blowout during production occurs with a frequency of 9.36E-04 per year which gives a likelihood level of 2 “Unlikely” on the Woodside Risk Matrix. An order of magnitude reduction has been taken to reduce the likelihood of significant environmental impacts to Level 1 “Highly Unlikely”, for the following reasons:

SINTEF and Lloyds data presented in the IOGP 2019 Blowout Frequencies study considers Production well integrity events between 1980 and 2011, with some additional data from the North Sea between 2011 and 2014. Frequencies are informed by incidents which occurred in Gulf of Mexico, which occurred prior to standards improvement following the Macondo event. Similarly, improvements in standards have been achieved in the North Sea compared to the pre-Macondo era. External causes are excluded for subsea production wells, as causes discussed appears to only be relevant to dry-tree/platform wells.

For the international blowout incidents analysed, these are expected to have resulted in varied release outcomes with varied flow and environmental consequence outcomes – not all are aligned with a worst case unconstrained full-bore blowout, from the highest flowing well, nor necessarily required a relief well to remediate (which is the basis for this risk assessment)

Woodside have adopted international best practice – the O&G UK Well Lifecycle Integrity Guidelines (post-Macondo industry improvements). Woodside continue to apply a rigorous well integrity management program (refer WOMP) as required under WMS and Australian regulations, including verification, and testing of key barriers including SSSVs.

Additionally, when considering likelihood from an ‘Experience’ perspective, and considering the significant environmental consequence likelihood as the outcome of a blowout event; historical blowouts resulting in major impacts to the environment have not occurred “many times in industry”. Hence, alignment with Highly Unlikely likelihood classification is deemed appropriate.

Consequence

The spatial extent and fate (including weathering) of the spilled hydrocarbon were considered during the impact assessment for a worst-case loss of well containment (presented in the following section). These considerations were informed primarily by the outputs from the numerical modelling studies undertaken by RPS (2024b), available information on environmental sensitivities that may credibly be impacted in the event of a worst-case spill, and relevant literature and studies considering the effects of hydrocarbon exposure.

Consequence Assessment

Environment that May Be Affected

Surface Hydrocarbons

Hydrocarbon spill modelling for surface hydrocarbons indicated that concentrations equal to or greater than the 10 g/m2 ecological threshold could potentially be found, in the form of slicks, up to 20 km (south-west) from the release location. There is minimal surface hydrocarbon contact with receptors for the worst-case scenario. The probability of films arriving at receptors were <1%.

Entrained Hydrocarbons

Entrained oil concentrations equal to or greater than the 100 ppb ecological thresholds are predicted to be found up to 420 km (south-west) from the release location. A number of receptors were predicted to be contacted by entrained hydrocarbons. The greatest probabilities of contact by entrained hydrocarbons were at Gascoyne MP (2%) and Montebello MP (71%).

Dissolved Hydrocarbons

Dissolved aromatic hydrocarbon concentrations equal to or greater than the 50 ppb ecological threshold are predicted to be found up to 80 km (south-west) from the release location. The greatest probabilities of contact by dissolved hydrocarbons were at Montebello MP (3%).

Accumulated Hydrocarbons

A number of receptors were predicted to potentially receive shoreline hydrocarbons in the spill modelling. The hydrocarbon contact is expected to be minimal for all receptors for the worst-case scenario. The probability of shoreline accumulation on receptors at all thresholds were <1%.

Summary of Potential Impacts to Environmental Value(s)

The combined EMBA for loss of well containment within which all other credible hydrocarbon spill EMBAs are contained, i.e. the sensitive receptors and their locations that may be exposed to hydrocarbons (surface, entrained, dissolved and accumulated) at or above the set threshold concentrations in the unlikely event of a loss of well containment during the Petroleum Activities Program are outlined in Section 4. The potential biological and ecological impacts of an unplanned hydrocarbon release as a result of a LOWC during the Petroleum Activities Program are discussed in the following sections.

Table 6-32: Environment that May Be Affected – key receptor locations and sensitivities potentially contacted above impact thresholds by the loss of well containment scenario with summary hydrocarbon spill contact ≥ 1% probability

Environmental Setting	Receptor	Environmental, social, cultural, heritage and economic aspects presented as per the environmental risk definitions (Woodside's Risk Management Procedure)																																Probability of hydrocarbon contact and fate (%)[93]					
		Physical		*Biological*																					*Socio-economic and cultural*												*Socio-cultural EMBA*		*EMBA*			
		Water quality	*Sediment quality*	*Marine primary producers*			*Other communities / habitats*								*Protected species*																			*Other species*									
		Open water (pristine)	Marine sediment (pristine)	Coral reef	Seagrass beds / macroalgae	Mangroves	Spawning / nursery areas	Open water – productivity / upwelling	Non-biogenic reefs	Offshore filter feeders and / or deepwater benthic communities	Nearshore filter feeders	Sandy shores	Estuaries / tributaries / creeks / lagoons (including mudflats)	Rocky shores	Cetaceans – migratory Whales	Cetaceans – dolphins and porpoises	Dugongs	Pinnipeds (sea lions / fur seals)	Marine turtles (foraging and internesting areas and significant nesting beaches)	Sea snakes	Whale sharks	Sharks and rays	Seabirds and migratory shorebirds	Pelagic fish populations	Demersal fish populations	Fisheries - commercial	Fisheries – traditional	Tourism and recreation	Protected areas / heritage – European and Indigenous / underwater cultural heritage	Offshore oil and gas infrastructure (topside and subsea)	Surface hydrocarbon (1 to 10 g/m²)	Accumulated hydrocarbons (10 to 100 g/m2)	Surface hydrocarbons (≥ 10 g/m2)	Entrained hydrocarbons (≥ 100 ppb)	Dissolved hydrocarbons (≥50 ppb)	Accumulated hydrocarbons (≥ 100 g/m2)
Australian Marine Parks	Gascoyne MP	✓	✓					✓							✓	✓			✓			✓	✓	✓		✓			✓					2			
	Montebello MP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		40			71	3		

[93] Worst case probability

Open water Environment (Near Spill Area)
Air Quality A hydrocarbon release during a loss of well containment has the potential to result in localised, temporary reduction in air quality and contribution of greenhouse gases to the global concentration of these gases in the atmosphere. Potential impacts from reduced air quality are expected to be minor, short-term and predominantly localised due to rapid entrainment and dissolution of gas bubbles into the water column. There is potential for human health effects for workers in the immediate vicinity of atmospheric emissions that potentially reach the surface. The ambient concentrations of methane and VOCs released from diffuse sources is difficult to accurately quantify, although the behaviour and fate is predictable in open offshore environments as rapidly dissolved in deep waters, and it is dispersed rapidly by meteorological factors such as wind and temperature. Methane and VOC emissions from a hydrocarbon release in such environments are rapidly degraded in the atmosphere by reaction with photo chemically-produced hydroxyl radicals. Due to the unlikely occurrence of a loss of well containment; the temporary nature of any methane or VOC emissions (from either gas surfacing or weathering of liquid hydrocarbons from a loss of well containment); the predicted behaviour and fate of methane and VOCs in open offshore environments; and the significant distance from the PAA to the nearest sensitive air shed (town of Dampier, about 157 km away), the potential impacts are expected to be minor and short-term.
Water Quality Water quality would be affected in the offshore environment within the EMBA due to hydrocarbon contamination from entrained, dissolved and surface hydrocarbons. Due to the weathering processes of the hydrocarbons, impacts to water quality are anticipated to be minor long term and/or significant short term as a result of hydrocarbon contamination above background levels.
Marine Sediment Quality Studies of hydrocarbon concentrations in deep sea sediments in the vicinity of a catastrophic well blowout indicate hydrocarbon from the blowouts can be incorporated into marine sediments (Romero et al. 2015). Proposed mechanisms for hydrocarbon contamination of sediments include sedimentation of hydrocarbons and direct contact between submerged plumes and the seabed (Romero et al. 2015). In the event of a major hydrocarbon release at the seabed, modelling indicates that a pressurised release of condensate would atomise into droplets that would be transported into the water column to the surface. As a result, the extent of potential impacts to the seabed area at and surrounding the release site would be confined to a localised footprint. Marine sediment quality would be reduced as a consequence of hydrocarbon contamination for a small area within the immediate release site for a long to medium term.
Benthic Fauna Communities In the event of a loss of well containment at the seabed, the spill modelling predicted hydrocarbon droplets would be entrained in a gas plume, transporting them through the water column and to the sea surface. As a result, the low sensitivity benthic communities associated with the unconsolidated, soft sediment habitat within the PAA are generally not expected to be exposed to released hydrocarbons. A localised area of impact relating to the hydrocarbon plume at the point of release is however predicted, which would result in a small area of seabed and any associated epifauna and infauna being exposed to hydrocarbons. Impacts to benthic communities within the PAA would subsequently be limited to the immediate area around the release site and may include lethal or sub-lethal impacts. Within the offshore waters of the EMBA, impacts to benthic fauna on the seafloor are not anticipated as hydrocarbons are not expected to gravitate toward the seafloor (as described above). Benthic fauna at geomorphic features located within the water column such as shoals and banks are not predicted to be impacted by dissolved and/or entrained hydrocarbons above the ecological thresholds. Offshore features such Rankin Bank support benthic communities, however, the modelling indicated that hydrocarbon contact would only occur at low thresholds below the ecological threshold. Notably, given the depths of offshore benthic communities such as Rankin Bank, the potential for impacts to benthic communities is considered to be significantly reduced given hydrocarbons will primarily feature in the upper water column.
The Ancient Coastline at 125 m Depth Contour and Continental Slope Demersal Fish Communities KEF, overlap the PAA (Figure 4-10). The Continental Slope Demersal Fish Communities KEF overlaps the Pluto Facility Operational Area. Other KEFs that overlap and are in proximity to the combined EMBA are listed in Section 4.7. These KEFs and geomorphic features may host relatively diverse or abundant fish assemblages compared to the otherwise relatively featureless continental shelf habitats of the NWMR. Impacts to KEFs are discussed below. In summary, impacts to these features are considered to be unlikely. Indirect impacts due to decreased habitat quality at these KEFs to pelagic and demersal fish communities are, therefore, considered unlikely. Impacts to pelagic fish (associated with receptors such as the Rankin Bank) from hydrocarbons are described herein. The values of these KEFs are described in further details within the Master Existing Environment (Woodside, 2022)):

Fish mortalities are rarely observed to occur as a result of hydrocarbon spills (International Tanker Owners Pollution Federation 2011b). This has generally been attributed to the possibility that pelagic fish are able to detect and avoid surface waters underneath hydrocarbon spills by swimming into deeper water or away from the spill affected areas. Fish that have been exposed to dissolved aromatic hydrocarbons are capable of eliminating the toxicants once placed in clean water. Hence individuals exposed to a spill are likely to recover (King et al. 1996). Where fish mortalities have been recorded historically, the spills (resulting from the groundings of the tankers Amoco Cadiz in 1978 and the Florida in 1969) have occurred in sheltered bays.

Laboratory studies have shown that adult fish are able to detect hydrocarbons in water at very low concentrations, and large numbers of dead fish have rarely been reported after hydrocarbon spills (Hjermann et al. 2007). This suggests that juvenile and adult fish are capable of avoiding water contaminated with high concentrations of hydrocarbons. However, sub-lethal impacts to adult and juvenile fish may be possible, given long-term exposure (days to weeks) to polyaromatic hydrocarbon (PAH) concentrations (Hjermann et al. 2007). While modelling of the loss of well containment indicates the potential EMBA for dissolved hydrocarbons is relatively extensive, no time-integrated exposure metrics were modelled; given the oceanographic environment within the EMBA, PAH exposures in the order of weeks for pelagic fish are not considered credible.

The effects of exposure to oil on the metabolism of fish appears to vary according to the organs involved, exposure concentrations and route of exposure (waterborne or food intake). Oil reduces the aerobic capacity of fish exposed to aromatics in the water and to a lesser extent affects fish consuming contaminated food (Cohen et al. 2005). The liver, a major detoxification organ, appears to be the organ where anaerobic activity is most impacted, probably increasing anaerobic activity to facilitate the elimination of ingested oil from the fish (Cohen et al. 2005).

Fish are perhaps most susceptible to the effects of spilled oil in their early life stages, particularly during egg and planktonic larval stages, which can become entrained in spilled oil. Contact with oil droplets can mechanically damage feeding and breathing apparatus of embryos and larvae (Fodrie and Heck 2011). The toxic hydrocarbons in water can result in genetic damage, physical deformities and altered developmental timing for larvae and eggs exposed to even low concentrations over prolonged timeframes (days to weeks) (Fodrie and Heck 2011). More subtle, chronic effects on the life history of fish as a result of exposure of early life stages to hydrocarbons include disruption to complex behaviours such as predator avoidance, reproductive and social behaviour (Hjermann et al. 2007). Prolonged exposure of eggs and larvae to weathered concentrations of hydrocarbons in water has also been shown to cause immunosuppression and allows expression of viral diseases (Hjermann et al. 2007). PAHs have also been linked to increased mortality and stunted growth rates of early life history (pre-settlement) of reef fishes, as well as behavioural impacts that may increase predation of post-settlement larvae (Johansen et al. 2017). However, the effect of a hydrocarbon spill on a population of fish in an area with fish larvae and/or eggs, and the extent to which any of the adverse impacts may occur, depends greatly on prevailing oceanographic and ecological conditions at the time of the spill and its contact with fish eggs or larvae. Hydrocarbons above ecological thresholds although not predicted to, may subsequently impact populations located near to the release location for the worst-case spill scenario, with lethal impacts not considered likely in this offshore environment. No significant escarpments, species of conservation significance, emergent features or areas of high biological productivity characteristically associated with the Continental Slope Demersal Fish Communities KEF have been observed in the PAA. Therefore, potential impacts to these regional-scale KEFs are not expected.

Protected Places

Receptors

The modelling of the worst-case LOWC indicated that Australian Marine Parks may be impacted by entrained (Gascoyne and Montebello Marine Park) and dissolved (Montebello Marine Park) hydrocarbons. No AMPs were predicted to potentially be contacted by surface hydrocarbons in the event of a worst-case spill scenario (RPS, 2024b).

Impacts

The Montebello Marine Park is the closest AMP to the PAA (overlapped by the facility Operational Area) predicted to be contacted by hydrocarbons. Impacts to this AMP are discussed below. Impacts to the natural, cultural, heritage and socio-economic values of the other three AMPs predicted to be contacted by hydrocarbons in a worst-case spill scenario are expected to be similar, however, of lower severity and duration due to their being at least 100 km further from the PAA.

Montebello Marine Park

The Montebello Marine Park comprises an area of about 3,413 km², all of which is zoned as a Multiple Use Zone (IUCN VI). The AMP ranges in water depths from less than 15 m up to 150 m.

The Montebello Marine Park is significant as it contains habitats, species and ecological communities' representative of the Northwest Shelf Province. It overlaps with The Ancient Coastline at the 125m Depth Contour KEF (see 'Key Ecological Features' above for a discussion of impacts to KEFs). The AMP provides connectivity between the deeper waters of the continental shelf and slope, and the adjacent Barrow Island and Montebello Islands State Marine Parks. A prominent seafloor feature in the AMP is Trial Rocks, which consists of two close coral reefs that are emergent at low tide. There is subsequently potential for impacts to shallow coral reef communities at Tryal Rocks, as discussed in the

section ‘Marine Primary Producers – Coral Reef’ above. The specific values of –he AMP and associated impacts are summarised here.

Natural values - The AMP includes diverse benthic and pelagic fish communities and ancient coastline thought to be an important seafloor feature (KEF) and a migratory pathway for humpback whales (BIA). The AMP supports a range of species, including those listed as threatened, migratory, marine and/or cetacean under the EPBC Act. BIAs within the AMP include breeding habitat for seabirds, internesting, foraging, mating and nesting habitat for marine turtles, a migratory pathway for humpback whales and foraging habitat for whale sharks. Impacts to the relevant species and BIAs are discussed in the sections above.

Cultural values - There is limited information about the cultural significance of this AMP, however, it is noted that sea country is valued for Indigenous cultural identity, health and wellbeing. Across Australia, Indigenous people have been sustainably using and managing their sea country for tens of thousands of years. Potential impacts to cultural values of the AMP will closely tie in with the impacts to the natural values of the Marine Park, as addressed above and below; and range from moderate mid-term potential impacts to major long-term potential impacts.

Heritage values - There are no World, National or Commonwealth heritage listings that apply to the AMP. Two historic shipwrecks are located within the Marine Park. Impacts to shipwrecks are discussed below under ‘Cultural Heritage’.

Social and economic values - Tourism, commercial fishing, mining and recreation are important activities in the AMP. These activities contribute to the wellbeing of regional communities and the prosperity of the nation. Impacts to tourism and recreation within the AMP are discussed with regard to offshore and nearshore waters in the sections ‘Tourism and Recreation’ below.

A worst-case hydrocarbon spill scenario has the potential to result in impacts to these AMPs that range from moderate, medium-term to major, long-term, with the consequence severity dependent on the actual timing, duration and extent of a spill.

Key Ecological Features

KEFs located within the combined EMBA are listed in Section 4.7 (described in the Master Existing Environment (Woodside, 2022)).

The modelling for the worst-case LOWC (MEE-01) predicted an overlap of entrained hydrocarbons above the ecological threshold with the following offshore features:

- Ancient coastline at the 125 m depth contour KEF
- Continental slope demersal fish communities KEF
- Glomar Shoals KEF

The Ancient Coastline, Glomar Shoals and Continental Slope Demersal Fish Communities are KEFs primarily defined by seabed geomorphological features and have been classified as KEFs in recognition of the potential for increased biological productivity and, therefore, ecological significance. Potential impacts to these KEFs include the direct and indirect impacts to benthic fauna / habitats and associated impacts to demersal fish populations described in the sections above.

In-water hydrocarbon exposure (entrained and dissolved) are only predicted to occur within the upper 0–10 m of the water column, therefore, benthic values of these KEFs are not anticipated to be impacted following a LOWC.

Notably, other than some small outcrops of hard substrate, no features indicative of the Ancient Coastline have been identified within the portion of this KEF overlapping the PAA (as per Section 4.7) These KEFs cover extensive areas (as listed in the Master Existing Environment (Woodside, 2022)) and, should impacts to receptors within the KEFs (e.g. benthic communities) occur, these would be anticipated to be short lived with no permanent impacts to the KEF.

Protected Species

A number of cetaceans were identified as potentially occurring with the PAA and the combined EMBA (see Section 4). In the event of a worst-case LOWC; surface, entrained and dissolved hydrocarbons exceeding environmental impact threshold concentrations may drift across habitat for oceanic cetacean species and the migratory routes and/or BIAs of cetaceans considered to be MNES (e.g. humpback whale and pygmy blue whale north and southbound migrations).

Cetaceans that have direct physical contact with surface, entrained or dissolved aromatic hydrocarbons may suffer surface fouling, ingestion of hydrocarbons (including from prey, water and sediments), aspiration of oily water or droplets and inhalation of toxic vapours (Deepwater Horizon 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 (Deepwater Horizon Natural Resource Damage Assessment Trustees 2016).

Given cetaceans maintain thick skin and blubber, external exposure to hydrocarbons is more likely to result in irritation to the more exposed skin and eyes. Entrained hydrocarbons may also be ingested, particularly by baleen whales which feed by filtering large volumes of water. Fresh hydrocarbons (i.e. typically in the vicinity of the release location) may have a higher potential to cause toxic effects when ingested, while weathered hydrocarbons are considered to be less likely to result in toxic effects.

Given the non-persistent nature of the relevant hydrocarbons, such as Pluto condensate, and the relatively small floating hydrocarbon release of the worst-case LOWC EMBA (RPS Group, 2024a, 2024b) the area where potential impacts from inhalation and physical contact with surface slicks may occur would primarily be localised around the release location and impacts would most likely be expected to be limited to individuals that contact the slick, as discussed above. The modelling for surface hydrocarbons above the ecological threshold did not overlap any cetacean BIAs beyond those that are found within the PPA: the EIO pygmy blue whale migration and distribution BIA and the humpback whale migration (north and south) BIA.

There is a small overlap of the southern right whale migration and reproduction BIAs in proximity to the North West Cape with entrained and dissolved oil exceeding thresholds, however no floating oil is present in this area and no hydrocarbons are predicted to enter the Exmouth Gulf, which is used as a resting area by humpback whales during the southern migration and a reproduction area by the Southern Right Whale.

In a review of the impacts of large-scale hydrocarbon spills on cetaceans, it was found that exposure to oil from the Deepwater Horizon resulted in increased mortality to cetaceans in the Gulf of Mexico (DHNRDT 2016), and long-term population level impacts to killer whales were linked to the Exxon Valdez tanker spill (Matkin et al. 2008). Given the nature of the condensate (compared with crude oil from these two spills) and relatively small nature of the surface slick, such exposure impacts to cetaceans may not eventuate.

Geraci (1988) has identified 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 also recorded larger whales (both mysticetes and odontocetes) and smaller delphinids traveling through and feeding in oil slicks. During the Deepwater Horizon spill cetaceans were routinely seems swimming in surface slicks offshore (and nearshore) (Aichinger Dias et al. 2017).

Suitable habitat for oceanic toothed whales (e.g. sperm whales) and dolphins (e.g. long-snouted spinner dolphin) is broadly distributed throughout the NWMR and, as such, whilst these species may be present within the combined EMBA, impacts from a spill are unlikely to affect an entire population. Notably, there are no known aggregation areas or BIAs for dolphins or whales within the PAA.

East Indian Ocean (EIO) Pygmy Blue Whale and Humpback Whale

EIO pygmy blue whales and humpback whales are known to migrate seasonally through the worst-case LOWC EMBA. A migration and distribution BIA for the pygmy blue whale overlaps the PAA and Facility and Xena-03 Operational Areas. A major spill event in June through to November would coincide with the humpback whale migration through the waters off the Pilbara, North West Cape and Shark Bay (outside the EMBA). A major spill in April to July or October to January would coincide with EIO pygmy blue whale migration (Double et al., 2010). Both the pygmy blue and humpback whales are baleen whales and are therefore most likely to be significantly impacted by toxic effects of the oil which can be engulfed during feeding. However, feeding during migrations is typically low level and opportunistic, with most feeding for both species occurring in the Southern Ocean (Thums et al., 2022). Subsequently the risk of ingestion of hydrocarbons through feeding is low.

Migrations of both pygmy blue whales and humpback whales are protracted through time and space (i.e. the whole population will not be within the worst-case LOWC EMBA at any one time), and as such, a hydrocarbon loss of containment is not considered likely to affect an entire population.

Dugong

There are no BIAs or known areas of aggregation in the offshore waters of either the combined EMBA or worst-case LOWC for the dugong. The BIAs are only found in nearshore waters, which is assessed below.

Summary

A worst-case hydrocarbon spill scenario has the potential to result in moderate, medium-term impacts to offshore cetacean species, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.

Marine Turtles

Five of the six marine turtle species were identified as potentially occurring within the combined EMBA of all spill scenarios, with a number of BIAs and Habitat Critical areas also identified. A flatback turtle internesting BIA intersects the PAA and Facility and Xena-03 Operational Areas (see Section 4.6.2).

Modelling for the worst-case LOWC (MEE-01) predicted a low probability of overlap by entrained hydrocarbons within a number of BIAs; including the green turtle, hawksbill, and flat back turtle internesting buffer (RPS, 2024b). The modelling predicted no exposure to shorelines at any exposure threshold. Therefore, impacts to Habitat Critical areas are not anticipated following a LOWC.

Adult marine turtles exhibit no avoidance behaviour when they encounter hydrocarbon spills (National Oceanic and Atmospheric Administration 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 (National Oceanic and Atmospheric Administration 2010). Oiling can also irritate and injure skin, which is most evident on pliable areas such as the neck and flippers (Lutcavage et al. 1995). A stress response associated with this exposure pathway includes an increase in the production of white

blood cells and even a short exposure to hydrocarbons may affect the functioning of their salt glands (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 (National Oceanic and Atmospheric Administration 2010).

Given the hydrocarbon is expected to weather rapidly when released to the environment, relatively fresh entrained hydrocarbons (which are typically relatively close to the release location) are considered to have the greatest potential for impact. Given the non-persistent nature of the hydrocarbons and the relatively small floating hydrocarbon EMBA, the area where potential impacts from inhalation may occur would be localised around the release location. There is also minimal surface hydrocarbon contact with the marine turtle BIAs and Habitat Critical areas listed in Section 4.6.2.

Due to the offshore location and water depths within the PAA, this area is unlikely to represent important habitat for marine turtles. There are also no known areas of aggregation (i.e. BIAs, Habitat Critical to Survival) for marine turtles within the PAA.

The d LOWC EMBA only overlapped the outer edges of a few marine turtle internesting BIAs, with no overlap of Habitat Critical to Survival areas for marine turtles (RPS, 2024b). Marine turtles are, therefore, likely to be present in the offshore waters of the EMBA, particularly as they are a migratory species which often travel large distances during migration periods. Important areas of aggregation for foraging, nesting and mating are typically associated with nearshore islands along the Pilbara and Gascoyne coastlines, as opposed to offshore waters.

Summary

In the event of a LOWC, there is potential that surface, entrained and dissolved hydrocarbons exceeding environmental impact threshold concentrations will be present in offshore waters. Therefore, a hydrocarbon spill may disrupt a portion of marine turtle populations for the green, flatback, hawksbill, loggerhead and/or leatherback turtle. However, there is considered to be no threat to overall population viability given the non-persistent nature of predicted hydrocarbons.

Sea Snakes

A number of sea snake species which are listed Marine under the EPBC Act were identified by the PMST as potentially occurring within the combined EMBA. Two critically endangered species were identified as known to occur within the EMBA, the short-nosed sea snake and the leaf-scaled sea snake.

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 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. Oiling of the sensory and respiratory areas on the body of the snake is shown to prevent the mouth from opening and obstructing the nares and airway which can interfere with feeding and result in asphyxiation. Oiling of the outer body surface has shown to inhibit their movements which can lead to overexertion and drowning. Sea snakes are also capable of transcutaneous oxygen uptake, therefore oiling to the surface of their cutaneous layer can compromise this ability (Yaghmour et al., 2022).

In general, seasnakes frequent the waters of the continental shelf area around offshore islands and potentially submerged shoals (water depths <100 m) (impacts described below). However, it is acknowledged that seasnakes may be present in the PAA and within the EMBA. Their abundance is not expected to be high, given the water depth and offshore environment.

In summary, a hydrocarbon spill may have a minor disruption to some individuals in the offshore environment. Population level impacts to seasnake species are not, however, considered credible.

Sharks and Rays

A number of shark and ray species were identified as potentially occurring within the PAA and/or combined EMBA (see Section 0). Two foraging BIAs for the whale shark, overlaps the combined EMBA; foraging (northward from Ningaloo along the 200 m isobath; PAA, combined EMBA) and foraging (high prey density - Ningaloo Marine Park; EMBA). Whale sharks are, therefore, likely to transit the open offshore waters within the EMBA whilst they migrate to and from Ningaloo Reef between July and November. Modelling for the worst-case LOWC scenario (MEE-01) predicted exposure to only one of the whale shark foraging BIA; foraging northward from Ningaloo along the 200 m isobath (RPS, 2024b).

Other listed Threatened pelagic species identified in the PMST report as potentially occurring within the combined EMBA include the white shark and grey nurse shark. There are no known areas of aggregation for these species in the offshore waters of the combined EMBA.

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 (i.e. consumption of prey). As gill breathing organisms, sharks and rays may be vulnerable to toxic effects of dissolved hydrocarbons (entering the body via the gills) and entrained hydrocarbons (coating of the gills inhibiting gas exchange). In the offshore environment, it is probable that

pelagic shark species, such as the whale shark, are able to detect and avoid surface waters underneath hydrocarbon spills by swimming into deeper water or away from the affected areas.

Impacts to whale sharks from a hydrocarbon spill will depend on the timing of the spill, however; whale sharks as a pelagic species are expected to demonstrate avoidance behaviour and population level impacts are not anticipated.

Seabirds

A number of EPBC Act listed Threatened and/or Migratory seabird and shorebird species were identified by the PMST as potentially occurring within the PAA and/or combined EMBA (see Section 4.6.4). The EMBA for the worst-case LOWC (MEE-01) also predicted exposure to a number of seabird BIAs; including the wedge-tailed shearwater roseate tern breeding and foraging BIAs.

Seabirds and migratory shorebirds are particularly vulnerable to contact with floating hydrocarbons, which may mat their feathers. This may lead to hypothermia from loss of insulation and ingestion of hydrocarbons when preening to remove hydrocarbons; both impacts may result in mortality (Hassan and Javed 2011). Notably, the credible loss of well containment scenarios result in a relatively small floating hydrocarbon EMBA which is primarily centred around the release location. Subsequently, the potential for seabird exposure to floating hydrocarbons is considered to be low. Migratory shorebirds are considered unlikely to interact with spilled hydrocarbons as they are not expected to stop over within the offshore waters surrounding the PAA during their migrations between mainland/island areas. Many seabirds and migratory shorebirds forage over extensive areas (some hundreds of kilometres out to sea) so individuals may be present. Seabirds which are roosting or resting on the Pluto platform may also be impacted, however; these would be individuals and not populations.

Seabirds which plunge dive to feed on prey may contact entrained or dissolved hydrocarbons, most likely through ingestion of prey which are contaminated. Impacts to prey abundance as a result of hydrocarbons may also indirectly impact individuals.

There are several breeding BIAs for seabirds and migratory shorebirds that overlap with the combined EMBA and breeding BIAs within the LOWC EMBA, which are associated with breeding and nesting at locations along the Gascoyne and Pilbara coastlines (including near-shore islands). The outer edge of a breeding BIA for the wedge-tailed shearwater overlaps with the PAA, and another is less than a kilometre away. It is likely that individual birds may, therefore, transit the PAA.

However, the EMBA for the worst-case LOWC predicted no impact to shorelines at any thresholds, therefore impacts to breeding sites are not anticipated in the event of a LOWC.

Given the relatively low area of floating hydrocarbons and the lack of key aggregation areas for migratory shorebirds and seabirds within the PAA, impacts at the population level are not anticipated. Individual animals may, however, be impacted with potential fatalities occurring from oiling.

Nearshore Waters (Mainland and Islands)

The combined EMBA overlaps the nearshore waters of a few shorelines and islands. However, the modelling for the LOWC scenario EMBA (MEE-01), predicted no shoreline, entrained or dissolved hydrocarbons (at or above the defined ecological thresholds) to potentially contact shallow, nearshore waters of identified islands and mainland coastlines. Therefore, impacts to nearshore waters is not predicted from a MEE-01 scenario.

Submerged Shoals and Banks

The combined EMBA overlaps a few submerged shoals and banks (Section 4.5). However, the modelling for the LOWC scenario EMBA (MEE-01), did not predict entrained or dissolved hydrocarbons (at or above the defined ecological threshold) to contact any submerged shoals and banks. Therefore, impacts are not anticipated for a MEE-01 scenario at these receptors.

All Settings

Coral Reefs

Receptors

There are no coral reef habitats located within the PAA. The closest coral reef habitats exist at Rankin Bank, Muiron Islands, the Montebello Islands, Barrow Island, Dampier Archipelago, Lowendal Island and numerous receptors associated with Ningaloo Reef, including the reef itself (see Section 4.5).

As discussed in ‘Benthic Fauna’, no dissolved or entrained hydrocarbons above the ecological threshold are anticipated to contact these known coral habitat areas for MEE-01. Therefore, impacts to coral reef habitats at these features are not anticipated during this scenario.

Modelling for the vessel separation scenario (MEE-04) also predicted low probability of hydrocarbon contact at the Montebello Shoals, Outtrim Patches, and Tryal Rocks.

Productivity

Primary production by plankton (supported by sporadic upwelling events in the offshore waters of the NWS) is an important component of the primary marine food web. Planktonic communities are generally mixed; including phytoplankton (cyanobacteria and other microalgae) and secondary consuming zooplankton, such as crustaceans (e.g. copepods), and the eggs and larvae of fish and invertebrates (meroplankton).

Plankton exposure to hydrocarbons in the water column can result in changes in species composition with declines or increases in one or more species or taxonomic groups (Batten et al. 1998). Phytoplankton may also experience decreased rates of photosynthesis (Tomajka 1985). For zooplankton, direct effects of contamination may include toxicity, suffocation, changes in behaviour, or environmental changes that make them more susceptible to predation.

Impacts on plankton communities are likely to occur in areas where entrained or dissolved aromatic hydrocarbon threshold concentrations are exceeded, but communities are expected to recover relatively quickly (within weeks or months). This is due to high population turnover with copious production within short generation times that also buffers the potential for long-term (i.e. years) population declines (International Tanker Owners Pollution Federation 2011a). Therefore, any impacts to exposed planktonic communities present within the EMBA are anticipated to be short-term.

Filter Feeders

Hydrocarbon exposure to offshore filter feeding communities may occur, however, due to the hydrocarbon modelling predicting no contact above the ecological threshold and the anticipated depth of the entrained and dissolved aromatic hydrocarbons. See discussion above on potential impacts.

Nearshore filter feeders that are present in shallower water <20 m may potentially are unlikely to be impacted by entrained hydrocarbon based on the predicted modelling.

The released hydrocarbons are predicted to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location) before they reach any potential filter feeder community. Therefore, impacts such as localised, long-term effects to community structure and habitat, are not predicted.

Seagrass Beds, Macroalgae and Mangroves

No primary macroalgal / seagrass communities identified within the worst-case LOWC EMBA (RPS, 2024b). Therefore, these communities not predicted to be exposed to hydrocarbons above the ecological threshold.

Summary of Potential Impacts to Socio-economic Values	
Setting	***Receptor Group***
All Settings	***Cultural Features and Heritage Values*** Through consultation and review of available literature (Section 4.9), Woodside understands that sea country, including marine ecosystems and species, archaeological heritage and heritage sites, marine parks, as well as intangible cultural heritage may be impacted in the event of a hydrocarbon release from a loss of well containment. Cultural features and heritage values that have the potential to be impacted include: Marine ecosystems and species: Marine ecosystems may hold both cultural and environmental value to Traditional Custodians (see Section 4.9), with cultural and environmental values intrinsically linked (DCCEEW 2023, MAC 2021 as cited in Woodside 2023a). It necessarily follows that an impact to marine ecosystems has the potential to impact cultural features where the impact is detectable within Sea Country— the seascape which Traditional Custodians view, interact with or hold knowledge of. The EMBA is known to include habitat for culturally important species such as whales, whale sharks, turtles, dugongs, plankton, and seagrass (Sections 4.6 and 4.9). In the event of a worst-case release of hydrocarbons individual fauna may be directly impacted or impacted through temporary degradation of their habitats, however, no population level impacts as expected. Impacts are not expected to occur to ecologically significant proportions of the populations of the species, nor expected to result in a decrease of the quality of the habitat such that the extent of these species is likely to decline. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained. Heritage Sites: The combined EMBA overlaps a number of native features and heritage values (see Section 4.9) Any oil (combined EMBA – not applicable to MEE01) that reaches the shoreline has potential to impact on indigenous heritage places along the coastline. In the unlikely event of a hydrocarbon release, shoreline accumulation may affect sensitive artefacts or areas, which could damage their heritage value. Marine Parks: The combined EMBA overlaps a number of AMPs under North-West Marine Parks Network Management Plan 2018 and a few State Marine Parks. Management Plans for these parks recognise cultural values of Indigenous groups (Section 4.9). Due to the low maximum concentrations predicted to reach any marine park, it is not anticipated that their values will be compromised.

	Intangible cultural heritage: Impacts may occur to intangible cultural values such as songlines; creation/dreaming sites, sacred sites, ancestral beings; cultural obligations to care for Country; knowledge of Country/customary law and transfer of knowledge; connection to Country; Access to Country; kinship systems and totemic species, resource collection. Related intangible cultural heritage may include the transmission of cultural knowledge about whales and whale behaviour, including birthing areas, whale communication and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn, 2021). Inter-generational transmission of cultural knowledge (including songlines) relating to marine reptiles may be impacted where changes results in reduced sightings (e.g., through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO, 2003). In the unlikely event of a hydrocarbon release, intangible cultural heritage values may be impacted.
Offshore Waters	***Fisheries – Commercial*** Please refer to Section 4.10.1 for a list of the fisheries occurring within the EMBA, and for those considered to have potential for impact with the Petroleum Activities Program. A worst-case hydrocarbon spill, as modelled for this EP, is not considered likely to cause significant direct impacts on the target species of these commercial fisheries, as discussed below. Refer to above sections for a discussion of impacts to spawning. Fish exposure to hydrocarbon can result in 'tainting' of their tissues. Even very low levels of hydrocarbons can impart a taint or 'off' flavour or smell in seafood. Tainting is reversible through the process of depuration which removes hydrocarbons from tissues by metabolic processes, although it is dependent upon the magnitude of the hydrocarbon contamination. Fish have a high capacity to metabolise these hydrocarbons while crustaceans (such as prawns) have a comparably reduced ability (Yender et al. 2002). Seafood safety is a concern associated with spill incidents. Therefore, actual or potential contamination of seafood can affect commercial and recreational fishers and can impact seafood markets long after any actual risk to seafood from a spill has subsided (Yender et al. 2002). A major hydrocarbon spill would result in the establishment of an exclusion zone around the spill affected area. There would also be a temporary prohibition on fishing activities for a period of time. Subsequently, there is potential for economic impacts to the affected commercial fishing operators. Additionally, hydrocarbon can foul fishing equipment such as traps and trawl nets, requiring cleaning or replacement. Impact to fishers would subsequently be dependent on the extent of the spill and resulting exclusion zone and may cause economic impacts due to fishing bans, damaged equipment and/or consumer perception of seafood safety. These impacts would not be expected to be long term or affect the viability of the fishery.
	Tourism and Recreation Tourism would likely be adversely affected if a visible surface slick entered areas of tourism activity. Spill modelling predicted low probability of hydrocarbon contact to the closest tourism area, such as the Montebello MP, Rankin Bank, and the Dampier AMP. These areas have some seasonal charter boat operators and recreational fishing activities, mainly concentrated around the islands. Recreational fishers predominantly target tropical species, such as emperor, snapper, grouper, mackerel, trevally and other game fish. Recreational angling activities include shore-based fishing, private boat and charter boat fishing, with the peak in activity between April and October (Smallwood et al. 2011). Impacts on species that are recreationally fished are described above under 'Commercial Fisheries' and 'Pelagic and Demersal Fish'. In the event of a major spill, tourists and recreational users may also avoid areas due to perceived impacts, including after the hydrocarbon spill has dispersed. There is also the potential for stakeholder perception that this remote environment will be contaminated over a larger area and for the longer term resulting in a prolonged period of tourism decline. Oxford Economics (2010) assessed the duration of hydrocarbon spill in relation to tourism impacts and found that on average, it took 12 to 28 months to return to baseline visitor spending. There is likely to be significant impacts to the tourism industry, wider service industry (hotels, restaurants and their supply chain) and local communities in terms of economic loss as a result of spill impacts to tourism. Recovery and return of tourism to pre-spill levels will depend on the size of the spill, effectiveness of the spill clean-up and change in any public misconceptions regarding the spill (Oxford Economics 2010).

	However, based on the low levels of tourism and recreation at these locations (compared to other locations such as the Ningaloo Coast), and the low probability of hydrocarbons above the socio-economic thresholds contacting these areas impacts are not expected to be significant.
	Offshore Oil and Gas Infrastructure Surface hydrocarbons from a worst-case spill may affect production from existing offshore petroleum facilities (e.g. platforms and FPSOs). For example, facility water intakes for cooling and fire hydrants could be shut off which could in turn lead to the temporary cessation of production activities. Spill exclusion zones established to manage the spill could also prohibit activity support vessel access as well as tankers approaching facilities on the NWS. However, no petroleum operations are located within the spill EMBA that would likely be affected. The closest oil and gas operation is the Wheatstone platform (operated by Chevron). Other nearby facilities include the Woodside-operated Angel platform, GWA and the Santos operated John Brookes platform (Section 4.10.5). Operation of these facilities is unlikely to be affected in the event of a worst-case loss of well containment.

MEE-01 Well Loss of Containment – Risk Analysis
A bowtie risk analysis was undertaken to assess MEE-01; refer to the below figures for bowtie diagrams which were an output of Woodside's risk analysis process.

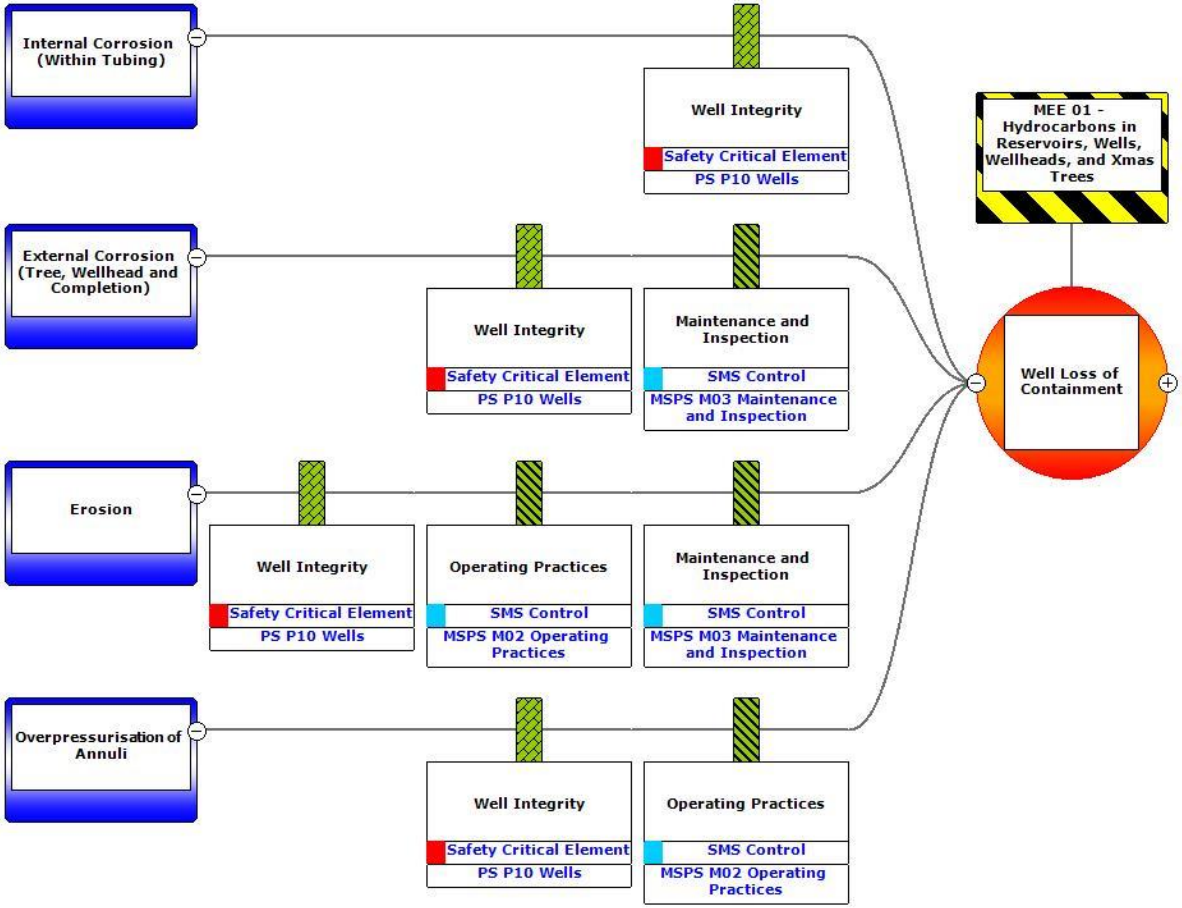


Figure 6-15: MEE-01 Wells Loss of Containment (Causes 1–4)

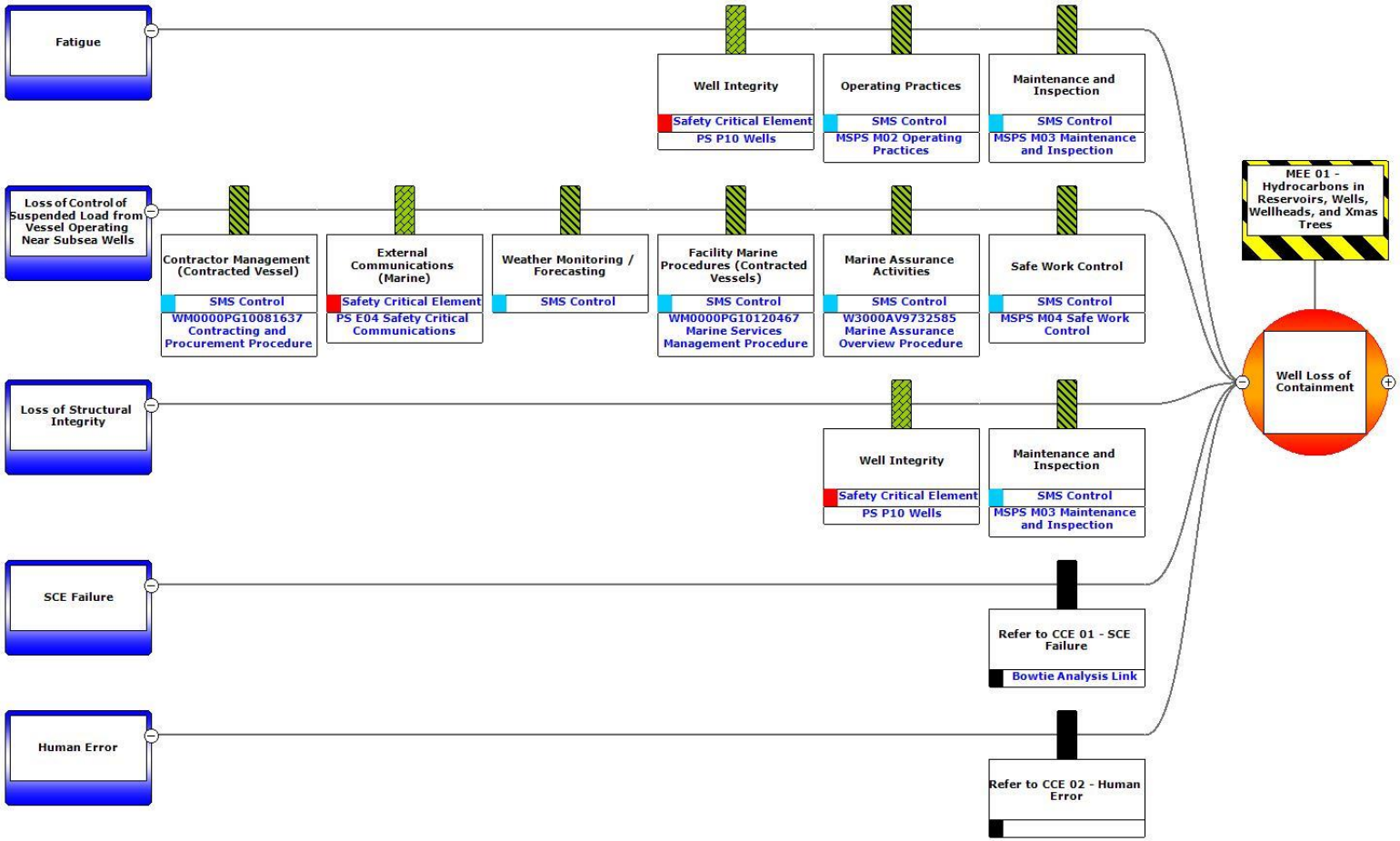


Figure 6-16: MEE-01 Wells Loss of Containment (Causes 5–9)

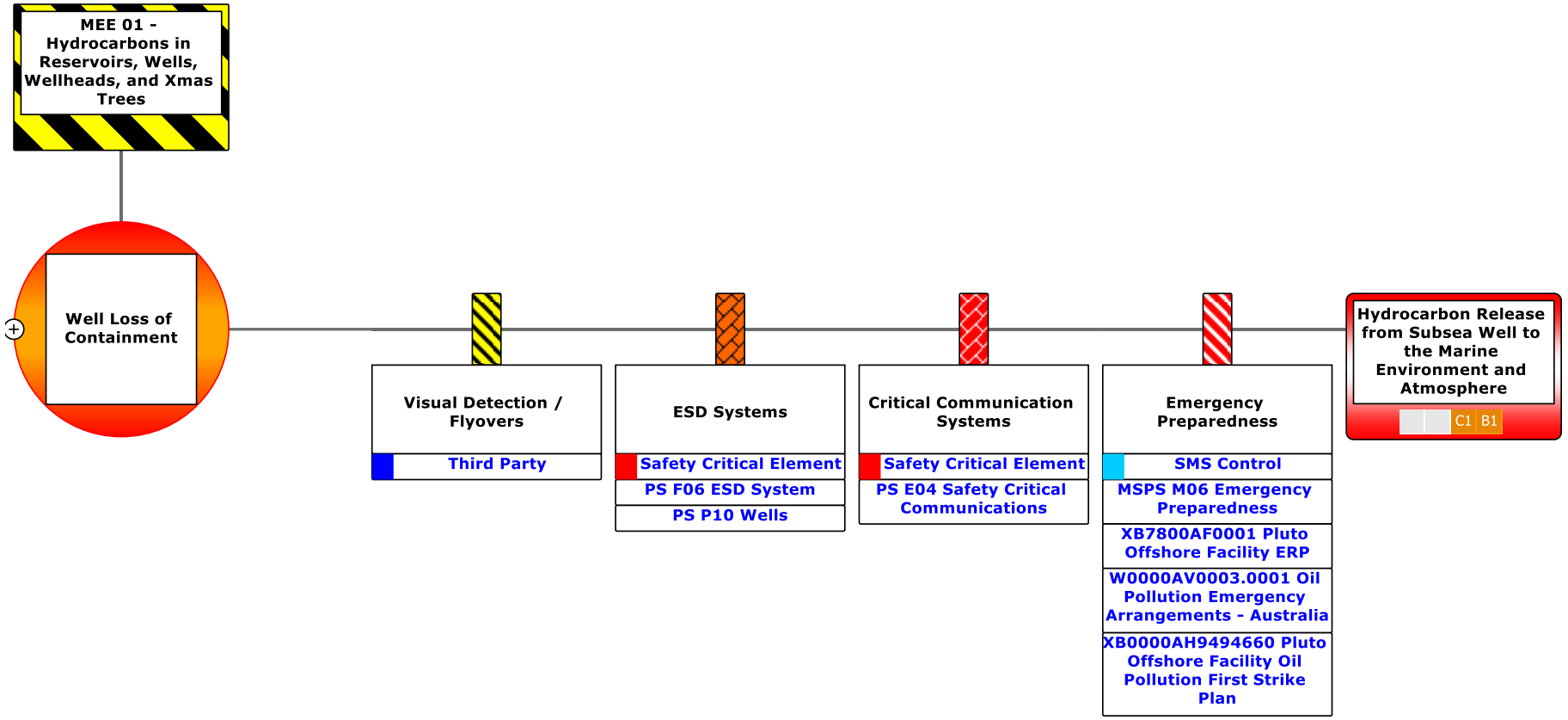


Figure 6-17: MEE-01 Wells Loss of Containment (Outcomes)

MEE-01 Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Preventative Barriers – Safety and Environmental Critical Elements				
Elimination	N/A	No elimination or substitution controls were identified beyond those incorporated in design.		
Substitution				
Engineering Controls	Maintain well and hydrocarbon-containing infrastructure integrity to contain reservoir fluids within the well envelope to avoid an MEE	P10 – Wells	Prevention (Technical)	Yes C 13.1
Engineering controls	Maintaining availability of critical external and internal communication systems to–prevent and facilitate response to accidents and emergencies.	E04 - Safety Critical Communication Systems	Prevention (Technical)	Yes C 13.2
Mitigating Barrier – Safety and Environmental Critical Elements				
Engineering Controls	Maintaining availability of critical external and internal communication systems to prevent and facilitate response to accidents and emergencies.	E04 – Safety Critical Communication Systems	Mitigation (Technical)	Yes C 13.2
Engineering controls	Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	F06 – Safety Instrumented System P10 – Wells	Reduction / Control (Technical)	Yes C 13.3
Legislation Codes and Standards				
Procedures and Administration	OPGGS (Resource Management and Administration) Regulations 2011: Accepted Well Operations Management Plan (WOMP) to demonstrate that the risks to well integrity are managed in accordance with sound engineering principles, standards, specifications, and good oilfield practice. It	Pluto Well Operations Management Plan	Prevention / Mitigation (Administration)	Yes C 13.4 Control based on legislative requirements – must be adopted)

MEE-01 Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
	describes the systems that are in place to ensure well design and integrity is managed for the well lifecycle, thus contributing to management of associated potential environmental consequences of well integrity events.			
Procedures and Administration	Incident reports are raised for unplanned releases within event reporting system.	Woodside Health, Safety and Environment Event Reporting and Investigation Procedure	Prevention/ Mitigation (Administration)	Yes C 13.5 Control based on Woodside Standards
Management System Specific Measures: Key Standards or Procedures				
Procedures and Administration	Implementing management systems to maintain: M02 – Operating practices M03 – Maintenance and inspections M04 – Safe work control Marine Services Management Procedure Marine Assurance Overview Procedure Contracting and Procurement Procedure.	MSPS-02 – Operating Practices MSPS-03 – Maintenance and Inspections MSPS-04 – Safe Work Control	Prevention (Administration)	Yes – see Section 7
Emergency Response and Contingency Planning	Implementing management systems to maintain: M06 – Emergency Preparedness Pluto Offshore Facility Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia.	MSPSM06 – Emergency preparedness Pluto Offshore Facility Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia	Mitigation (Administration)	Yes – See Section 7 Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response.
Risk Based Analysis				
For risks identified as MEEs, a detailed risk-based Bowtie Analysis (as outlined in Section 2.7.3) has been used to identify, analyse and demonstrate that controls in place reduce the risk associated with each MEE to ALARP. Controls have been selected following hierarchy of control principles and consider independence of each barrier and their type of effect in controlling the hazardous event.				

MEE-01 Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***

Application of Woodside's Risk Management Procedures and implementation of the WOMP ensures the continuous identification of hazards, systematic assessment of risks, and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

- ongoing hazard identification, risk assessment and the identification of control measures
- ongoing integrity management of hardware control measures in accordance with the operational performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability
- well integrity codes and standards.

For each SCE, detailed requirements for equipment functionality, availability, reliability and survivability are incorporated into SCE Performance Standards which also include the relevant assurance tasks (e.g. inspection, maintenance, testing and monitoring requirements) to ensure technical integrity.

Bowtie analysis was undertaken to assess MEE-01, with review of well integrity formal safety and design studies.

Company Values

Woodside's corporate values require all personnel to comply with appropriate policies, standards, procedures and processes while being accountable for their actions and holding others to account in line with Our Values. As detailed above, the Petroleum Activities Program is undertaken in line with these policies, standards and procedures that include suitable controls to prevent loss of well containment, and response should a loss of well containment occur.

Societal Values

Due to the Petroleum Activities Program's proximity to sensitive receptors (e.g. Barrow Island, Ningaloo Coast) and the potential extent of the wider EMBA, a major hydrocarbon spill could have impacts to a community. However, due to the low maximum concentrations predicted to reach sensitive receptors, it is not anticipated that their values will be compromised. Therefore, the LOWC risk rating presents a Decision Type B in accordance with the decision support framework described in Section 2.6.1. Extensive consultation was undertaken for this program to identify the views and concerns of relevant persons, as described in Section 5.

Woodside has sent an Activity Factsheet to all identified relevant persons regarding the Petroleum Activities Program (Section 5). Woodside has consulted with AMSA and the WA Department of Transport (DoT) on spill response strategies. In accordance with the MoU between Woodside and AMSA, a copy of the Oil Pollution First Strike Plan was provided to AMSA.

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 very low likelihood unplanned hydrocarbon release as a result of a loss of well containment.

The principle of inherent safety and environmental protection is based on prevention of the MEE through design of well integrity, ensuring the wells are operated within their design envelope through operating practices, and assurance through maintenance and inspection. If hydrocarbon loss of containment occurs, mitigation measures are in place to minimise the consequence, by limiting the inventory which can be released and implementing remediation.

The controls in place for prevention and mitigation of MEEs are specified and assured through implementing the WOMP, SCE management procedures including performance standards for SCEs, and Management System Performance Standards (MSPSs) for Safety Critical Management System Controls.

The application of Woodside Risk Management Procedures and implementation of the WOMP ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

- ongoing hazard identification, risk assessment and the identification of control measures
- ongoing integrity management of hardware control measures in accordance with the technical performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability,
- well integrity codes and standards.

Given the controls in place to prevent and control loss of containment events and mitigate their consequences, it is considered that MEE risk associated with loss of well containment is managed to ALARP.

Demonstration of Acceptability

Acceptability Statement:

Loss of well containment has been evaluated as having a 'moderate' risk rating, based on a C consequence level and a 'highly unlikely' likelihood. As per Section 2.6.3, Woodside considers C+ consequence risks as acceptable if ALARP is demonstrated using good industry practice, consideration of company and societal values and risk based analysis, if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained.

Acceptability is demonstrated with regard to the considerations below.

Principles of Ecologically Sustainable Development

Woodside is a proud Australian company that is here for the long term. Woodside has a strong history of exploration and development of oil and gas reserves in the north west of Western Australia with an excellent environmental record, while providing revenue to State and Commonwealth Governments, returns to shareholders, jobs and support to local communities. Titles for oil and gas exploration are released based on commitments to explore with the aim of uncovering and developing resources. It is under the lease agreement that Woodside has determined the potential to develop the hydrocarbon fields for which acceptance of this EP is sought under the Environment Regulations.

Woodside has established a number of research projects in order to understand the marine environments in which they operate, notably in the Exmouth Region and the Kimberley Region, including Rankin Bank, Glomar Shoal, Enfield Canyon and Scott Reef. Where scientific data does not exist, Woodside assumes a pristine natural environment exists, and therefore implements all practicable steps to prevent damage. Woodside's corporate values (Appendix A) require that we consider the environment and communities in which we operate when making decisions.

Woodside looks after the communities and environments in which it operates. Risks are inherent in petroleum activities; however, through sound management and systematic application of policies, standards, procedures and processes, Woodside considers that despite this risk, the extremely low likelihood of loss of well containment is acceptable.

Internal Context

The Petroleum Activities Program is consistent with Woodside corporate policies, standards, procedures, processes and training requirements as outlined in the Demonstration of ALARP and EPOs, including:

- Woodside Environment and Biodiversity Policy (Appendix A)
- Woodside Risk Management Policy (Appendix A)
- the SCE Performance Standards developed and implemented for the facility
- Hydrocarbon spill preparedness and response strategies are considered applicable to the nature and scale of the risk, and associated impacts of the response are reduced to ALARP (Section 2.8.1)

Woodside corporate values include working sustainably, with respect to the environment and communities in which we operate, listening to internal and external stakeholders and considering HSE when making decisions. Consultation, outlined below, has been undertaken prior to the Petroleum Activities Program.

External Context – Societal Values

Woodside recognises that its licence to operate from a regulatory and societal perspective is based on historical performance, complying with appropriate policies, standards and procedures, and understanding the expectations of external stakeholders. External stakeholder consultation, outlined below, has been undertaken prior to the Petroleum Activities Program:

- Woodside has consulted with AMSA and WA DoT on spill response strategies. In accordance with the Memorandum of Understanding between Woodside and AMSA, a copy of the Oil Pollution First Strike Plan was provided to AMSA and DoT.
- Other relevant persons were consulted (Section 5) and their feedback incorporated into this EP where appropriate.
- By providing hydrocarbon spill response measures that are commensurate with the risk rating, location and sensitivity of the receiving environment (including social and aesthetic values), Woodside believes this addresses societal concerns to an acceptable level.

Other Requirements (includes Laws, Policies, Standards and Conventions)

The Petroleum Activities Program is consistent with laws, policies, standards and conventions, including:

- accepted Safety Case (as per the requirements of the OPGGS (Safety) Regulations 2009
- Mutual Aid MoU for relief well drilling is in place
- accepted WOMP as per the requirements of the OPPGS (Resource Management and Administration) Regulations 2011
- notification of reportable and recordable incidents to NOPSEMA, if required, in accordance with Section 7.13.5.

The Petroleum Activities Program is consistent with the objectives in the Ningaloo management plans (Management Plan for Ningaloo Marine Park and Muiron Islands Marine Management Areas, Ningaloo Marine Park Management Plan) in relation to water quality, coral, shoreline and intertidal, macroalgal, seagrass, mangroves, seabirds and social and economic values.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 13 Woodside will manage its activities to prevent material well loss of containment events from occurring. Well loss of containment risks to the environment are managed to limit risk to High through maintenance of prevention and mitigative barriers during the Petroleum Activities Program.[94]	C 13.1 Maintaining well mechanical integrity to contain reservoir fluids within the well envelope to avoid an MEE.	PS 13.1 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P10 – Wells, to ensure a well retains the mechanical integrity to contain reservoir fluids within the well envelope at all times to avoid an MEE, including operate phase environmentally critical equipment for pressure containment, structures, monitoring and isolating systems associated with the well	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 13.2 Maintaining availability of critical external and internal communication systems to facilitate response to accidents and emergencies.	PS 13.2 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: E04 – Safety Critical Communication Systems to allow effective Emergency Response (ER) communications in emergencies, including: internal communications such as audible and visual warning systems, and voice communications during emergency events external communications such as voice communications to adjacent facilities, aircraft and vessels, and external incident control centres during emergency events.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 13.3 Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD	PS 13.3 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical	MC 1.16.1 Records demonstrate implementation of SCE Technical

[94] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	Performance Standard(s) to prevent environment risk related Damage to SCEs for: F06 – Safety Instrumented System P10 – Wells, together detect and respond to predefined initiating conditions and/or initiate responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE.	Performance Standard(s) and Safety Critical Element Management Procedure.
	C 13.4 OPGGS (Resource Management and Administration) Regulations 2011: Accepted WOMP.	PS 13.4 An accepted WOMP is implemented, and well integrity notification and reporting are undertaken in accordance with the Regulations (as applicable).	MC 13.4.1 Acceptance letter from NOPSEMA demonstrates acceptance of the WOMP. Records demonstrate applicable NOPSEMA notification and reporting.
	C 13.5 Incident reports are raised for unplanned releases within event reporting system.	PS 13.5 Incident reports raised for unplanned releases, and Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous[95] chemical - in any 48-hour period.	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response	

[95] *Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.*

6.8.6 Unplanned Hydrocarbon Release: Subsea Equipment Loss of Containment (MEE-02)

Context		
Flowline and Riser System – Section 3.4.3 Pipeline and 6-inch Chemical Supply Line – Section 3.4.4 Subsea Infrastructure – Section 3.4.5	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Protected Places – Section 4.8 Socio-economic Environment – Section 4.9	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere within PSZ and to mid-point of export pipeline		x	x	x	x	x	x	B	C	1	M	LCS GP PJ RBA CV SV	Acceptable if ALARP	EPO 14
Subsea release from export pipeline to the marine environment and atmosphere between mid-point of export pipeline to shore		x	x	x	x	x	x	B	B	1	M			

Description of Source of Risk

A loss of containment from subsea equipment, including the export pipeline may result in the release of large volumes of hydrocarbon inventory to the environment. The worst-case scenario is based on a release (such as a major rupture or failure) and assumes depressurisation and release of the pipeline inventory prior to and following activation of the emergency shut down systems. Due to the potential consequence of a worst-case subsea equipment loss of containment, this risk is considered to be an MEE (MEE-02).

The potential hazard sources that could instigate a loss of containment from the export pipeline are:

- internal corrosion
- external corrosion
- erosion (for flowlines)
- overpressure
- equipment fatigue and mechanical failures

- pipeline stability and freespans
- anchor impact/dragging
- loss of control of suspended load from supply/ support boat.

Escalation from other MEEs can cause subsea equipment loss of containment:

- loss of Structural Integrity (MEE-03)
- loss of Marine Vessel Separation (MEE-04)
- loss of Control of Suspended Load from facility lifting operations (MEE-05)

The potential for subsea loss of containment events within the PSZ to escalate due to fire and/or explosion events is considered in Section 6.8.7 Loss of Structural Integrity (MEE-03).

A number of common failure causes due to human error and SCC failures are presented in the generic Human Error and SCE Failure bowties in Section 6.8.10

Subsea Export Pipeline Loss of Containment – Credible Scenarios

The credible worst-case hydrocarbon release caused by subsea loss of containment is a release from the export pipeline.

Woodside evaluated three locations for a loss of containment of the export pipeline, as the location will influence the potential environmental consequence. These included:

- A seabed loss of containment of hydrocarbons from the export pipeline approximately 29 km shorewards along the pipeline from Pluto A. The approximate mid-point location was identified as the point closest to offshore sensitive environmental receptors (i.e. Montebello Islands).
- A seabed loss of containment of hydrocarbons from the export pipeline at the State waters 3nm boundary to consider potential near-shore impacts.
- A surface loss of containment of hydrocarbons from the export pipeline at the riser platform. However, based on the predicted annualised probability and previous modelling studies, the subsea scenario (1) was predicted to be the worst-case scenario within the PSZ, and therefore a surface scenario was not modelled.

The characteristics of the release scenarios modelled are summarised in Table 6-33.

Refer to Section 6.8.2 for additional information on modelling methods and environmental impact, thresholds and hydrocarbon characteristics.

Table 6-33: Summary of worst-case subsea pipeline loss of containment release scenarios

Scenario	Hydrocarbon	Duration (hrs)	Depth (m)	Latitude	Longitude	Total Condensate Release Volume (Sm3)
Scenario 3: Loss of containment of the export pipeline 29 km from Pluto A	Pluto condensate	8	78	20° 3’ 55.1” S	115° 36’ 1.1” E	472
Scenario 4: Loss of containment of the export pipeline at the State Waters boundary	Pluto condensate	8	41	20° 21’ 0.81” S	116° 42’ 12.41” E	662

Decision Type, Risk Analysis and ALARP Tools

Woodside has a good history of implementing industry standard practice in subsea system design and construction. In the company’s recent history, it has not experienced any pipeline integrity events that have resulted in significant releases or significant environmental impacts. The facility has never experienced a worst-case loss of pipeline and riser containment in its operational history.

Prevention and Mitigation

The main measures in place to prevent and mitigate consequences of a subsea equipment loss of containment event are:

- Pipeline design and integrity management.
- Sand management systems.

- Process control and emergency shutdown systems.
- Operating practices.
- Maintenance and inspection
- Emergency and hydrocarbon spill response

Decision Type

Decision Type B has been applied to this risk under the Guidance on Risk Related Decision Making (Oil and Gas UK 2014). This reflects the complexity of the risk, the higher potential consequence and stakeholder implications should the event be realised. To align with this decision type, a further level of analysis has been applied using risk based tools including the bowtie methodology (described in Section 2.7.3) and hydrocarbon spill trajectory modelling (described in Section 6.8.2). Company and societal values were also considered in the demonstration of ALARP and acceptability, considered through internal reviews, and stakeholder consultation (Section 5).

The release of hydrocarbons as a result of subsea equipment loss of containment is considered a Major Environment Event (MEE-02). The hazard associated with this MEE is hydrocarbons in subsea infrastructure tied to or originating from the facility.

Quantitative Spill Risk Assessment

Spill modelling of each of the subsea loss of containment credible spill scenarios was undertaken by RPS (RPS, 2024c, 2024d), on behalf of Woodside, to determine the fate of hydrocarbon released in each scenario based on the assumptions outlined in Section 6.8.2. Modelling was undertaken over all seasons to address year-round operations. This is considered to provide a conservative estimate of the EMBA, and the potential impacts from the identified worst-case credible release volumes for all subsea loss containment scenarios.

Hydrocarbon Characteristics

Refer to Section 6.8.2 for a discussion of Pluto condensate characteristics.

Subsea Plume Dynamics

The loss of subsea containment scenarios will result in a buoyant plume of hydrocarbons, which has been modelled using the OILMAP-Deep numerical model for Scenarios 3A and 7 (summarised in Table 6-34 and Table 6-35, respectively).

Table 6-34: Near-field subsurface discharge model parameters, OILMAP deep model, for the loss of containment of the export pipeline at 29 km from Pluto A for hour 1

	Parameter	Scenario 3
Inputs	Release depth (m below sea level)	78
	Oil density (g/cm3) (at 15°C)	0.733
	Oil viscosity (cP) (at 15°C)	0.58
	Oil temperature (°C)	95
	Gas:Oil ratio (m3/m3) [scf/bbl]	9,264/ 52,016
	Oil flow rate (m3/hr)	2,444
	Hole diameter (m) [in]	1.2 [47.2]
Outputs	Plume diameter (m)	10
	Plume height (m above seabed	78
	Plume initial rise velocity (m/s)	33
	Plume terminal rise velocity (m/s)	27
Predicted oil droplet size distribution	20% droplets of size (µm)	2,586
	20% droplets of size (µm)	3,776
	20% droplets of size (µm)	4,908
	20% droplets of size (µm)	6,380
	20% droplets of size (µm)	9,316

Table 6-35: Near-field subsurface discharge model parameters, OILMAP deep model, for the loss of containment of export pipeline at State Water boundary for 1 hour

	Parameter	Scenario 4
Inputs	Release depth (m below sea level)	41
	Oil density (g/cm3) (at 15°C)	0.733
	Oil viscosity (cP) (at 15°C)	0.58
	Oil temperature (°C)	95
	Gas:Oil ratio (m3/m3) [scf/bbl]	7,495/ 42,082
	Oil flow rate (m3/hr)	3,063
	Hole diameter (m) [in]	1.2 [47.2]
Outputs	Plume diameter (m)	5.3
	Plume height (m above seabed	41
	Plume initial rise velocity (m/s)	50.9
	Plume terminal rise velocity (m/s)	41.8
Predicted oil droplet size distribution	20% droplets of size (µm)	2,024
	20% droplets of size (µm)	2,956
	20% droplets of size (µm)	3,842
	20% droplets of size (µm)	4,994
	20% droplets of size (µm)	7,293

Likelihood

In accordance with the Woodside Risk Matrix, given prevention and mitigation measures in place, worst case subsea loss of containment likelihood has been assessed as 1 (Highly Unlikely).

Subsea loss of containment full bore export pipeline loss of containment events where the zone of contact potentially includes shoreline impact or impact on nearshore Marine Parks / Reserves with low associated probability: Formal safety studies indicate the frequency of this event is calculated to be 3.03E-05, or 1 in 33,000 years. This means with outcome mitigation factored in, the likelihood is considered 1 “Highly Unlikely”

For full bore loss of containment releases from the export riser or pipeline at any point within the platform PSZ, consequences for the worst-case credible spill where the zone of contact does not include predicted shoreline impact or impact on nearshore Marine Parks / Reserves; Likelihood is estimated to be 3.6E-05 per year, or 1 in 27,470 years.

Similarly, for releases at the platform location from the production flowlines or risers; the frequency of this event is estimated to be 9.8E-05, or 1 in 10,200 years. Therefore both scenarios have consequences likelihood considered as 1 “Highly Unlikely”.

Consequence

The spatial extent and fate (including weathering) of the spilled hydrocarbon were considered during the impact assessment for a worst-case subsea or riser loss of containment (presented in the following section). These considerations were informed primarily by the outputs from the numerical modelling studies undertaken by RPS (2024c, 2024d), available information on environmental sensitivities that may credibly be impacted in the event of a worst-case spill and relevant literature and studies considering the effects of hydrocarbon exposure.

Consequence Assessment

Environment that May Be Affected

Scenario 3 - Loss of containment of the export pipeline at 29 km from Pluto A

Surface Hydrocarbons

The hydrocarbon spill modelling indicated that concentrations of floating hydrocarbons equal to or greater than the 10 g/m2 threshold could potentially be found, in the form of slicks, approximately 10 km north-west, from the release location. The only receptor modelled with a probability of contact at the ecological threshold (10 g/m2) was Montebello AMP (90%).

Dissolved Hydrocarbons

Dissolved aromatic hydrocarbon concentrations equal to or greater than the 50 ppb threshold are predicted to be found up to around 10 km south-west from the release location. The only receptor modelled with a probability of contact at the ecological threshold (50 ppb) was Montebello AMP (2%).

Entrained Hydrocarbons

Entrained oil concentrations equal to or greater than the 100 ppb threshold are predicted to be found up to 110 km south-west from the release location. The only receptors modelled with a probability of contact at the ecological threshold (100 ppb) was Montebello AMP (47%) and Tryal Rocks (1%).

Accumulated Hydrocarbons

No shoreline accumulation at the ecological threshold, at or above 100 g/m2, was predicted.

Scenario 4 - Loss of containment of the export pipeline at the State Waters 3nm boundary

Surface Hydrocarbons

The hydrocarbon spill modelling indicated that concentrations of floating hydrocarbons equal to or greater than the 10 g/m2 threshold could potentially be found, in the form of slicks, up to 12 km south-west from the release location. However, no receptors are predicted to be contacted by surface hydrocarbons at or above ecological thresholds.

Dissolved Hydrocarbons

Dissolved aromatic hydrocarbon concentrations equal to or greater than the 50 ppb threshold are predicted to be found up to around 10 km south-west from the release location. However, no receptors are predicted to be contacted by dissolved hydrocarbons at ecological thresholds.

Entrained Hydrocarbons

Entrained oil concentrations equal to or greater than the 100 ppb threshold are predicted to be found up to 80 km south-west from the release location.

Receptors with the highest probability of contact at the ecological threshold (100 ppb) include Dampier AMP (23%), Cape Bruguieres (3%), Dampier Archipelago (16%), Cohen Island (7%), Enderby Island (1%), Gidley Island (1%), Goodwyn Island (1%), Keast Island (5%), Kendrew Island (6%), Legendre Island (13%), Malus Island (1%), Rosemary Island (7%), Courtenay Shoal (1%), Hammersley Shoal (8%), and the Madeline Shoals (25%).

Accumulated Hydrocarbons

Shoreline accumulation was predicted at or above 100 g/m2 was predicted for Cape Bruguieres (1%), Dampier Archipelago (2%), Cohen Island (2%), Keast Island (1%), Legendre Island (1%), and Rosemary Island (1%)

Any impacts to biological and physical receptors within this area are addressed within the impact discussion for MEE-01 (Section 6.8.5).

Summary of Potential Impacts to Environmental Value(s)

The credible worst-case hydrocarbon spill scenario that may arise from MEE-02 may impact upon a range of environmental receptors. Potential impacts of a hydrocarbon spill to the open water environment and receptors has been assessed within the worst-case spill scenario, MEE-01; refer to Section 6.8.5 for a description of potential impacts.

However, the spill scenario that may arise from MEE-02 is the only scenario predicted to impact the shorelines at or above relevant thresholds. Therefore, potential impacts to nearshore waters (including mainlands and islands) have been assessed below.

Table 6-36: Environment that May Be Affected - Key receptor locations and sensitivities potentially contacted above impact thresholds by the export pipeline and riser loss of containment scenarios with summary hydrocarbon spill contact ≥ 1% probability

Environmental Setting	Receptor	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure)																														Probability of hydrocarbon contact and fate (%)					
		Physical		*Biological*																					*Socio-economic and Cultural*								*Socio-cultural EMBA*		*EMBA*			
		Water Quality	*Sediment Quality*	*Marine Primary Producers*			*Other Communities / Habitats*								*Protected Species*										*Other Species*													
		Open Water (Pristine)	Marine Sediment (Pristine)	Coral Reef	Seagrass Beds / Macroalgae	Mangroves	Spawning / Nursery Areas	Open water – Productivity / Upwelling	Non-biogenic Reefs	Offshore Filter feeders and / or Deepwater Benthic Communities	Nearshore Filter Feeders	Sandy Shores	Estuaries / Tributaries / Creeks / Lagoons (including mudflats)	Rocky Shores	Cetaceans – Migratory Whales	Cetaceans – Dolphins and Porpoises	Dugongs	Pinnipeds (Sea Lions / Fur Seals)	Marine Turtles (Foraging and Internesting Areas and Significant Nesting Beaches)	Sea Snakes	Whale Sharks	Sharks and Rays	Seabirds and Migratory Shorebirds	Pelagic Fish Populations	Demersal Fish Populations	Fisheries - Commercial	Fisheries - Traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (1–10 g/m²)	Accumulated hydrocarbons (10–100 g/m2)	Surface Hydrocarbons (≥ 10 g/m2)	Entrained Hydrocarbons (≥ 100 ppb)	Dissolved Hydrocarbons (≥50 ppb)	Accumulated Hydrocarbons (≥ 100 g/m2)
Offshore	Dampier MP	✓	✓					✓							✓	✓			✓			✓	✓	✓		✓			✓				23		
	Montebello MP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		95		90	47	2	
Islands	Legendre Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		1	3		13		1
	Rosemary Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		1	1		7		1
	Cohen Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			3		7		2
	Gidley Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			1		1		
	Keast Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			2		5		1
	Kendrew Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			1		6		
	Enderby Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					1		
	Goodwyn Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					1		
	Malus Island	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					1		
Submerged Banks and Shoals	Madeleine Shoals	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		1			25		
	Courtenay Shoal	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					1		

Environmental Setting	Receptor	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure)																															Probability of hydrocarbon contact and fate (%)					
		Physical		*Biological*																							*Socio-economic and Cultural*													
		Water Quality	*Sediment Quality*	*Marine Primary Producers*			*Other Communities / Habitats*								*Protected Species*												*Other Species*														*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 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 / Fur Seals)	Marine Turtles (Foraging and Internesting Areas and Significant Nesting Beaches)	Sea Snakes	Whale Sharks	Sharks and Rays	Seabirds and Migratory Shorebirds	Pelagic Fish Populations	Demersal Fish Populations	Fisheries - Commercial	Fisheries - Traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (1–10 g/m²)	Accumulated hydrocarbons (10–100 g/m2)	Surface Hydrocarbons (≥ 10 g/m2)	Entrained Hydrocarbons (≥ 100 ppb)	Dissolved Hydrocarbons (≥50 ppb)	Accumulated Hydrocarbons (≥ 100 g/m2)
	Hammersely Shoal	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					8		
	Tryal Rocks	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					1		
Coastlines	Dampier Archipelago	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		1	3		16		2
	Cape Bruguieres	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			2		3		1

Nearshore Waters (Mainland and Islands)
Marine Sediment Quality The EMBA modelled for MEE-02 scenarios (RPS, 2024c, 2024d) overlapped the nearshore waters of a few shorelines and islands. Specifically, the modelling for the export pipeline release near State Waters 3nm boundary was the only scenario to predict hydrocarbon accumulation above the ecological threshold at any shoreline. Low probabilities (<2%) of hydrocarbon accumulation were predicted at a few nearshore receptors, such as the Dampier Archipelago, Cape Bruguieres, Keast Island, Cohen Island, Legendre Island, and Rosemary Island. Therefore, hydrocarbon contact from this scenario may lead to reduced marine sediment quality by several processes, such as adherence to sediment and deposition on shores or seabed habitat.
Protected Species
Cetaceans Evaluation of the extent of the spill EMBA modelled for MEE-02 demonstrated an overlap with areas where cetaceans are known to occur, including the BIAs for a number of species. The potential impacts of hydrocarbon exposure upon cetaceans has already been assessed within the offshore environment evaluation above Section 6.8.6. No additional BIAs beyond those already assessed were identified within the EMBA modelled for MEE-02.
Marine Turtles Marine turtles are known to utilise nearshore waters and shorelines for foraging and breeding activities (including internesting), with significant nesting beaches along the WA mainland coast and nearshore islands in locations (such as the Dampier Archipelago and Montebello Island). The combined EMBA overlaps a number of marine turtle BIAs. The modelling for the LOC from the export pipeline scenario in MEE-02 predicted low probabilities of contact by shoreline hydrocarbons above the ecological threshold at a number of these nearshore shorelines; including Dampier Archipelago (2%), Legendre Island (1%) and rosemary Island (1%). In addition, a number of islands and the nearshore waters of these marine turtle habitat areas are also shown to be exposed to entrained hydrocarbons exceeding the threshold concentrations modelled for MEE-02. Seasonal timings for breeding, nesting and hatchling dispersal for each marine turtle species is provided in Section 4.6.5, as are the known BIAs and habitat critical areas. The potential impacts of exposure within the offshore environment has been previously discussed within Section 6.8.5. In the nearshore environment, turtles can ingest hydrocarbons when feeding and/or can be indirectly affected by loss of a 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 with hatchlings may occur on nesting beaches (accumulated hydrocarbons) or in nearshore waters (entrained hydrocarbons) where hydrocarbons are predicted to make shoreline contact. Males waiting in nearshore areas to mate with adult females may also be impacted by entrained hydrocarbons. Marine turtles aggregating near nesting beaches within the spill EMBA during the mating and nesting seasons are most vulnerable to hydrocarbons, due to greater turtle densities and the possible disruption to important life cycle behaviours. Potential impacts may occur at the population level due to the presence of a high number of breeding individuals and hatchlings (during hatchling dispersal) and may impact on overall population viability of marine turtle species. However, given the volatile nature of the hydrocarbons population level impacts are not anticipated to occur.
Sea Snakes Impacts to sea snakes for the mainland and island nearshore waters from direct contact with hydrocarbons may occur and may include potential damage to the dermis and irritation to mucous membranes of the eyes, nose and throat (ITOPF, 2011a). Due to the time to impact in the nearshore environment, the hydrocarbons are considered to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location).
Sharks and Rays Whale sharks and manta rays generally transit along the nearshore coastline in these areas and are vulnerable to surface, entrained and dissolved aromatic hydrocarbon spill impacts, with both taxa having similar modes of feeding. Whale sharks and manta rays (reef manta ray and giant manta ray) are known to frequent Ningaloo Reef (forming feeding aggregations March through July) and the nearshore waters of the Muiron Islands (located 228 km south-west of the PAA). Impacts from hydrocarbon exposure occurring within the nearshore waters of their main foraging areas, such as Ningaloo Reef, has been assessed in more detail below as the spill EMBA for MEE-04 is more relevant for this assessment.
Seabirds

There is the potential for seabirds, and resident/non-breeding overwintering shorebirds that use the nearshore waters for foraging and resting to be exposed to hydrocarbons above ecological impact thresholds within the EMBA modelled for MEE-02. Impacts may include both lethal or sub-lethal effects, as discussed below and above in the offshore environment assessment.

Although breeding oceanic seabird species can travel long distances to forage in offshore waters, most breeding seabirds tend to forage in nearshore waters near to their breeding colony, resulting in intensive feeding by higher seabird densities in these areas during the breeding season and making these areas particularly sensitive in the event of a spill.

Migratory shorebirds may be exposed to stranded hydrocarbons 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 al. 2012).

As mentioned, predicted surface hydrocarbons are relatively restricted to the release location, with only low probabilities of sporadic shoreline contact at certain locations. Shoreline hydrocarbon contact above ecological thresholds may occur at the Dampier Archipelago, Cape Bruguieres and a number of islands, including Cohen Island, Keast Island, Legendre and Rosemary Island during a MEE-02 scenario. Impacts may, therefore, occur at the population level for species breeding at these locations should a spill occur during the relevant species breeding seasons.

Impacts are likely to occur through the ingestion of contaminated fish (nearshore waters) or invertebrates (intertidal foraging grounds such as beaches, mudflats and reefs) which have been exposed to surface, shoreline, entrained or dissolved hydrocarbons within the combined EMBA. Ingestion of contaminated prey can also lead to internal injury to sensitive membranes and organs (International Petroleum Industry Environmental Conservation Association, 2004). Whether the toxicity of ingested hydrocarbons is lethal or sub-lethal will depend on the weathering stage and its inherent toxicity. Exposure to hydrocarbons may have longer term effects, with impacts to population numbers due to decline in reproductive performance and malformed eggs and chicks, affecting survivorship and loss of adult birds. Seabirds also typically nest above the high-water mark, meaning nesting areas would not be expected to be directly impacted.

Notably, the nearest receptor to the release location that is predicted to receive shoreline hydrocarbons above threshold concentrations is the Dampier Archipelago. Shoreline hydrocarbons were modelled to take a minimum of 21 hours to arrive at this location (RPS, 2024d). Hydrocarbons will be weathered after this period and toxic impacts unlikely to occur. Birds utilising the nearshore waters and intertidal areas for foraging and resting at locations of shoreline contact may, therefore, suffer sub-lethal and, less likely, lethal impacts.

Submerged Shoals and Banks

Protected Species

Marine Turtles

While there are no shoal, bank or reef features within the PAA, there is the potential for marine turtles to be present at submerged shoals and banks within the spill EMBA modelled for MEE-02; with modelling predicted relatively low probabilities of contact by entrained hydrocarbons at Madeleine Shoals (25%), Courtnenay Shoal (1%), Hammersely Shoal (8%) and Tryal Rocks (1%). Shoals and banks may, at times, be foraging habitat for marine turtles, given the coral and filter feeding biota associated with these areas.

Notably, there are no known key aggregation areas (i.e. BIAs or habitat critical areas) for marine turtles associated with these submerged receptors (see Section 4.6.2 for further details on key areas).

Impacts to marine turtles at submerged shoals and banks in offshore marine environments have been discussed above. Marine turtles would be expected to be foraging, resting and breathing at the surface at these geomorphic features. Ingestion of hydrocarbons while foraging through prey is also possible.

Marine

turtles that may be present at these submerged shoals and banks within the EMBA may be impacted by entrained hydrocarbons present at concentrations greater than the relevant thresholds. Impacts would be expected to be limited to the individuals that may be transiting these areas. Subsequently, impacts at the population level are not anticipated for any of the five marine turtle species that may frequent shoals and banks within the EMBA.

Sea snakes

It is likely that sea snakes will be present at submerged shoals and banks within the EMBA modelled for MEE-2. Whilst there are no known areas of aggregation for sea snakes within the extended combined EMBA (see Section 4.6.2), individual sea snakes may be impacted by hydrocarbons predicted at and near to their habitat preferences (see Section 4.6.2).

The potential impacts to sea snakes following exposure to hydrocarbons have been discussed above.

Sea snake species in Australia generally show strong habitat preferences (Heatwole and Cogger 1993); species that have preferred habitats associated with submerged shoals and oceanic atolls may be disproportionately affected by a hydrocarbon spill affecting such habitat. However, population level impacts are not anticipated.

Sharks and Rays

Pelagic sharks and rays may frequent submerged shoals and banks to feed within the EMBA modelled for MEE-02. Some species may also exhibit site fidelity to these geomorphic features. There is the potential for resident shark and ray populations to be impacted directly from hydrocarbon contact or indirectly through contaminated prey or loss of habitat.

Species which are resident to or exhibit site-fidelity to impacted Shoals or Banks may experience sub-lethal impacts and/or become displaced. Indirect impacts through ingestion of prey that has been exposed to hydrocarbons and/or the loss of marine flora habitats may also impact sharks and rays.

Pelagic sharks and rays are expected to move away from areas affected by spilled hydrocarbons. Impacts to such species are expected to be limited to behavioural responses/displacement. Shark and ray species that have associations with submerged shoals and banks may or may not be displaced/exhibit behavioural avoidance in response to such habitat being contacted by spilled hydrocarbons. Such species may be more susceptible to a reduction in habitat quality resulting from a hydrocarbon spill. It is expected that there will be no impacts at the population level

All Settings

Coral

Modelling for the pipeline export scenario (MEE-02) was predicted to contact known coral reef habitats above the ecological threshold. The modelling predicted low probability of entrained hydrocarbons to contact the Dampier Archipelago (16%).

Impacts

Exposure to entrained hydrocarbons (≥100 ppb) / dissolved aromatic hydrocarbons (≥50 ppb) 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 upper reef slopes (subtidal corals), reef flat (intertidal corals) and lagoonal (back reef) coral communities. Mortality in a number of coral species is possible and this 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).

This could result in impacts to the shallow water fringing coral communities/reefs of the nearshore islands.

Shoreline Accumulation

A very low probability of shoreline contact (<2%) above the ecological threshold was predicted at a few receptors for the MEE-02 scenario at the State Waters 3nm boundary including Cape Brugieres, Dampier Archipelago, Cohen Island, rosemary Island, Keast Island, Leagendre Island.

Shallow coral habitats (i.e. nearshore and intertidal waters) are most vulnerable to hydrocarbons through coating by direct contact with surface slicks during periods when corals are tidally-exposed at spring low tides. Water soluble hydrocarbon fractions associated with surface slicks are known to cause high coral mortality (Shigenaka 2001) via direct physical contact of hydrocarbon droplets to sensitive coral species (such as the branching coral species).

There is, therefore, potential for lethal impacts due to the physical hydrocarbon coating of sessile benthos (including by entrained hydrocarbons), with likely significant mortality of corals (adults, juveniles and established recruits) at the small spill affected areas. These impacts are particularly applicable to branching corals which are reported to be more sensitive than massive corals (Shigenaka 2001).

Recruitment / Spawning

In the unlikely event of a spill occurring at the time of coral spawning at potentially affected coral locations or in the general peak period of biological productivity, there is the potential for a significant reduction in successful 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 and dissolved aromatic 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 (which may include fringing reefs of the offshore islands) will be entirely dependent on actual hydrocarbon concentration, duration of exposure and water depth of the affected communities. Coral cover, structure and composition may be reduced in hydrocarbon impacted areas, manifested by loss of corals and associated sessile biota.

Recovery of impacted reef areas from a range of stressors typically relies on coral larvae from neighbouring coral communities that have either not been affected or only partially impacted. For example, there is evidence that Ningaloo Reef corals and fish are partly self-seeding (Underwood 2009) with the supply of larvae from locations within Ningaloo Reef of critical importance to the healthy maintenance of the coral communities. Recovery at other coral reef areas, may not be aided by a large supply of larvae from other reefs, with levels of recruits after a disturbance event only returning to previous levels after the numbers of reproductive corals had also recovered (Gilmour et al. 2013).

The hydrocarbon modelling for the MEE-02 scenarios predicted only low probability of contact from entrained hydrocarbons at the Dampier Archipelago, Outtrim Patches, submerged Shoals, and Tryal Rocks. Therefore, a worst-case scenario of an export pipeline release near the State Waters boundary may cause impacts to coral reefs with the EMBA, with the potential to cause long-term effects.

Productivity

The potential impacts to plankton and offshore productivity following exposure to entrained hydrocarbons have been discussed above.

Filter Feeders

Nearshore filter feeders that are present in shallower water <20 m may potentially be impacted by entrained hydrocarbon based on the predicted modelling.

However, the released hydrocarbons are predicted to be weathered and less likely to result in toxic effects in comparison to fresh hydrocarbons (i.e. typically in the vicinity of the release location) before they reach any potential filter feeder community. Therefore, impacts such as localised, long-term effects to community structure and habitat, are not predicted.

Seagrass Beds, Macroalgae and Mangroves

The primary macroalgal / seagrass communities identified within the combined EMBA including those along the Ningaloo Coast (patchy and low cover associated with the shallow limestone lagoonal platforms), Muiron Islands (associated with limestone pavements), and the Barrow and Montebello Island groups are not predicted to be exposed to hydrocarbons above the ecological threshold based on the modelling.

The seagrass and macroalgal beds that may be found at other areas of lower coverage, such as the Dampier Archipelago, may be susceptible to impacts from entrained hydrocarbons from a worst-case release near the State Water boundary (MEE-02). 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. Furthermore, given the non-persistent nature of the hydrocarbons, however, no significant effects to seagrass and macroalgal habitats are expected to occur.

Mangrove habitats and associated mud flats and salt marsh at Ningaloo Coast (small habitat areas) and the Montebello Islands have were not predicted to be exposed to entrained hydrocarbons. Therefore, impacts are not expected to occur.

Summary of Potential Impacts to Socio-economic Values	
Setting	***Receptor Group***
Nearshore Island and Mainland Coastal Areas (Nearshore Waters)	***Fisheries – Commercial*** A few State managed fisheries have been identified to overlap with the EMBA. Any impacts to these fisheries would include possible direct mortality or sub-lethal impacts to the target species, as well as indirect financial and reputational impacts from possible fishing exclusion zones and perceived health impacts by the community/consumers as a result of the spill event. Impacts to fish stocks would depend on the time of the year the spill event was to occur, and the maturity of the fishery. Impacts are, however, expected to be restricted to mid-term for both direct and indirect impacts. Fishing activities may be hampered if fisheries are restricted from entry to an affected area, however the area potentially affected represents a very small part of available fishery zones and the short duration that diesel would persist limits the potential for significant impacts.
	Fisheries – Traditional Although no designated traditional fisheries have been identified within the PAA or EMBA, it is recognised that Indigenous communities' fish in the shallow coastal and nearshore waters of Ningaloo Reef and therefore may be impacted if a worst-case hydrocarbon spill were to occur. Impacts would be similar to those identified for commercial fishing, in the form of a potential fishing exclusion zone and possible contamination/tainting of fish stocks.

	Tourism and Recreation Tourism would likely be adversely affected if a visible surface slick entered areas of tourism activity. Spill modelling predicted low probability of hydrocarbon contact to the closest tourism area, such as the Montebello MP and Dampier AMP and archipelago. These areas have some seasonal charter boat operators and fishing activities, mainly concentrated around the islands. The Dampier Archipelago was predicted to have low probability of shoreline contact by MEE-02 scenario. This area experiences seasonal charter boats and recreational fishing. In the event of an export pipeline release near the State Water 3nm boundary, there could be restricted access to this area for a period of days to weeks, until natural weathering or tides and currents remove the hydrocarbon.

MEE-02 Subsea Equipment Loss of Well Containment – Risk Analysis
A bowtie risk analysis was undertaken to assess MEE-02; refer to the below figures for bowtie diagrams which were an output of Woodside's risk analysis process.

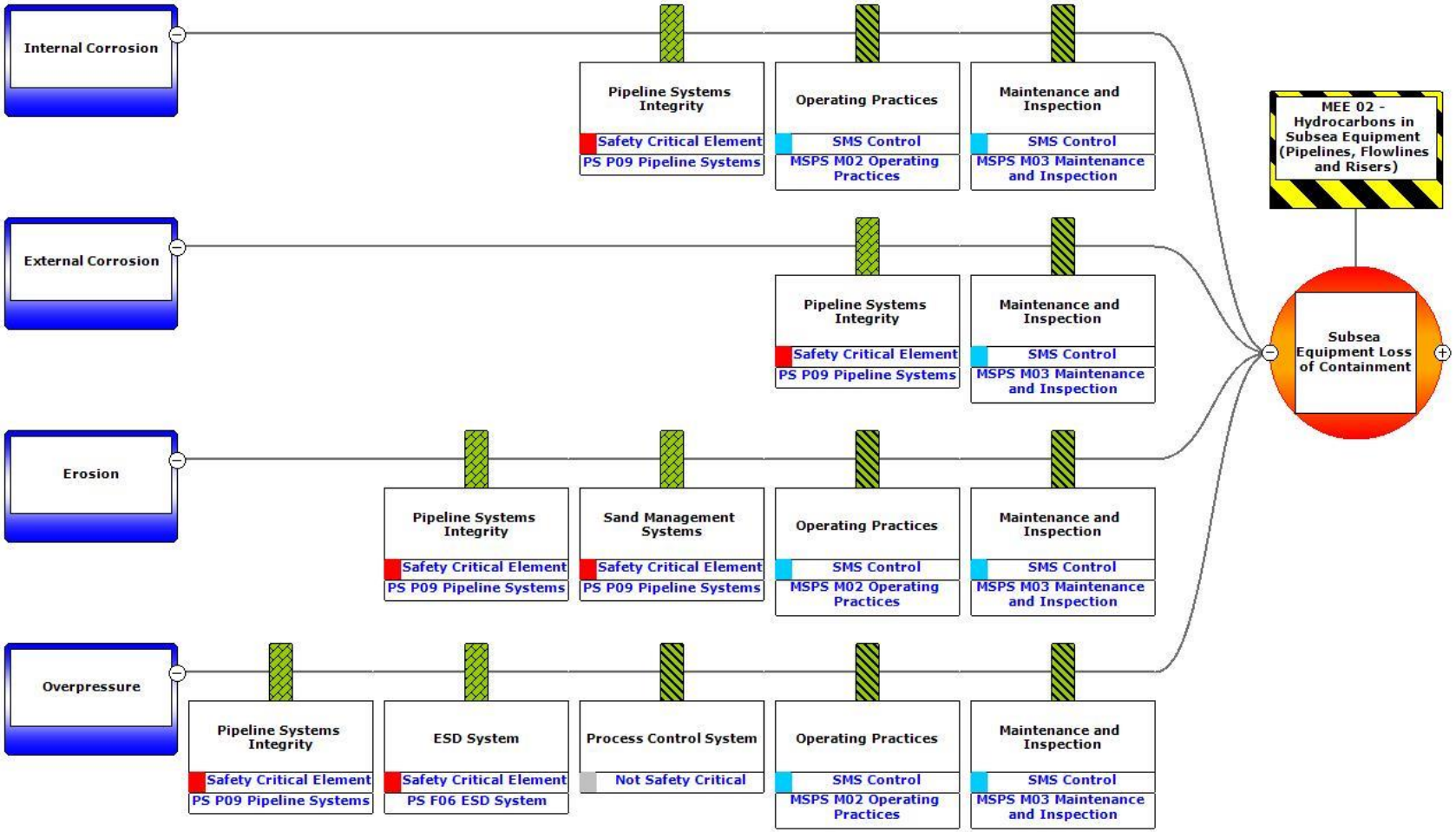


Figure 6-18: MEE-02 Subsea Equipment Loss of Containment (Causes 1–4)

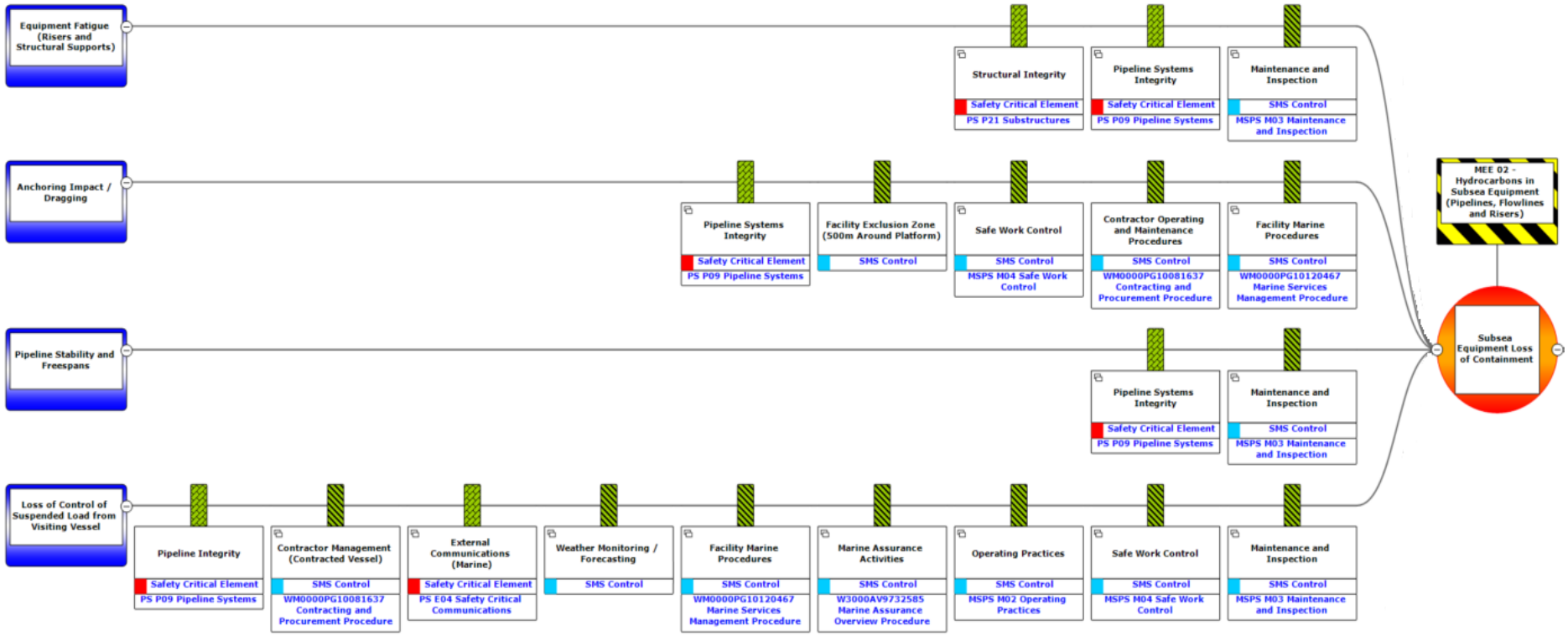


Figure 6-19: MEE-02 Subsea Equipment Loss of Containment (Causes 5–8)

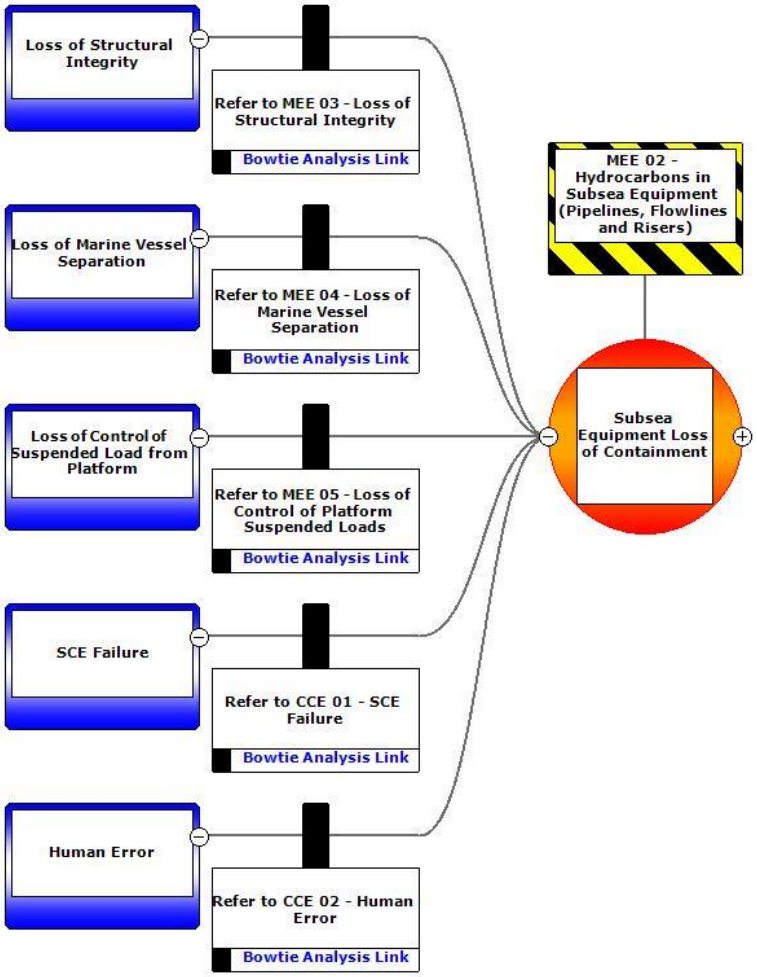


Figure 6-20: MEE-02 Subsea Equipment Loss of Containment (Causes 9–13)

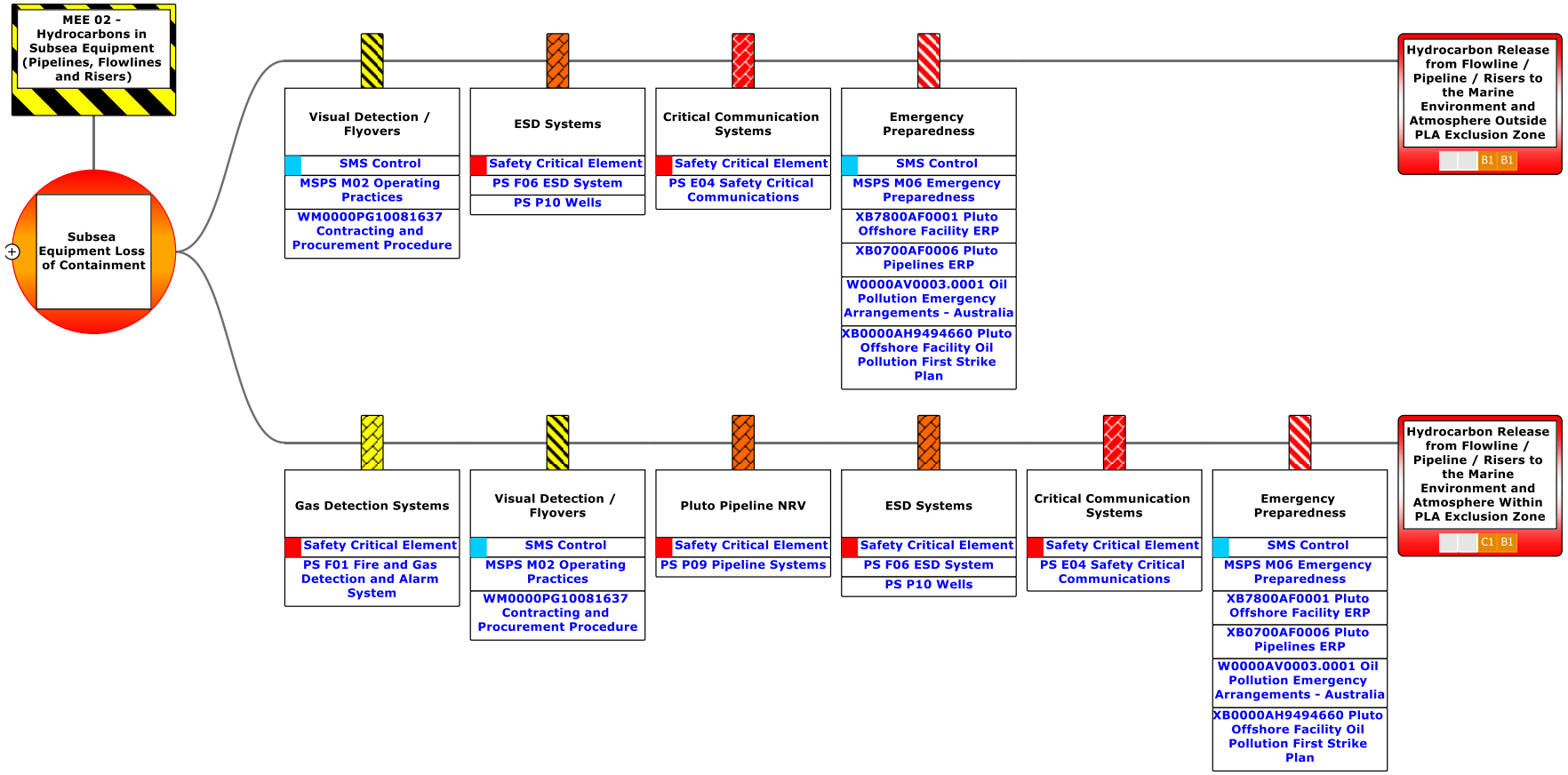


Figure 6-21: MEE-02 Subsea Equipment Loss of Containment (Outcomes)

MEE-02 Subsea Equipment Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Preventative Barriers – Safety and Environmental Critical Elements				
Elimination	N/A	No elimination or substitution controls were identified beyond those incorporated in design.		
Substitution				
Engineering Controls	Maintaining pipeline, riser and hydrocarbon-containing infrastructure integrity.	P09 – Pipeline systems P21 – Substructures F06 – Safety Instrumented System E04 – Safety Critical Communications	Prevention (Technical)	Yes C 14.1
Mitigating Barrier – Safety and Environmental Critical Elements				
Engineering Controls	Fire and gas detection systems operational on Pluto-A facility (for potential detection of subsea riser LOC)	F01 – Fire and Gas detection and alarm systems	Detection (Technical)	Yes C 14.2
Engineering Controls	Maintain availability of external and internal communication systems	E04 – Safety critical communications	Mitigation (Technical)	Yes C 13.2
Engineering Controls	Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	F06 – Safety Instrumented System P10 – Wells (for subsea/flowlines LOC controls)	Reduction/ Control (Technical)	Yes C 13.3
Engineering controls	Pluto pipeline NRV in place as emergency barrier to prevent significant liquid backflow loss of containment to the environment in the event of riser rupture / topsides catastrophic failure.	P09 – Pipeline systems	Reduction/ Control (Technical)	Yes C 14.1
Legislation Codes and Standards				

MEE-02 Subsea Equipment Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Procedures and Administration	OPGGS (Resource Management and Administration) Regulations 2011: Accepted Well Operations Management Plan (WOMP) to demonstrate that the risks to well integrity are managed in accordance with sound engineering principles, standards, specifications, and good oilfield practice. It describes the systems that are in place to ensure well design and integrity is managed for the well lifecycle, thus contributing to management of associated potential environmental consequences of well integrity events – including reservoir isolations applicable in subsea system risk management.	Pluto Well Operations Management Plan	Prevention/ Mitigation (Administration)	Yes C 13.4 Control based on legislative requirements – must be adopted
Procedures and Administration	OPGGS (Safety) Regulations 2009: Accepted Safety Case for the Pluto facility to: • identify hazards that have the potential to cause an MAE • detail assessment of MAE risks • describe the physical barrier SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with an MAE to ALARP, thus contributing to management of associated potential environmental consequences of MAEs.	Pluto A Operations Safety Case	Prevention/ Mitigation (Administration)	Yes C 14.4 Control based on legislative requirements – must be adopted

MEE-02 Subsea Equipment Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Procedures and Administration	Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: Accepted Safety Case for the Export Pipeline to: • identify hazards associated with pipeline operations that have the potential to cause an MAE • provide a detailed description for the pipeline • detail assessment of MAE risks • describe the physical barriers SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with an MAE to ALARP, thus contributing to management of associated potential environmental consequences of pipeline-related MAEs.	Pluto Export Pipeline Safety Case	Prevention/ Mitigation (Administration)	Yes C 14.5 Control based on legislative requirements – must be adopted
Procedures and Administration	Incident reports are raised for unplanned releases within event reporting system.	Woodside Health, Safety and Environment Event Reporting and Investigation Procedure	Prevention/ Mitigation (Administration)	Yes C 13.5 Control based on Woodside Standards
Management System Specific Measures: Key Standards or Procedures				

MEE-02 Subsea Equipment Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Procedures and Administration	Implementing management systems to maintain: • M02 – Operating practices • M03 – Maintenance and inspections • M04 – Safe work control • Marine Services Management Procedure • Marine Assurance Overview Procedure • Contracting and Procurement Procedure.	MSPS M02 – Operating practices MSPS M03 – Maintenance and inspections MSPS M04 – Safe work control Marine Services Management Procedure Marine Assurance Overview Procedure Contracting and Procurement Procedure	Prevention (Administration)	Yes – See Section 7 Implementation Strategy
Emergency Response and Contingency Planning	Implement management systems to maintain: • M02 – Operating Practices • M06 – Emergency preparedness • Pluto Offshore Facility Emergency Response Plan • Pluto Pipelines ERP • Pluto Offshore Facility Oil Pollution First Strike Plan • Oil Pollution Emergency Arrangements – Australia	MSPS-02 Operating Practices MSPS M06 – Emergency preparedness Pluto Offshore Facility Emergency Response Plan Pluto Pipelines Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia	Mitigation (Administration)	Yes – See Section 7 Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response.
Risk Based Analysis				

MEE-02 Subsea Equipment Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***

For risks identified as MEEs, a detailed risk-based Bowtie Analysis (as outlined in Section 2.7.3) has been used to identify, analyse and demonstrate that controls in place reduce the risk associated with each MEE to ALARP. Controls have been selected following hierarchy of control principles and consider independence of each barrier and their type of effect in controlling the hazardous event.

Application of Woodside's Risk Management Procedures and implementation of the Pluto A Operations Safety Case and Pluto Export Pipeline Safety Case ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

ongoing hazard identification, risk assessment and the identification of control measures

ongoing integrity management of hardware control measures in accordance with the operational performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability.

For each SCE, detailed requirements for equipment functionality, availability, reliability and survivability are incorporated into SCE Performance Standards which also include the relevant assurance tasks (e.g. inspection, maintenance, testing and monitoring requirements) to ensure technical integrity.

Bowtie analysis was undertaken to assess MEE-02, with review of formal safety assessments and subsea system design studies.

Company Values

Corporate values require all personnel at Woodside to comply with appropriate policies, standards, procedures and processes while being accountable for their actions and holding others to account in line with Our Values. As detailed above, the Petroleum Activities Program is undertaken in line with these policies, standards and procedures that include suitable controls to prevent subsea flowline and riser loss of containment, and response should a loss of containment occur.

Societal Values

Due to the Petroleum Activities Program's proximity to sensitive receptors (e.g. Montebello Islands) and the potential extent of the wider EMBA, the pipeline and riser loss of containment risk rating presents a Decision Type B in accordance with the decision support framework described in Section 2.6.1. Consultation was undertaken for this program to identify the views and concerns of relevant persons, as described in Section 5.

Woodside has sent an Activity Factsheet to all identified relevant persons regarding the Petroleum Activities Program (Section 5). Woodside has consulted with AMSA and WA DoT on spill response strategies. In accordance with the MoU between Woodside and AMSA, a copy of the Oil Pollution First Strike Plan was provided to AMSA.

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 very low likelihood unplanned hydrocarbon release as a result of a pipeline and riser loss of containment.

The principle of inherent safety and environmental protection is based on the prevention of the MEE through design of pipelines and risers, ensuring the export pipeline and risers are operated within their design envelope through operating practices, and assurance through maintenance and inspection. If hydrocarbon loss of containment occurs, mitigation measures are in place to minimise the consequence by limiting the inventory which can be released and implementing remediation.

The controls in place for prevention and mitigation of MEEs are specified and assured through implementing the Safety Cases, SCE management procedures including performance standards for SCEs and MSPSs for Safety Critical Management System Controls.

The application of Woodside Risk Management Procedures ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

- ongoing hazard identification, risk assessment and the identification of control measures
- ongoing integrity management of hardware control measures in accordance with the technical performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability.

Given the controls in place to prevent and control loss of containment events and mitigate their consequences it is considered that MEE risk associated with a pipeline and riser loss of containment is managed to ALARP.

MEE-02 Subsea Equipment Loss of Well Containment – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Demonstration of Acceptability				
Acceptability Statement Subsea equipment loss of containment has been evaluated as having a 'moderate' level of risk rating. Subsea loss of containment events are risk assessed as Highly Unlikely potential "C – Moderate" consequence for offshore events, and; Export pipeline mid-point to shore section loss of containment events risk assessed as Highly Unlikely , potential "B – Major" consequence. As per Section 2.6.3, Woodside considers 'moderate' risk ratings as broadly acceptable if the adopted controls are implemented. Due to the consequence associated with MEE-02, Decision Type B has been applied, and ALARP is demonstrated using good industry practice, consideration of company and societal values and risk based analysis, if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained. Acceptability is demonstrated with regard to the oil spill risk considerations as described in Section 6.8.5 (MEE-01) (the considerations include principles of Ecologically Sustainable Development, internal context, external context and other requirements (includes laws, policies, standards and conventions)). On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in Section 2.8.2, this is considered an acceptable level of risk.				

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 14 Woodside will manage its activities to prevent material subsea loss of containment events from occurring. Subsea loss of containment risks to the environment are managed to limit risk to High through maintenance of prevention and mitigative barriers during the Petroleum Activities Program. [96]	C 14.1 Maintaining pipeline, riser and hydrocarbon-containing infrastructure integrity to prevent, or mitigate the effects of an MEE.	PS 14.1 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: • E04 – Critical Communications • F06 – Safety Instrumented System • P09 – Pipeline Systems (including sand management) • P21 – Substructures to together; - maintain the minimum required mechanical and structural integrity to prevent loss of containment that may result in an MEE • -detect and respond to pre-defined initiating conditions to protect mechanical integrity.P09 – Pipeline Systems Pluto pipeline NRV in place as emergency barrier to prevent significant liquid backflow loss of containment to the environment	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.

[96] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		in the event of riser rupture / topsides catastrophic failure.	
	C 14.2 Maintaining fire and gas detection and alarm systems on the Pluto facility to facilitate prevention and response to fire or gas hazards (as applicable for potential detection of subsea riser LOC).	PS 14.2 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: F01 – Fire and Gas Detection and Alarm Systems (as applicable for potential detection of subsea riser LOC), - to continuously monitor and alert for fire events and significant gas accumulations, initiate actions to minimise event escalation, and support Emergency Response by providing status of situation.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 13.2 Maintaining availability of critical external and internal communication systems to facilitate response to accidents and emergencies.	PS 13.2 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: E04 – Safety Critical Communication Systems, to allow effective Emergency Response (ER) communications in emergencies, including: internal communications such as audible and visual warning systems, and voice communications during emergency events external communications such as voice communications to adjacent facilities, aircraft and vessels, and external incident control centres during emergency events.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 13.3 Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	PS 13.3 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: F06 – Safety Instrumented System P10 – Wells (for subsea/flowline LOC controls), to together detect and respond to pre-defined initiating conditions and/or initiate responses that put the process plant, equipment, and the wells in a safe condition so as to prevent or mitigate the effects of an MEE.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 13.4	PS 13.4	MC 13.4.1

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	OPGGS (Resource Management and Administration) Regulations 2011: Accepted WOMP.	An accepted WOMP is implemented, and well integrity notification and reporting are undertaken in accordance with the Regulations (as applicable).	Acceptance letter from NOPSEMA demonstrates acceptance of the WOMP. Records demonstrate applicable NOPSEMA notification and reporting.
	C 14.4 OPGGS (Safety) Regulations 2009: Accepted Safety Case for the Pluto facility.	PS 14.4 An accepted Safety Case is implemented, and safety notification and reporting is undertaken in accordance with the Regulations (as applicable).	MC 14.4.1 Acceptance letter from NOPSEMA demonstrates acceptance of the Safety Case. Records demonstrate applicable NOPSEMA notification and reporting.
	C 14.5 OPGGS (Safety) Regulations 2009: Accepted Safety Case for the Export Pipeline.	PS 14.5 An accepted Safety Case is implemented, and safety notification and reporting is undertaken in accordance with the Regulations (as applicable).	MC 14.5.1 Acceptance letter from NOPSEMA demonstrates acceptance of the Safety Case. Records demonstrate applicable NOPSEMA notification and reporting.
	C 13.5 Incident reports are raised for unplanned releases within event reporting system.	PS 13.5 Incident reports raised for unplanned releases, and Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous97 chemical - in any 48-hour period.	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response	

[97] *Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.*

6.8.7 Unplanned Hydrocarbon Release: Loss of Structural Integrity (MEE-03)

Context		
Topsides – Section 3.4.1 Process Description – Section 3.5.4 3.4.6 Hydrocarbon and Chemical Inventories and Selection – Section 3.9	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Protected Places – Section 4.8 Socio-economic Environment – Section 4.9	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Marine environment footprint and associated hydrocarbon and chemical release associated with structural collapse of riser platform		x	x	x	x	x	x	B	C	1	M	LCS GP PJ RBA	Acceptable ALARP	EPO 15
Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere within PSZ (MEE-02) – caused by loss of structural integrity		x	x	x	x	x	x	B	C	1	M			

Description of Source of Risk

Extreme environmental conditions or other causes which result in an exceedance of the design criteria and a catastrophic failure of the facility and individual equipment (e.g. cranes, flare tower, etc.) has been identified as a potential MEE (MEE-03). Catastrophic structural failure of the facility could lead to the release of hydrocarbons to the environment.

The identified causes, including escalation from other MEEs, include:

- internal corrosion;
- external corrosion;
- equipment failure;
- extreme weather (cyclone, high waves);
- seismic events/seabed instability; and
- fire/overpressure event (escalation of loss of containment event).

Escalation from other MEEs can also cause loss of structural integrity:

- loss of marine vessel separation (refer to MEE-04, Section 6.8.8); and
- loss of control of suspended load from facility lifting operations (refer to MEE-05).

A number of common failure causes due to human error and SCC failures are presented in the generic Human Error and generic SCE Failure bowties in Section 6.8.10.

There is a possibility of riser platform collapse ('slow' or 'rapid') caused by the extreme loads induced by strong winds and extreme waves. Extreme weather may induce fracture of pipework due to vibration/fatigue and loosen/dislodge objects/projectiles causing impact to equipment/pipework and subsequently, resulting in a loss of containment.

Structural damage to the platform resulting from the causes listed above could be minor or could in the most extreme situation result in total loss of the platform. The type of structural failure considered is restricted to major structural damage (e.g. catastrophic collapse of the jacket or release of hydrocarbons on or adjacent to the platform). Such events are beyond the design basis for the platform.

Loss of Structural Integrity – Credible Scenarios

A loss of structural integrity could result in a significant release of hydrocarbons. A loss of structural integrity may result in credible hydrocarbon spill scenarios consistent with:

- subsea equipment loss of containment (MEE-02)
- loss of marine vessel separation (MEE-04)
- topsides loss of containment (one or more storage inventories) through to total loss of platform hydrocarbon/chemical inventory (bound by MEE-04 impact assessment) (Section 6.8.6).

The worst-case credible spill scenarios associated with these MEEs/sources of risk are discussed in the relevant sections above, with impacts dependent on the extent of structural damage, volume of hydrocarbons released (including cumulative volumes from tanks/vessels), the associated weather conditions, and effectiveness of mitigation and response measures.

Decision Type, Risk Analysis and ALARP Tools

Woodside has a good history of implementing industry standard practice in structural design, construction and operation. In the company's 60-year history, it has not experienced any loss of structural integrity events that have resulted in significant releases or significant environmental impacts.

Decision Type

Decision Type B has been applied to this risk under the Guidance on Risk Related Decision Making (Oil and Gas UK 2014). This reflects the complexity of the risk, the higher potential consequence and stakeholder implications should the event be realised. To align with this decision type, a further level of analysis has been applied using risk-based tools including the bowtie methodology (described in Section 2.7.3) and hydrocarbon spill trajectory modelling. Company and societal values were also considered in the demonstration of ALARP and acceptability, considered through internal reviews, and stakeholder consultation (Section 5).

The potential release of hydrocarbons from a loss of structural integrity is considered an MEE (MEE-03). The hazard associated with this MEE is hydrocarbons in pipelines, risers, process and non-process hydrocarbon and chemical inventories and potentially the physical riser platform/jacket structure itself..

Quantitative Spill Risk Assessment

Credible worst-case stochastic spill modelling for the scenarios associated with MEE-02 Subsea system loss of containment and MEE-04 Loss of Marine Vessel Separation (diesel loss of containment) has been undertaken. Results of these modelling studies have been used to inform the consequence assessment for these MEEs; these assessments are applicable to bounding the worst-case consequence assessment for a loss of structural integrity event. A "C" Moderate consequence is assigned to worst-case releases from the riser platform location for both MEE-02 Subsea system loss of containment, and a conservatively assessed diesel loss of containment scenario (MEE-04) which bounds the worst-case impact potential for cumulative topsides hydrocarbon, chemicals and marine vessel loss of containment in case of a structural collapse.

Likelihood

Formal safety studies inform an assessed frequency of total platform collapse estimated to be 1.08E-04 per year, or 1 in 9,285 years considering seismic factors, weather events and vessel collision risk. Once the low likelihood of cumulative instantaneous release to result in worst-case environmental consequence is considered, together with prevention and mitigation factors - the likelihood is assessed as "Highly Unlikely" in accordance with the Woodside Risk Matrix

Consequence

The spatial extent and fate (including weathering) of the spilled hydrocarbon was considered during the impact assessment for a loss of structural integrity. These considerations were informed primarily by the outputs from the stochastic modelling studies undertaken by RPS (2024c, 2024e), available information on environmental sensitivities that may credibly be impacted in the event of a worst-case spill, and relevant literature and studies considering the effects of hydrocarbon exposure.

Consequence Assessment

Environment that May Be Affected

As discussed above, the potential impacts from hydrocarbon release caused by a loss of structural integrity are analogous to those which would result from:

- loss of containment from subsea equipment (within PSZ) (MEE-02)
- loss of marine vessel separation (MEE-04)
- topsides loss of containment (one or more storage inventories) through to total loss of platform hydrocarbon/chemical inventory (bound by MEE-04 impact assessment) (Section 6.8.6).

The potential impacts associated with these impacts are therefore discussed in the above-mentioned sections.

Seabed Disturbance

In the event of loss of structural integrity, there is the potential for collapse of the riser platform leading to an incremental increase of the facility's footprint on the seabed. The potential area that would be affected can conservatively be defined as the existing facility footprint plus 100 m in all directions, that is approximately 300 m by 350 m (0.105 km2). The benthic habitats surrounding the riser platform have been subject to historical disturbance (e.g. facility construction and operation) and are considered to be of low ecological value (although it is acknowledged the facility provides artificial hard substrate which has formed the basis of relatively high biodiversity communities at this location when compared to the surrounding seabed). Subsequently, the physical disturbance to the seabed resulting from the collapse of the riser platform would be localised but may result in long-term disturbance to benthic communities.

The riser platform could also act as a source of environmental contaminants due to material on board the platform (e.g. chemical/hydrocarbon inventories, corrosion of structural materials, debris, etc.). The potential for contamination would diminish over time, as the structure degrades. Depending on the nature of the loss of structural integrity, complete or partial salvage of the riser platform may not be feasible. These structures are expected to be colonised by marine organisms, and a reef habitat will develop over time on the structures.

While the PAA overlaps the Continental Slope Demersal Fish Communities KEF and Ancient Coastline at 125 m Depth Contour KEFs, neither of these are in close proximity to the riser platform.

MEE-03 Loss of Structural Integrity – Risk Analysis

A bowtie risk analysis was undertaken to assess MEE-03; refer to the below figures for bowtie diagrams which were an output of Woodside's risk analysis process.

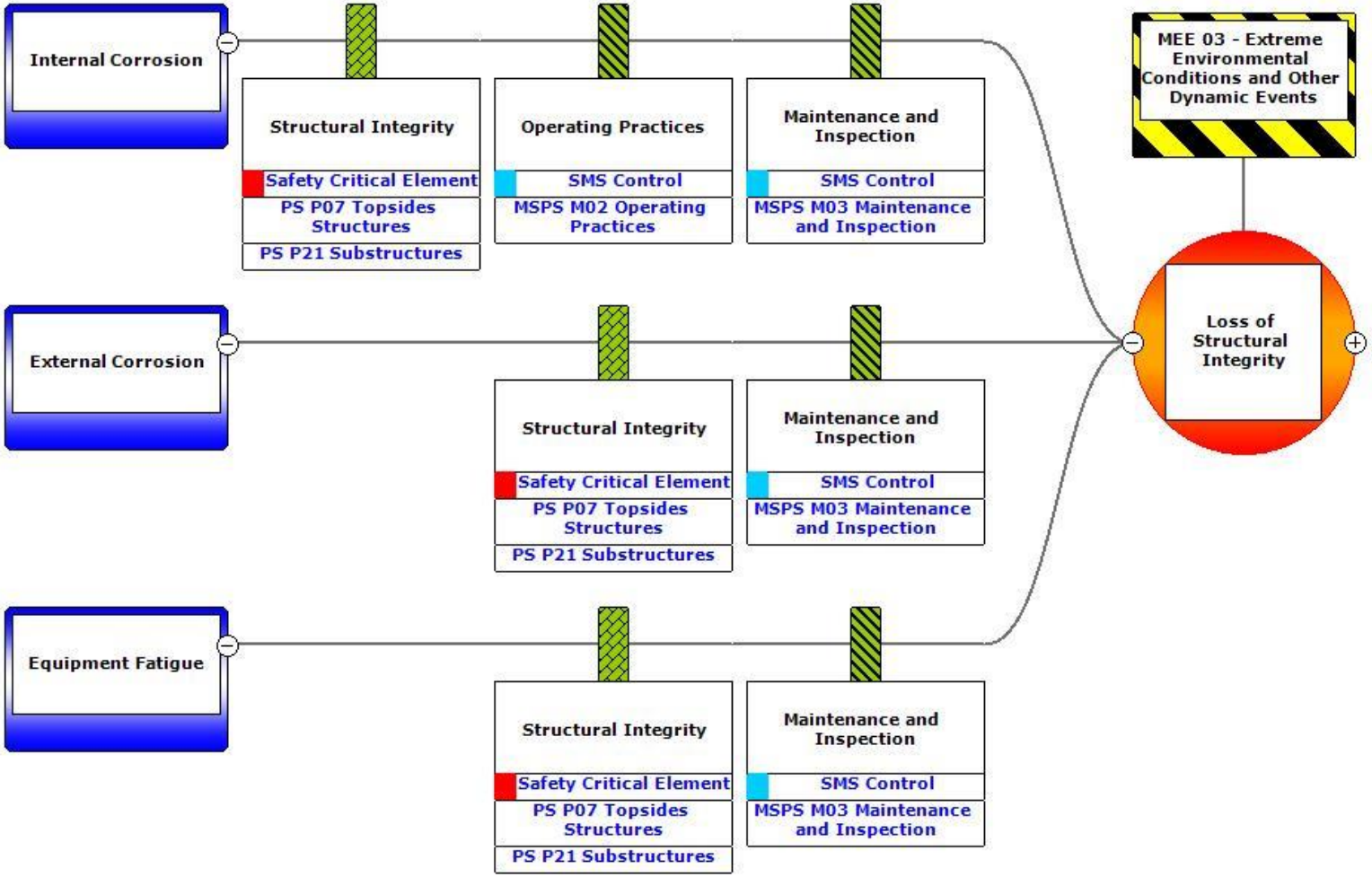


Figure 6-22; MEE-03 Loss of Structural Integrity (Causes 1–3)

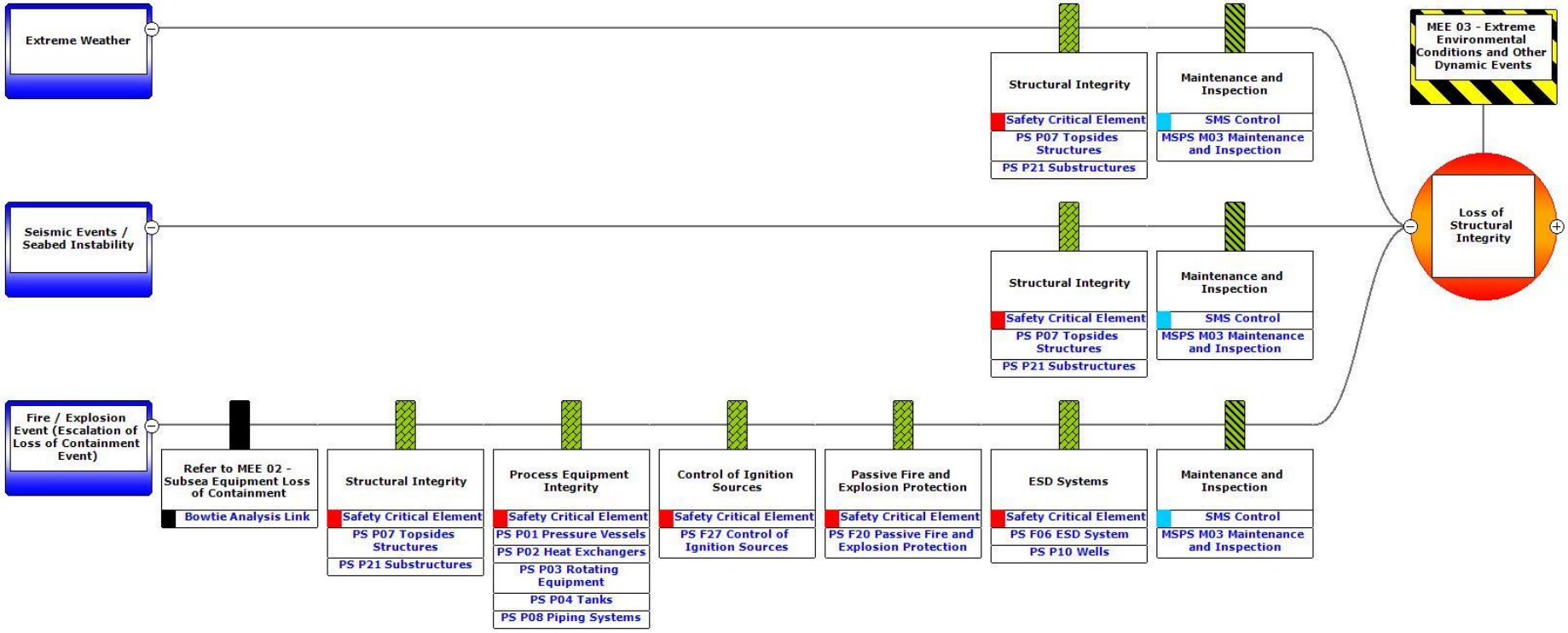


Figure 6-23: MEE-03 Loss of Structural Integrity (Causes 4-6)

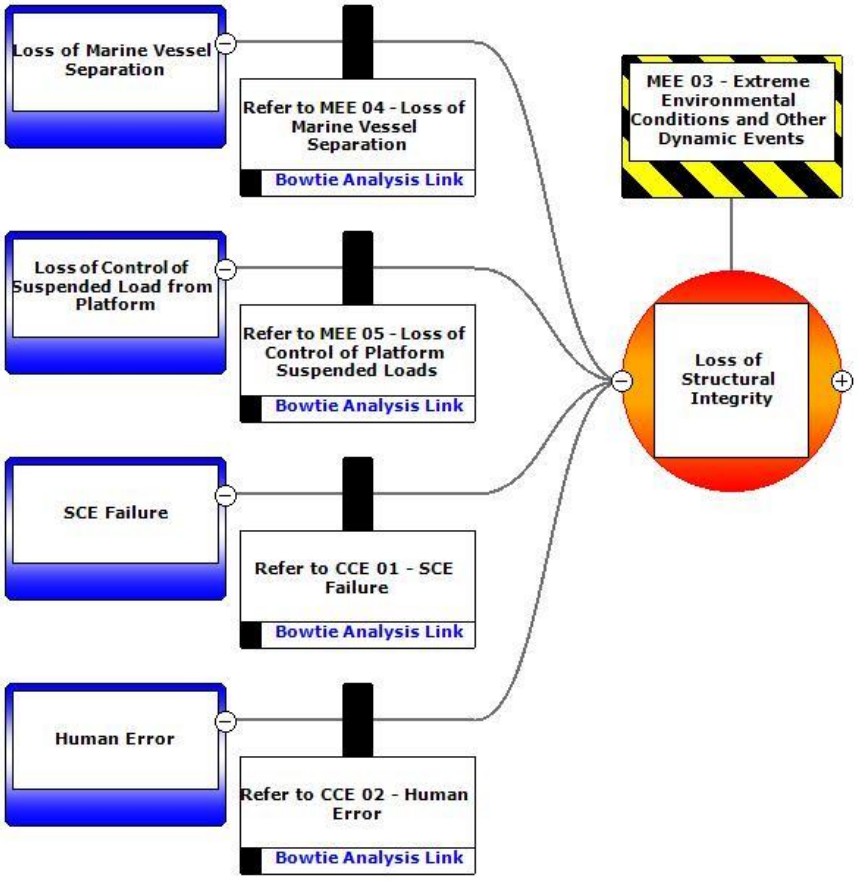


Figure 6-24: MEE 03 Loss of Structural Integrity (Causes 7 – 10)

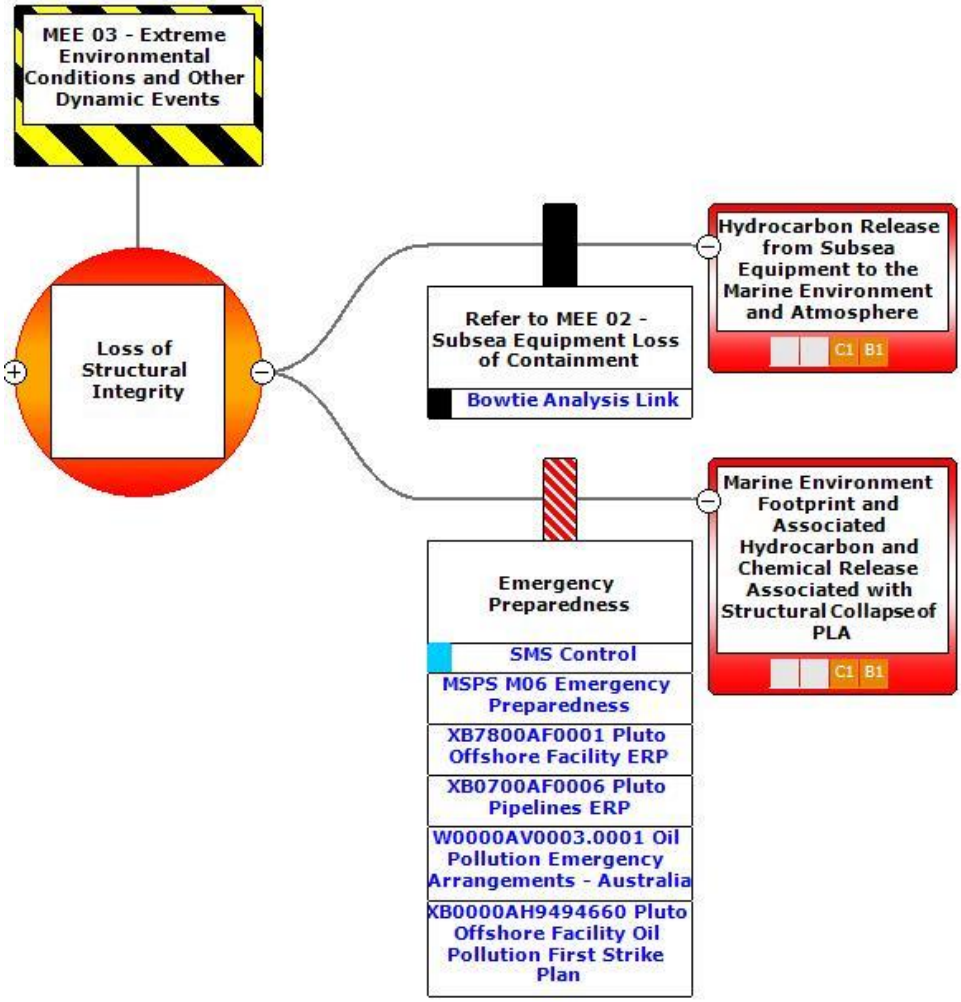


Figure 6-25: MEE-03 Loss of Structural Integrity (Outcomes)

MEE-03 Loss of Structural Integrity – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect (Refer to Table 6-27)***	***Control Adopted***
Preventative Barriers – Safety and Environmental Critical Elements				
Elimination Substitution	N/A	No elimination or substitution controls were identified beyond those incorporated in design.		
Engineering Controls	Maintaining structural integrity to ensure availability of critical systems during a major accident or environment event, and prevent structural failures from contributing to escalation of an MEE.	P07 – Topsides structures P21 – Substructures	Prevention (Technical)	Yes C 15.1
Engineering Controls	Maintaining control of ignition sources and fire protection to prevent loss of structural integrity.	F27 – Control of ignition sources F20 – Passive fire and explosion protection	Prevention (Technical)	Yes C 15.2
Engineering Controls	Maintain topsides hydrocarbon-containing infrastructure integrity to prevent loss of structural integrity	P01 – Pressure Vessels P02 – Heat Exchangers P03 – Rotating Equipment P04 – Tanks P08 – Piping Systems	Prevention (Technical)	Yes C 15.3
Engineering Controls	Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	F06 – Safety Instrumented System P10 – Wells	Prevention (Technical)	Yes C 13.3
Mitigating Barrier – Safety and Environmental Critical Elements				
None identified with respect to structural failure. Subsea system SCE mitigations as per MEE-02.				
Legislation Codes and Standards				

MEE-03 Loss of Structural Integrity – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect (Refer to Table 6-27)***	***Control Adopted***
Procedures and Administration	Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: Accepted Safety Case for the Pluto Facility to: identify hazards that have the potential to cause an MAE detail assessment of MAE risks describe the physical barrier SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with an MAE to ALARP, thus contributing to management of associated potential environmental consequences of MAEs. .	Pluto Safety Case	Prevention (Administration) Control based on legislative requirement – must be adopted	Yes C 14.4
Procedures and Administration	Incident reports are raised for unplanned releases within event reporting system.	Woodside Health, Safety and Environment Event Reporting and Investigation Procedure WM0000PG9905421	Prevention/ Mitigation (Administration) Control based on Woodside Standards and regulatory requirements	Yes C 13.5
Management System Specific Measures: Key Standards or Procedures				
Procedures and Administration	Implementing management systems to maintain: M02 – Operating practices M03 – Maintenance and inspections.	MSPS M02 – Operating practices MSPS M03 – Maintenance and inspections	Prevention (Administration)	Yes – See Section 7 Implementation Strategy
Emergency Response and Contingency Planning	Implement management systems to maintain: M06 – Emergency preparedness Pluto Offshore Facility Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia. Pluto Pipelines Emergency Response Plan	MSPS M06 – Emergency preparedness Pluto Offshore Facility Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia Pluto Pipelines Emergency Response Plan	Mitigation (Administration)	Yes – See Section 7 Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response.
Risk Based Analysis				

MEE-03 Loss of Structural Integrity – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect (Refer to Table 6-27)***	***Control Adopted***

For risks identified as MEEs, a detailed risk based Bowtie Analysis (as outlined in Section 2.7.3) has been used to identify, analyse and demonstrate that controls in place reduce the risk associated with each MEE to ALARP. Controls have been selected following hierarchy of control principles and consider independence of each barrier and their type of effect in controlling the hazardous event.

Application of Woodside's Risk Management Procedures and implementation of the Pluto A Operations Safety Case ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

- ongoing hazard identification, risk assessment and the identification of control measures
- ongoing integrity management of hardware control measures in accordance with the operational performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability.

For each SCE, detailed requirements for equipment functionality, availability, reliability and survivability are incorporated into SCE Performance Standards which also include the relevant assurance tasks (e.g. inspection, maintenance, testing and monitoring requirements) to ensure technical integrity.

Bowtie analysis was undertaken to assess MEE-03, with review of formal safety assessment studies.

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 very low likelihood of a loss of structural integrity.

The principle of inherent safety and environmental protection is based on the prevention of the MEE through design of the facility, ensuring the equipment is operated within the design envelope through operating practices, and assurance through maintenance and inspection. If a loss of structural integrity occurs, mitigation measures are in place to minimise the consequence by limiting the inventory which can be released and implementing remediation.

The controls in place for prevention and mitigation of MEEs are specified and assured through implementing the Pluto A Operations Safety Case, SCE management procedures including performance standards for SCEs, and MSPSs for Safety Critical Management System Controls.

The application of Woodside Risk Management Procedures and implementation of the Pluto A Operations Safety Case ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP.

Given the controls in place to prevent and control loss of containment events and mitigate their consequences, alongside procedural control of facility operations, it is considered that MEE risk associated a loss of structural integrity is managed to ALARP.

Demonstration of Acceptability

Acceptability Statement:

A loss of structural integrity has been evaluated as having a 'Moderate' risk rating (including the consideration of applicable MEEs). As per Section 2.6.1, Woodside considers 'Moderate' (B0) risk ratings as acceptable if managed to ALARP. Due to the consequence associated with MEE-03, Decision Type B has been applied, and ALARP is demonstrated using good industry practice and risk-based analysis, if legislative requirements are met and societal concerns are accounted for, and the alternative control measures are grossly disproportionate to the benefit gained.

Acceptability is demonstrated with regard to the oil spill risk considerations as described in Section 6.8.5 (MEE-01) (the considerations include principles of Ecologically Sustainable Development, internal context, external context and other requirements (includes laws, policies, standards and conventions)).

On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in Section 2.8.2 this is considered an acceptable level of risk.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	Controls	Environmental Performance Standards	***Measurement Criteria***
EPO 15	C 15.1	PS 15.1	MC 2.11.1

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	Controls	Environmental Performance Standards	***Measurement Criteria***
Woodside will manage its activities to prevent loss of structural integrity events which could cause material loss of containment to the marine environment. Structural integrity loss of containment risks to the environment are managed to limit risk to High through maintenance of prevention and mitigative barriers during the Petroleum Activities Program. [98]	Maintaining structural integrity to ensure availability of critical systems during a major accident or environment event, and prevent structural failures from contributing to escalation of an MEE.	Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P21 – Substructures P07 – Topsides/Surface Structures, to together: provide and maintain structural integrity to support SCE systems under all design conditions through service life prevent structural failure from contributing to the escalation of an MEE by providing support/ protection of SCE systems during an emergency event, and/or support containment of environmentally hazardous material.	Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure.
	C 15.2 Maintaining control of ignition sources and fire protection to prevent loss of structural integrity.	PS 15.2 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related Damage to SCEs for: F27 – Control of Ignition Sources F20 – Passive Fire and Explosion Protection, - to together prevent ignition of flammable or explosive atmospheres within identified Hazardous Areas and/or prevent a fires and explosions from contributing to escalation of an MEE.	MC 2.11.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure
	C 15.3 Maintaining topsides hydrocarbon-containing infrastructure integrity.	PS 14.3 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related Damage to SCEs for: P01 – Pressure Vessels P02 – Heat Exchangers P03 – Rotating Equipment P04 – Tanks P08 – Piping Systems, to together provide minimum required mechanical integrity for	MC 2.11.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure

[98] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	Controls	Environmental Performance Standards	***Measurement Criteria***
		identified SCE systems (piping, heat exchangers, rotating equipment and pressure vessels) for operation within defined integrity limits to prevent a loss of containment that may result in an MEE.	
	C 13.3 Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	PS 13.3 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: F06 – Safety Instrumented System P10 – Wells (for subsea/flowline LOC controls), to together detect and respond to pre-defined initiating conditions and/or initiate responses that put the process plant, equipment, and the wells in a safe condition so as to prevent or mitigate the effects of an MEE.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 14.4 OPGGS (Safety) Regulations 2009: Accepted Safety Case for the Pluto facility.	PS 14.4 An accepted Safety Case is implemented, and safety notification and reporting is undertaken in accordance with the Regulations (as applicable).	MC 14.4.1 Acceptance letter from NOPSEMA demonstrates acceptance of the Safety Case. Records demonstrate applicable NOPSEMA notification and reporting.
	C 13.5 Incident reports are raised for unplanned releases within event reporting system.	PS 13.5 Incident reports raised for unplanned releases, and Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous99 chemical - in any 48-hour period.	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response	

[99] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

6.8.8 Unplanned Hydrocarbon Release: Loss of Marine Vessel Separation (MEE-04)

Context		
Topsides – Section 3.4.1 Pipeline and 6-inch Chemical Supply Line – Section 3.4.4 Hydrocarbon Inventories–Section 3.9 Support Vessel Operations -Section 3.8 Vessel-based Activities for the Xena-3 Tie-back – Section 3.12	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Protected Places – Section 4.8 Socio-economic Environment – Section 4.9	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Hydrocarbon release of marine diesel to the marine environment from vessel due to collision within the PSZ.		x	x	x	x	x	x	B	C	1	M	LCS GP PJ RBA CV SV	Acceptable if ALARP	EPO 16
Hydrocarbon release from pipeline, flowline(s) and riser(s) to the marine environment and atmosphere (MEE-02/03) caused by collision and structural integrity failures.		x	x	x	x	x	x	B	C	1	M			
Marine environment footprint and associated hydrocarbon and chemical release associated with platform loss of structural integrity (MEE-03) caused by collision.		x	x	x	x	x	x	B	C	1	M			

Description of Source of Risk

A loss of marine vessel separation between a vessel and the facility, or between vessels may result in a loss of hydrocarbon containment from the facility and/or the release of fuel from the vessel. A loss of marine vessel separation with PLA has been identified as a potential MEE (MEE-04). Loss of marine vessel separations can arise from:

- visiting vessel collisions associated with platform support vessels, IMMR and accommodation vessels – ships which are visiting the riser platform can accidentally collide with the platform or each other during approach to, or manoeuvring alongside, the platform; and

- errant passing vessel collision – ships which are not visiting the riser platform (i.e. passing vessels) can, for one reason or another, move off-course and collide with the platform
- vessel operations during adverse weather.

The different collision hazards involve significantly different sized vessels and collision speeds; hence, differing impact energies and consequences have been assessed.

Visiting Vessels

Visiting vessels are defined as those which are routinely used to service the facility. Operating procedures dictate how vessels are operated, loaded and unloaded, but it will generally occur so that the prevailing winds move the vessel away from the facility. The primary causes of visiting vessel collisions are failure to follow safe procedures and communication errors between the marine vessels and riser platform operations. These errors could be worsened by:

- vessel station keeping failures
- vessel operations in adverse weather conditions.

A number of common failure causes due to human error and SCC failures are presented in the generic Human Error and generic SCE Failure bowties in Section 6.8.10

Errant Passing Vessels

Errant passing vessels are defined as third party vessels that enter the riser platform's 500 m PSZ, but do not call at the riser platform (i.e. not support vessels). The collision can be powered or drifting. Either has the potential to cause significant damage to the riser platform.

The causes of errant passing vessel collisions include:

- failure of propulsion or steering systems
- adverse weather conditions resulting in poor visibility
- rough seas
- human error.

Woodside implements a range of control measures to mitigate the risk of errant vessel collision. In addition to the potential for large hydrocarbon releases following impact by a vessel with the riser platform, powered collisions from large passing vessels or tankers could have sufficient impact energy to breach both skins of the vessel to the extent that there is a loss of containment of cargo or fuel oil with the potential for significant loss of inventory and consequent environmental impact. This is not within the control of Woodside so is not assessed further.

Loss of Vessel Separation – Credible Hydrocarbon Spill Scenario

The loss of marine vessel separation is considered a Major Environment Event (MEE-04). The hazards associated with this MEE is loss of containment of hydrocarbons in subsea equipment, process and non-process hydrocarbon inventories and potentially fuel stored in vessels (such as platform support/IMMR vessels).

A loss of marine vessel separation could result in a significant release of process hydrocarbons. Hydrocarbon releases may result in a spill to the marine environment as described in Section 6.8.6 (MEE-02 – Subsea Equipment Loss of Containment, surface scenario) caused due to mechanical integrity impacts to structures which include flowline/export pipeline riser systems. Escalation events could interact with Loss of Structural Integrity MEE-03 Section 6.8.7 topsides inventories. In addition, vessel cargo, including diesel inventory, could be spilled if the cause of the loss of platform integrity was a collision from a support vessel or other in-field vessel.

Worst case hydrocarbon release scenarios for a subsea equipment loss of containment (MEE-02) that could result from loss of marine vessel separation in the PSZ is discussed in Section 6.8.6. Relevant trajectory modelling as applicable to these scenarios is also discussed above.

A loss of vessel separation may lead to the accidental release of marine diesel from the fuel tanks on the vessel(s) involved. For a vessel collision to result in the worst-case scenario of a hydrocarbon spill potentially impacting an environmental receptor, several factors must align as follows:

- 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 affect the marine environment is considered highly unlikely. Given the offshore location of the Operational Area, vessel grounding in relation to the Petroleum Activities Program is not considered a credible risk.

A collision between a platform, subsea support vessel or ASV with a third-party vessel (i.e. commercial shipping, other petroleum related vessels and commercial fishing vessels) was considered the only credible event that could release a significant quantity of marine diesel to the environment. This was assessed as being credible but highly unlikely given the platform support vessels typically operate in the Operational Area, the presence of vessels in the Operational Area is typically temporary (e.g. while undertaking IMMR activities), vessels undertaking the Petroleum Activities Program typically operate of low speeds or are stationary, the standard vessel operations and equipment in

place to prevent collision at sea, and the construction and placement of storage tanks. For marine vessels, credible spill volume assumptions are taken as the volume of the largest fuel tank in line with AMSA guidelines [Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities].The largest tank of a platform support or subsea support vessel is unlikely to exceed 105 m3. However, non-routine vessel activities may be required with larger tank inventories such as ASV with segregated tank inventories of ~300 m3, with combined capacity of ~1,800 m3. For the purposes of understanding the characteristics of a marine diesel release from a large vessel, a loss of 1000 m3 of marine diesel to sea-surface within the PSZ has been selected as being representative of a worst-case spill scenario.

Decision Type, Risk Analysis and ALARP Tools

Woodside has not experienced any loss of marine vessel separation events that have resulted in significant environmental impacts. The facility has never experienced a worst-case loss of containment due to loss of vessel separation in its operational history.

Decision Type

A decision type 'B' has been applied to this risk under the Guidance on Risk Related Decision Making (Oil and Gas UK 2014). This reflects the complexity of the risk, the higher potential consequence and stakeholder implications should the event be realised. To align with this decision type, a further level of analysis has been applied using risk-based tools including the Bowtie Methodology (described in Section 2.7.3) and hydrocarbon spill trajectory modelling. Company and societal values were also considered in the demonstration of ALARP and acceptability, considered through internal reviews, and stakeholder consultation (Section 5).

Quantitative Spill Risk Assessment

Credible worst-case hydrocarbon spill scenarios subsea equipment loss of containment (MEE-02) applies to a loss of vessel separation (MEE-04) causing structural failures, with PLA facility location noted to be further away (offshore) from key receptors modelled in a mid-point export pipeline loss of containment scenario. Refer to the Section 6.8.6 for a discussion of this credible worst-case spill scenario.

Spill modelling of the worst-case credible loss of marine diesel from a vessel spill scenario was undertaken by RPS (2024e) on behalf of Woodside. Modelling of a diesel fuel tank loss of containment described in Table 6-37: Summary of worst-case vessel fuel tank loss of containment during operations scenario was undertaken over all seasons to address possible year-round vessel operations. This is considered to provide a conservative estimate of the EMBA and the potential impacts from the identified worst-case credible release volumes for marine diesel loss of containment scenarios.

Table 6-37: Summary of worst-case vessel fuel tank loss of containment during operations scenario

Scenario	Hydrocarbon	Duration (minutes)	Depth (m)	Latitude	Longitude	Total Hydrocarbon Release Volume (m3)
Scenario 5: Vessel fuel tank loss of containment	Marine Gas Oil	60	Surface	19° 59' 46.5" S	115° 22' 5.6" E	1,000

Hydrocarbon Characteristics

See Section 6.8.2 for a description of marine diesel.

Likelihood

In accordance with the Woodside Risk Matrix, a likelihood of 'highly unlikely' event as it 'has occurred once or twice in the industry' (experience-based likelihood) and aligns with a frequency of '1 in 10,000 to 1 in 100,000 years' has been assigned to each of the following events:

- hydrocarbon release from subsea equipment to the marine environment and atmosphere
- marine environment footprint and associated hydrocarbon and chemical release associated with structural collapse of riser platform.
- surface release from vessel fuel tank

Consequence

The spatial extent and fate (including weathering) of the spilled hydrocarbon was considered during the impact assessment for MEE-02 Section 6.8.6, and separate diesel modelling scenario. These considerations were informed primarily by the outputs from the stochastic modelling studies undertaken by RPS (2024c, 2024e), available information on environmental sensitivities that may credibly be impacted in the event of a worst-case spill (Section 6.8.5 and 6.8.6), and relevant literature and studies considering the effects of hydrocarbon exposure.

Consequence Assessment

Environment that May Be Affected

As discussed above, the potential impacts from a hydrocarbon release caused by a loss of vessel separation include those which would result from:

- subsea equipment loss of containment (MEE-02 – Scenario 3)
- loss of structural integrity.
- Scenario 5 - Loss of containment of the Marine Diesel within the PSZ
- The potential impacts are –discussed in the above-mentioned sections and below.

Scenario 5 - Loss of containment of the Marine Diesel within the PSZ

Surface Hydrocarbons

The hydrocarbon spill modelling indicated that concentrations of floating hydrocarbons equal to or greater than the 10 g/m2 threshold could potentially be found, in the form of slicks, up to 50 km north and north-east from the release location. Receptors with the highest probability of contact at the ecological threshold include Montebello AMP with a 24% probability.

Entrained Hydrocarbons

Entrained oil concentrations equal to or greater than the 100 ppb threshold are predicted to be found up to 400 km south-west from the release location.

Receptors with the highest probability of contact at the ecological threshold (>100 ppb) include Gascoyne AMP (4%), Montebello AMP (57.5%) and Tryal Rocks (1.5%). Several other sensitive receptors are predicted to be contacted at concentrations equal to or greater than 100 ppb with probabilities of 0.5-2%Table 6-38.

Dissolved Hydrocarbons

Dissolved aromatic hydrocarbon concentrations equal to or greater than the 50 ppb threshold are predicted to be found up to around 26 km south-west from the release location. Receptors with the highest probability of contact at the ecological threshold (>50 ppb) include Montebello AMP (19.5%).

Accumulated Hydrocarbons

The modelling predicted no shoreline hydrocarbon accumulated at any receptor above the ecological threshold.

Summary of Potential Impacts to Environmental Value(s)

The credible worst-case hydrocarbon spill scenario that may arise from MEE-04 may impact upon a range of environmental receptors; refer to Table 6-38 for a summary of receptors identified by the stochastic spill modelling studies. Potential impacts of a hydrocarbon spill to the open water environment and receptors has been assessed within the worst-case spill scenario, MEE-01; refer to Section 6.8.5 for a description of potential impacts.

The modelling for the spill scenario that may arise from MEE-04 predicted some low-probability entrained hydrocarbons that may also impact the environment and receptors within the nearshore waters above the relevant thresholds that were not located within the EMBAs modelled for either the worst-case spill scenario; MEE-01 or MEE-02 assessed above. Therefore, the potential impacts have been assessed further below.

Table 6-38: Environment that May Be Affected - Key receptor locations and sensitivities potentially contacted above impact thresholds by loss of vessel marine diesel inventory at the PLA PSZ for threshold ≥0.5%

Environmental Setting	Receptor	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure)																															Probability of hydrocarbon contact and fate (%)					
		Physical		*Biological*																						*Socio-economic and Cultural*							*Socio-cultural EMBA*		*EMBA*			
		Water Quality	*Sediment Quality*	*Marine Primary Producers*			*Other Communities / Habitats*								*Protected Species*										*Other Species*														
		Open Water (Pristine)	Marine Sediment (Pristine)	Coral Reef	Seagrass Beds / Macroalgae	Mangroves	Spawning / Nursery Areas	Open water – Productivity / Upwelling	Non-biogenic Reefs	Offshore Filter feeders and / or Deepwater Benthic Communities	Nearshore Filter Feeders	Sandy Shores	Estuaries / Tributaries / Creeks / Lagoons (including mudflats)	Rocky Shores	Cetaceans – Migratory Whales	Cetaceans – Dolphins and Porpoises	Dugongs	Pinnipeds (Sea Lions / Fur Seals)	Marine Turtles (Foraging and Internesting Areas and Significant Nesting Beaches)	Sea Snakes	Whale Sharks	Sharks and Rays	Seabirds and Migratory Shorebirds	Pelagic Fish Populations	Demersal Fish Populations	Fisheries - Commercial	Fisheries - Traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (1–10 g/m²)	Accumulated hydrocarbons (10–100 g/m2)	Surface Hydrocarbons (≥ 10 g/m2)	Entrained Hydrocarbons (≥ 100 ppb)	Dissolved Hydrocarbons (≥50 ppb)	Accumulated Hydrocarbons (≥ 100 g/m2)
Offshore	Montebello MP	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		29.5		24	57.5	19.5	
	Gascoyne MP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓				4		
	Ningaloo MP										✓	✓	✓	✓					✓					✓				✓	✓					0.5		
Islands	Southern Pilbara Islands	✓	✓	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					1		
	Barrow Island	✓	✓	✓	✓	✓	✓	✓	·		·	✓	·	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓	✓				0.5		
	Flat Island	✓	✓	✓	✓	·	✓	✓	·	✓	·	✓	·	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	·	·	✓	✓					1		
	Hermite Island	✓	✓	✓	✓	✓	✓	✓	·		·	✓	·	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓	✓				0.5		
	Montebello Islands	✓	✓	✓	✓	✓	✓	✓	·		·	✓	·	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓	✓				0.5		
	Muiron Islands	✓	✓	✓	✓	·	✓	✓	·	✓	·	✓	·	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	·	·	✓	✓					1.5		
	Peak Island	✓	✓	✓	✓	·	✓	✓	·	✓	·	✓	·	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	·	·	✓	✓					1		
	Serrurier Island	✓	✓	✓	✓	·	✓	✓	·	✓	·	✓	·	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	·	·	✓	✓					0.5		
State Marine Parks and Nature	Barrow Island MP	✓	✓	✓	✓	✓	✓	✓	·		·	✓	·	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓	✓				0.5		
	Barrow Island MMA	✓	✓	✓	✓	✓	✓	✓	·		·	✓	·	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓	✓				0.5		

Environmental Setting	Receptor	Environmental, Social, Cultural, Heritage and Economic Aspects presented as per the Environmental Risk Definitions (Woodside's Risk Management Procedure)																													Probability of hydrocarbon contact and fate (%)					
		Physical		*Biological*																						*Socio-economic and Cultural*					*Socio-cultural EMBA*		*EMBA*			
		Water Quality	*Sediment Quality*	*Marine Primary Producers*			*Other Communities / Habitats*							*Protected Species*										*Other Species*											
		Open Water (Pristine)	Marine Sediment (Pristine)	Coral Reef	Seagrass Beds / Macroalgae	Mangroves	Spawning / Nursery Areas	Open water – Productivity / Upwelling	Non-biogenic Reefs	Offshore Filter feeders and / or Deepwater Benthic Communities	Nearshore Filter Feeders	Sandy Shores	Estuaries / Tributaries / Creeks / Lagoons (including mudflats)	Rocky Shores	Cetaceans – Migratory Whales	Cetaceans – Dolphins and Porpoises	Dugongs	Pinnipeds (Sea Lions / Fur Seals)	Marine Turtles (Foraging and Internesting Areas and Significant Nesting Beaches)	Sea Snakes	Whale Sharks	Sharks and Rays	Seabirds and Migratory Shorebirds	Pelagic Fish Populations	Demersal Fish Populations	Fisheries - Commercial	Fisheries - Traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	Surface hydrocarbon (1–10 g/m²)	Accumulated hydrocarbons (10–100 g/m2)	Surface Hydrocarbons (≥ 10 g/m2)	Entrained Hydrocarbons (≥ 100 ppb)	Dissolved Hydrocarbons (≥50 ppb)	Accumulated Hydrocarbons (≥ 100 g/m2)
	Montebello Island MP	✓	✓	✓	✓	✓	✓				✓	·	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓					1		
	Muiron Islands MMA	✓	✓	✓	✓	·	✓	✓	·	✓	·	✓	·	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	·	·	✓	✓					1.5		
	Ningaloo Coast WH								·	·	✓	✓	✓	✓				·	✓				✓			·	✓	✓	·				0.5		
	Ningaloo MP (State)								·	·	✓	✓	✓	✓				·	✓				✓			·	✓	✓					0.5		
Submerged Banks and Shoals	Montebello Shoals	✓	✓	✓	✓	✓	✓	✓		✓	·	✓	✓	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓					0.5		
	Outtrim Patches	✓	✓	✓	✓	·	✓	✓	·	✓	·	✓	·	✓	✓	✓	✓	·	✓	✓	✓	✓	✓	✓	✓	·	·	✓	✓					1		
	Tryal Rocks	✓	✓	✓	✓	✓	✓	✓	·		·	✓	·	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	·	✓	✓					1.5		

Nearshore Waters (Mainland and Islands)

Marine Sediment Quality

The EMBA modelled for MEE-04 scenario overlaps the nearshore waters of a few shorelines and islands (RPS, 2024e).

Low probabilities (<2%) of entrained hydrocarbons were predicted to contact a few nearshore receptors, such as the Ningaloo Coast, Montebello Islands and Shoals, Barrow Island and Muiron Island. Therefore, hydrocarbon contact from this scenario may lead to reduced marine sediment quality by several processes, such as adherence to sediment and deposition seabed habitat.

No shorelines were predicted to be exposed to either shoreline accumulation or floating surface hydrocarbons at any threshold (RPS, 2024e).

Protected Species

Cetaceans and dugongs

Coastal populations of small cetaceans (e.g. the spotted dolphin) and dugongs are known to reside or frequent nearshore waters along the WA coastline and nearshore islands, including the Exmouth Gulf, Ningaloo Coast and at the Muiron Islands, Montebello and Barrow Island groups, and the Pilbara Southern Island Groups. The general impacts of hydrocarbons on cetaceans has been assessed above.

Evaluation of the extent of the spill EMBA modelled for MEE-04 demonstrated an overlap with areas where cetaceans are known to occur, including the BIAs for a number of species. In addition to the BIAs that overlaps the PPA, the EMBA overlaps with the dugong calving, breeding, foraging (high density seagrass beds) and nursing BIAs, the OIE pygmy blue whale foraging BIA (see Section 4.6).

OIE pygmy blue whale

The pygmy blue whale foraging area in the Ningaloo Coast is within the EMBA modelled for the vessel separation scenario (due to contact with entrained hydrocarbons at 100 ppb); however, it is about 232 km south-west of the PAA and the EMBA is not representative of any one hydrocarbon spill. The likelihood of impacts occurring within this BIA are, therefore, considered low.

Dugong

Impacts (in addition to those noted above) include ingestion of hydrocarbons by dugongs that feed on oiled seagrass and indirect impacts to dugongs should seagrass habitats be damaged by a hydrocarbon spill. As noted for the pygmy blue whale foraging BIA, the spill EMBA modelled for MEE-04 scenario only overlaps a small northern portion of the Exmouth Gulf and it is considered a low likelihood that the dugong BIAs (and associated seagrass meadows) located there and along the Ningaloo Coast (BIAs for calving, nursing, breeding and foraging) would be impacted by a hydrocarbon spill. No surface or shoreline hydrocarbons are predicted within the Exmouth Gulf or associated dugong BIAs within this EMBA.

Summary

A hydrocarbon spill following a vessel separation may impact coastal cetaceans through site displacement and damage to food source, however, due to the non-persistent nature of the hydrocarbon it is not predicted to result in impacts on overall population viability of either dugongs or coastal cetaceans.

Marine Turtles

Marine turtles are known to utilise nearshore waters and shorelines for foraging and breeding activities (including internesting), with significant nesting beaches along the WA mainland coast and nearshore islands in locations (such as the Dampier Archipelago and Montebello Island).

The combined EMBA overlaps a number of marine turtle BIAs. The modelling for MEE-04 scenario predicted exposure by to entrained hydrocarbons exceeding the relevant exposure thresholds at a number of islands and the nearshore waters of these marine turtle habitat areas.

The modelling for MEE-04 predicted no hydrocarbon exposure to any shorelines at any threshold. Therefore, impacts to nesting individuals are not expected following a release of hydrocarbons in the event of a vessel separation.

The potential impacts of hydrocarbon exposure within the nearshore environment has been assessed above. Marine turtles aggregating near nesting beaches within the EMBA for MEE-04 during the mating and nesting seasons are most vulnerable to hydrocarbons, due to greater turtle densities and the possible disruption to important life cycle behaviours.

Potential impacts may occur at the population level due to the presence of a high number of breeding individuals and hatchlings (during hatchling dispersal) and may impact on overall population viability of marine turtle species. However, given the volatile nature of the hydrocarbons population level impacts are not anticipated to occur

Sea Snakes

The potential impacts of hydrocarbon exposure within the nearshore environment upon sea snakes has been assessed above.

Sharks and Rays

Whale sharks and manta rays (reef manta ray and giant manta ray) are known to frequent Ningaloo Reef (forming feeding aggregations March through July) and the nearshore waters of the Muiron Islands (located 228 km south-west of the PAA). Whale sharks and manta rays generally transit along the nearshore coastline in these areas and are vulnerable to surface, entrained and dissolved aromatic hydrocarbon spill impacts, with both taxa having similar modes of feeding.

Whale sharks are versatile feeders, filtering large amounts of water over their gills, catching planktonic and nektonic organisms (Jarman and Wilson 2004). Whale sharks at Ningaloo Reef have been observed using two different feeding strategies, including passive sub-surface 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 the potential for individuals that are present in worse affected spill areas to ingest potentially toxic amounts of entrained or 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 also cause displacement of whale sharks from important feeding and resting areas at Ningaloo Reef, potentially disrupt migration and aggregations to these areas in subsequent seasons. Whale sharks may also be affected indirectly by entrained or dissolved aromatic hydrocarbons through the contamination of their prey. The preferred food of whale sharks are planktonic organisms which are abundant in the coastal waters of Ningaloo Reef in late summer/autumn, driving the annual arrival and aggregation of whale sharks in this area. If a worse-case 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.

There is the potential for other coastal shark species (e.g. dwarf, narrow and/or green sawfish) to be impacted directly from hydrocarbon contact and/or indirectly through contaminated prey or loss of habitat. Excluding sawfish, which may exhibit high site fidelity, it is most likely that shark species (as mobile animals) will move away from spill affected areas and suffer minimal direct impact.

A spill reaching the Ningaloo coastline during key aggregation periods and impacting important whale shark foraging areas may have severe impacts to the local whale shark population, including possible mortality of individuals and impacts to life cycle habitats such as migration patterns. Most species of shark and ray (including whale sharks) are, however, expected to move away from spill affected areas with minimal impacts.

Seabirds

The potential impacts of hydrocarbon exposure within the nearshore environment upon seabirds has been assessed above. The modelling for the EMBA for MEE-04 predicted no shoreline accumulation of hydrocarbons at any thresholds. As mentioned above, the area exposed to surface hydrocarbons is also relatively restricted to the release site, therefore impacts to rafting or foraging individuals is anticipated to be low.

Submerged Shoals and Banks

Protected Species

Marine Turtles

Modelling for the MEE-04 spill scenario predicted a very low probability of overlap of submerged shoals and banks by the EMBA; including Montebello Shoals (0.5%), Outram Patches (1%), and Tryal Rocks (1.5%). Shoals and banks may, at times, be foraging habitat for marine turtles, given the coral and filter feeding biota associated with these areas.

Notably, there are no known key aggregation areas (i.e. BIAs or habitat critical areas) for marine turtles associated with these submerged receptors (see Section 4.6.2 for further details on key areas).

Impacts to marine turtles at submerged shoals and banks in offshore marine environments have been discussed above in Section 6.8.5. Marine turtles would be expected to be foraging, resting and breathing at the surface at these geomorphic features. Ingestion of hydrocarbons while foraging through prey is also possible.

Marine turtles that may be present at these submerged shoals and banks within the EMBA may be impacted by entrained hydrocarbons present at concentrations greater than the relevant thresholds. Impacts would be expected to be limited to the individuals that may be transiting these areas. Subsequently, impacts at the population level are not anticipated for any of the five marine turtle species that may frequent shoals and banks within the EMBA.

Sea snakes

It is likely that sea snakes will be present at submerged shoals and banks within the EMBA modelled for MEE-2. Whilst there are no known areas of aggregation for sea snakes within the extended combined EMBA (see Section 4.6.2), individual sea snakes may be impacted by hydrocarbons predicted at and near to their habitat preferences (see Section 4.6.2).

The potential impacts to sea snakes following exposure to hydrocarbons have been discussed above.

Sharks and Rays

Pelagic sharks and rays may frequent submerged shoals and banks to feed within the EMBA modelled for MEE-04. The potential impacts to sharks and rays following exposure to entrained hydrocarbons have been discussed above.
All Settings
Coral
The potential impacts to coral and coral recruitment / spawning following exposure to entrained hydrocarbons have been discussed above.
Productivity
The potential impacts to plankton and offshore productivity following exposure to entrained hydrocarbons have been discussed above.
Seagrass Beds, Macroalgae and Mangroves
The potential impacts to seagrass beds, macroalgae and mangroves following exposure to entrained hydrocarbons have been discussed above.

Summary of Potential Impacts to Socio-economic Values	
Setting	***Receptor Group***
Nearshore Island and Mainland Coastal Areas (Nearshore Waters)	***Fisheries – Commercial*** The potential impacts to commercial fisheries following exposure to hydrocarbons have been discussed above.
	Fisheries – Traditional Although no designated traditional fisheries have been identified within the PAA or EMBA, it is recognised that Indigenous communities' fish in the shallow coastal and nearshore waters of Ningaloo Reef and therefore may be impacted if a worst-case hydrocarbon spill were to occur. Impacts would be similar to those identified for commercial fishing, in the form of a potential fishing exclusion zone and possible contamination/tainting of fish stocks.
	Tourism and Recreation Tourism would likely be adversely affected if a visible surface slick entered areas of tourism activity. Spill modelling predicted low probability of hydrocarbon contact to the closest tourism area, such as the Montebello MP and Dampier AMP and archipelago. These areas have some seasonal charter boat operators and fishing activities, mainly concentrated around the islands. Modelling also predicted low probabilities of entrained hydrocarbon exposure at areas such as the Ningaloo Coast located over 200 km south of the PPA. These areas experience high levels f seasonal tourism and recreational activities. Impacts would be temporary exclusion of these activities within the exposed areas. No long-term impacts are expected due to the distance and weathering and fate of the hydrocarbons exposed to prior to reaching these areas.

MEE-04 Loss of Marine Vessel Separation – Risk Analysis
A bowtie risk analysis was undertaken to assess MEE-04; refer to the below figures for bowtie diagrams which were an output of Woodside's risk analysis process.

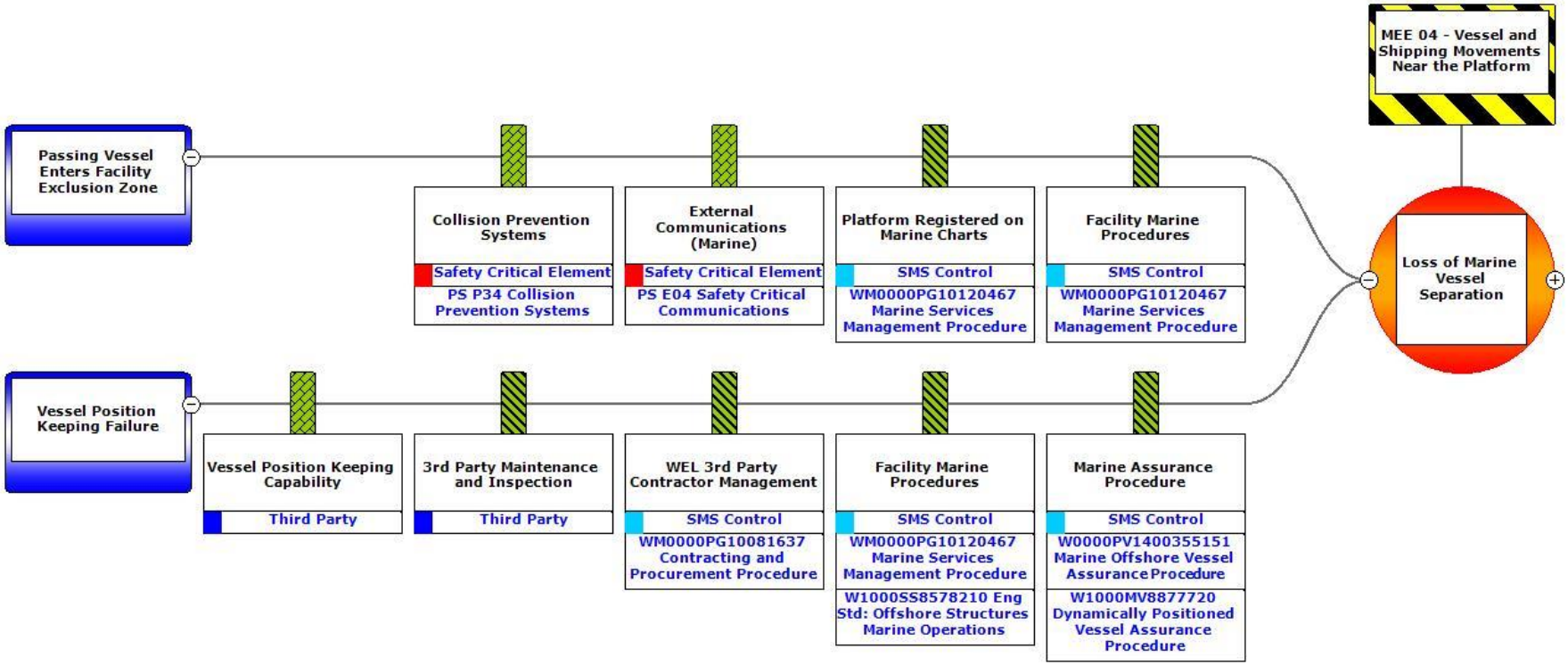


Figure 6-26: MEE-04 Loss of Vessel Separation (Causes 1-2)

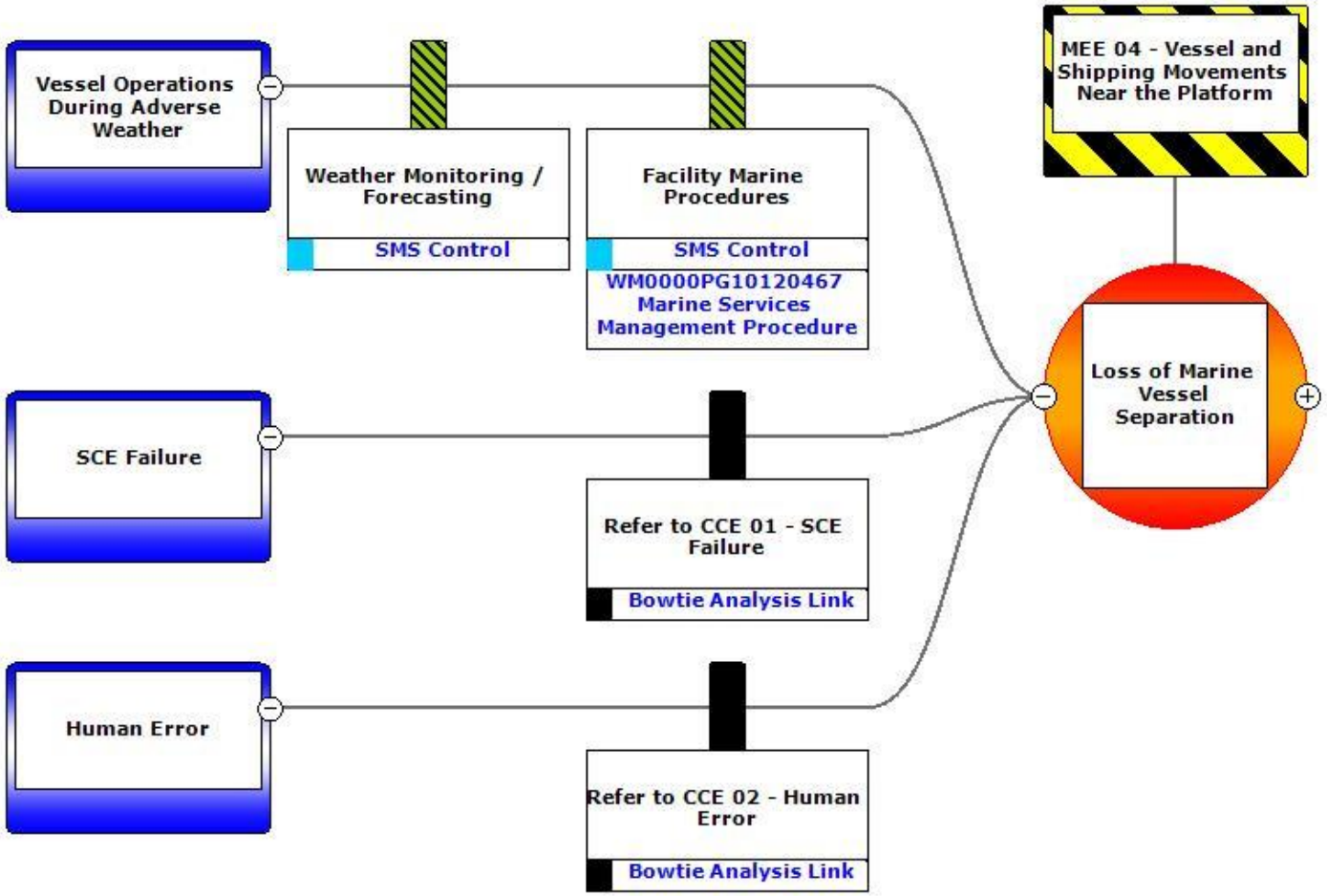


Figure 6-27: MEE 04 Loss of Marine Vessel Separation (Causes 3-5)

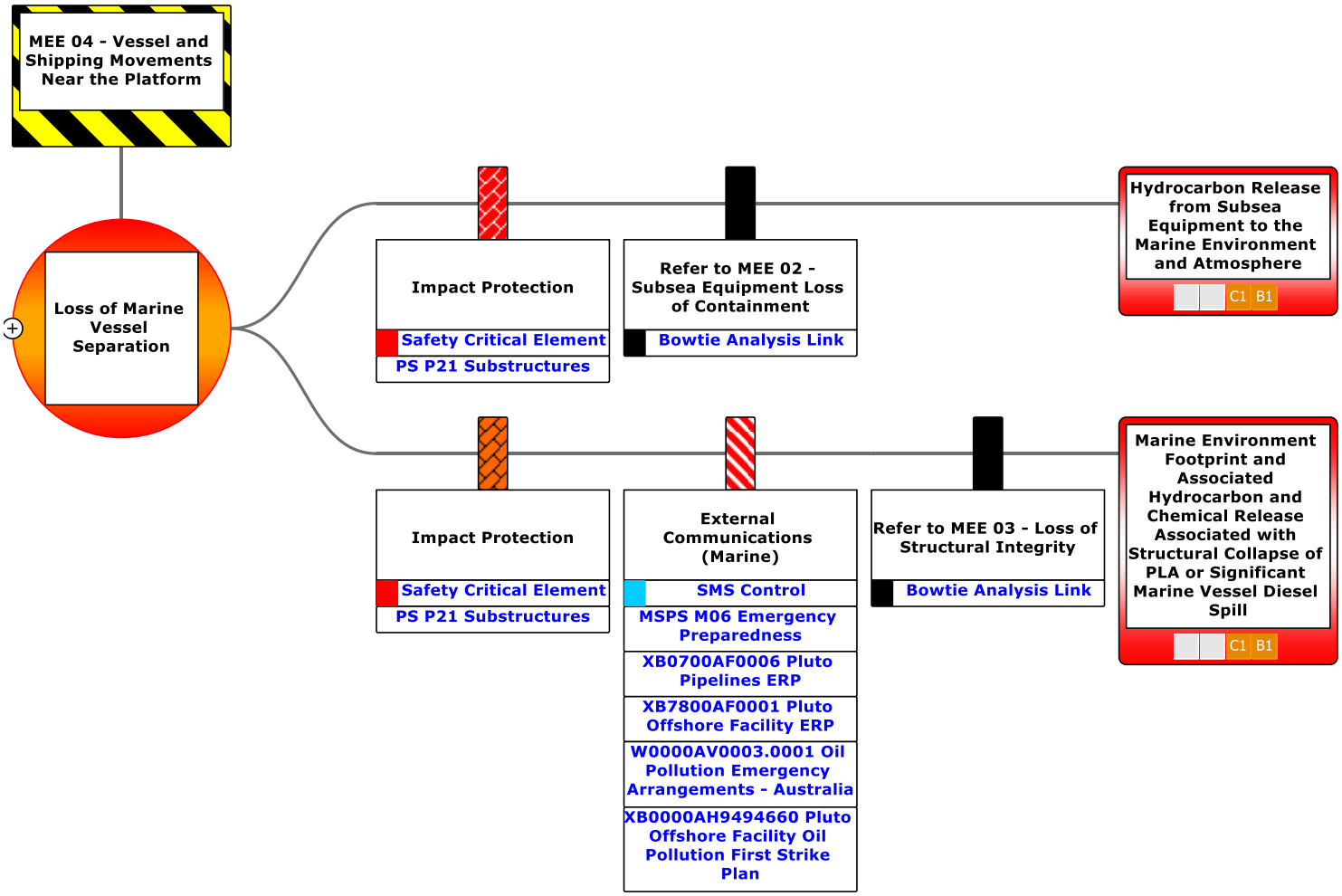


Figure 6-28: MEE-04 Loss of Vessel Separation (Outcomes)

MEE-04 Loss of Marine Vessel Separation – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Preventative Barriers – Safety and Environmental Critical Elements				
Elimination	N/A	No elimination or substitution controls were identified beyond those incorporated in design.		
Substitution				
Engineering Controls	Maintaining collision warning systems and navigational aids to alert facility of a potential collision with marine vessels, and to alert marine vessels of facility location so that they may take timely action to avoid the facility and hence reduce likelihood of collision.	P34 – Ship Intrusion Detection System	Detection (Technical)	Yes C 16.1
Engineering Controls	Maintaining availability of critical external and internal communication systems to facilitate prevention and response to accidents and emergencies.	E04 – Safety critical communications systems	Prevention (Technical)	Yes C 13.2
Mitigating Barrier – Safety and Environmental Critical Elements				
Engineering Controls	Maintaining structural integrity to ensure availability of critical systems during a major accident or environment event, and prevent loss of marine vessel separation from contributing to escalation of an MEE.	P21 – Substructures	Mitigation (Technical)	Yes C 15.1
Legislation Codes and Standards				
Procedures and Administration	OPGGS (Safety) Regulations 2009: Accepted Safety Case for the Pluto facility to: identify hazards that have the potential to cause an MAE detail assessment of MAE risks describe the physical barrier SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with an MAE to ALARP, thus contributing to management of associated potential environmental consequences of MAEs.	Pluto Safety Case	Prevention (Administration) Control based on legislative requirements – must be adopted	Yes C 14.4
Procedures and Administration	Incident reports are raised for unplanned releases within event reporting system.	Woodside Health, Safety and Environment Event Reporting and Investigation Procedure WM0000PG9905421	Prevention/ Mitigation (Administration) Control based on legislative requirements	Yes C 13.5

MEE-04 Loss of Marine Vessel Separation – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Management System Specific Measures: Key Standards or Procedures				
Procedures and Administration	Implementing management systems to maintain: Contracting and Procurement Procedure Marine Offshore Vessel Assurance Procedure Marine Services Management Procedure Dynamically Positioned Vessel Assurance Procedure Engineering Standard: Offshore Structure Marine Operations	Marine Services Management Procedure Marine Offshore Vessel Assurance Procedure Contracting and Procurement Procedure Dynamically Positioned Vessel Assurance Procedure Engineering Standard: Offshore Structures Marine Operations	Prevention (Administration)	Yes – See Section 7 Implementation Strategy
Emergency Response and Contingency Planning	Implementing management systems to maintain: M06 – Emergency preparedness Pluto Offshore Facility Emergency Response Plan Pluto Pipelines Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia.	MSPS M06 – Emergency preparedness Pluto Offshore Facility Emergency Response Plan Pluto Pipelines Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia	Mitigation (Administration)	Yes – See Section 7 Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response.
Risk Based Analysis				
For risks identified as MEEs, a detailed risk-based Bowtie Analysis (as outlined in Section 2.7.3) has been used to identify, analyse and demonstrate that controls in place reduce the risk associated with each MEE to ALARP. Controls have been selected following hierarchy of control principles and consider independence of each barrier and their type of effect in controlling the hazardous event. Application of Woodside's Risk Management Procedures and implementation of the Pluto A Operations Safety Case and Pluto Export Pipeline Safety Case ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes: • ongoing hazard identification, risk assessment and the identification of control measures • ongoing integrity management of hardware control measures in accordance with the operational performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability. For each SCE, detailed requirements for equipment functionality, availability, reliability and survivability are incorporated into SCE Performance Standards which also include the relevant assurance tasks (e.g. inspection, maintenance, testing and monitoring requirements) to ensure technical integrity. Bowtie analysis was undertaken to assess MEE-04, with review of formal safety assessment studies.				

MEE-04 Loss of Marine Vessel Separation – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***

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 remote likelihood unplanned hydrocarbon release as a result of a loss of marine vessel separation.

The principle of inherent safety and environmental protection is based on the prevention of the MEE through design of the facility jacket and pipeline, flowline and riser integrity and ensuring controls are assurance through maintenance and inspection, and safe operating practices applied. If hydrocarbon loss of containment occurs, mitigation measures are in place to minimise the consequence by limiting the inventory which can be released and implementing remediation.

The controls in place for prevention and mitigation of MEEs are specified and assured through implementing the Pluto A Operations Safety Case(s), SCE management procedures including technical performance standards for SCEs and MSPSs for Safety Critical Procedures.

The application of Woodside Risk Management Procedures, and implementation of the Pluto Subsea Pipeline and Pluto A Operations Safety Cases ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

ongoing hazard identification, risk assessment and the identification of control measures

ongoing integrity management of hardware control measures in accordance with SCE technical performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability.

Given the controls in place to prevent and control loss of containment events and mitigate their consequences, it is considered that MEE risk associated with Loss of Marine Vessel Separation at the riser platform is managed to ALARP

Demonstration of Acceptability

Acceptability Statement

Loss of marine vessel separation has been evaluated as having a ‘moderate’ level of risk rating. Woodside considers ‘moderate’ risk ratings as broadly acceptable if the adopted controls are implemented. Due to the consequence associated with MEE-04, Decision Type B has been applied, and ALARP is demonstrated using good industry practice, consideration of company and societal values and risk-based analysis, if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained.

Acceptability is demonstrated with regard to the oil spill risk considerations as described in Section 6.8.5 (MEE-01) (the considerations include principles of Ecologically Sustainable Development, internal context, external context and other requirements (includes laws, policies, standards and conventions)).

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 16 Woodside will manage its activities to prevent loss of marine vessel separation events from resulting in material loss of containment to the marine environment. Structural integrity loss of containment risks to the environment are managed to limit risk to	C 16.1 Maintaining collision warning systems and navigational aids to alert facility of a potential collision with marine vessels, and to alert marine vessels of facility location so they may take timely action to avoid the facility and hence reduce likelihood of collision.	PS 16.1 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P34 – Collision prevention systems to: alert facility of a potential collision with marine vessels alert marine vessels of facility location so they may take timely action to avoid the facility and	MC 2.11.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
High[100] during the Petroleum Activities Program.		hence reduce likelihood of collision.	
	C 13.2 Maintaining availability of critical external and internal communication systems to facilitate response to accidents and emergencies.	PS 13.2 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: E04 – Safety Critical Communication Systems, to allow effective Emergency Response (ER) communications in emergencies, including: internal communications such as audible and visual warning systems, and voice communications during emergency events external communications such as voice communications to adjacent facilities, aircraft and vessels, and external incident control centres during emergency events	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure
	C 15.1 Maintaining structural integrity to ensure availability of critical systems during a major accident or environment event, and prevent structural failures from contributing to escalation of an MEE.	PS 15.1 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P21 – Substructures P07 – Topsides/Surface Structures, to together: provide and maintain structural integrity to support SCE systems under all design conditions through service life prevent structural failure from contributing to the escalation of an MEE by providing support/ protection of SCE systems during an emergency event, and/or support containment of environmentally hazardous material.	MC 2.11.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure.
	C 14.4 OPGGS (Safety) Regulations 2009:	PS 14.4 An accepted Safety Case is implemented, and safety notification and reporting is	MC 14.4.1 Acceptance letter from NOPSEMA demonstrates

[100] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	Accepted Safety Case for the facility.	undertaken in accordance with the Regulations (as applicable).	acceptance of the Safety Case. Records demonstrate applicable NOPSEMA notification and reporting.
	C 13.5 Incident reports are raised for unplanned releases within event reporting system.	PS 13.5 Incident reports raised for unplanned releases, and Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous101 chemical - in any 48-hour period.	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response	

6.8.9 Unplanned Hydrocarbon Release: Loss of Control of Suspended Load from Platform (MEE-05)

Context		
Produced Water System – Section 3.5.5 Lifting Operations – Section 3.7.5 Project Vessels – Section 3.8	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Protected Places – Section 4.8 Socio-economic Environment – Section 4.9	Consultation – Section 5

Impacts and Risks Evaluation Summary														
	Environmental Value Potentially Impacted							***Evaluation***						
Source of Risk	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome

[101] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere within PSZ (MEE-02) – caused by loss of control of suspended load		x	x	x	x	x	x	B	C	1	M	LCS GP PJ RBA CV		EPO 17
Hydrocarbon release from topsides equipment to the marine environment and atmosphere – caused by loss of control of suspended load		x	x	x		x		A	D	1	M		Acceptable if ALARP	

Description of Source of Risk

Lifting activities on the riser platform can take place from the platform crane between supply vessels and laydown areas, or between laydown areas. Lifting operations performed using the platform or visiting vessel cranes could potentially lead to dropped objects, impacting assets (topsides equipment, subsea infrastructure) inside the riser platform 500 m PSZ, potentially leading to a hydrocarbon loss of containment from topsides and/or subsea infrastructure. Loss of suspended load has been identified as an MEE (MEE-05). A loss of suspended load may arise from:

- lifting equipment failure
- facility lifting operations
- adverse weather

A number of common failure causes due to human error and SCC failures are presented in the generic Human Error and SCE Failure bowties in Section 6.8.10.

Loss of Control of Suspended Load – Credible Scenarios

The identified outcome of this MEE is a loss of containment of hydrocarbons due to impact of a dropped object on topsides equipment or subsea pipelines resulting in a release of the hydrocarbon inventory to the atmosphere or the marine environment.

Decision Type, Risk Analysis and ALARP Tools

Woodside has a good history of implementing industry standard practice in subsea system design and construction. In the company's recent history, it has not experienced any loss of suspended load events that have resulted in significant releases or significant environmental impacts.

Decision Type

Decision Type B has been applied to this risk under the Guidance on Risk Related Decision Making (Oil and Gas UK 2014). This reflects the complexity of the risk, the higher potential consequence and stakeholder implications should the event be realised. To align with this decision type, a further level of analysis has been applied using risk-based tools including the bowtie methodology (described in Section 2.7.3) and hydrocarbon spill trajectory modelling. Company and societal values were also considered in the demonstration of ALARP and acceptability, considered through internal reviews, and stakeholder consultation (Section 5).

A loss of control of a suspended load is considered an MEE (MEE-05). The hazard associated with this MEE is the hydrocarbon inventory of flowlines and risers, or topsides process and non-process hydrocarbons.

Quantitative Spill Risk Assessment

The credible worst-case hydrocarbon scenario for MEE-02 is considered to apply to a loss of control of suspended load, as they may credibly arise from damage to hydrocarbon containing subsea infrastructure within the 500 m PSZ. A quantitative spill risk assessment was not conducted for the topsides loss of containment scenario due to the relatively small credible release volume. Potential escalation events are considered and previously discussed in Section 6.8.7 Loss of Structural Integrity.

Likelihood

In accordance with the Woodside Risk Matrix a likelihood rating of "Highly Unlikely" is assigned for potential environmental consequences from loss of containment events caused by dropped objects. Formal safety assessment

studies considered the frequency of dropped objects from platform into sea with potential impaction to flowline or export pipeline being limited to 1.0E-05 per year, or 1 in 100,000 years. This aligns with an experience-based likelihood assessment as it 'has occurred once or twice in the industry' and is considered appropriate also for hydrocarbon release from topsides equipment to the marine environment and atmosphere, due to the nature of topsides infrastructure, containment storage design and locations, and lifting protocols in place.

Consequence

The spatial extent and fate (incl. weathering) of the spilled hydrocarbons were considered during the impact assessment for a loss of control of suspended load. These considerations were informed primarily by the outputs from the numerical modelling studies undertaken by RPS, available information on environmental sensitivities that may credibly be impacted in the event of a worst-case spill, and relevant literature and studies considering the effects of hydrocarbon exposure. Refer to Section 6.8.9 (MEE-02) and Section 6.9.2 for a description of the consequence potentially resulting from subsea and topsides loss of containment scenarios, respectively – as applicable worse-case outcomes from loss of control of suspended load events.

Benthic disturbance

In the unlikely event of an object being dropped into the marine environment, potential environmental effects would be limited to slight 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 slight but permanent.

MEE-05 Loss of Control of Suspended Load from Platform – Risk Analysis
A bowtie risk analysis was undertaken to assess MEE-05; refer to the below figures for bowtie diagrams which were an output of Woodside's risk analysis process.

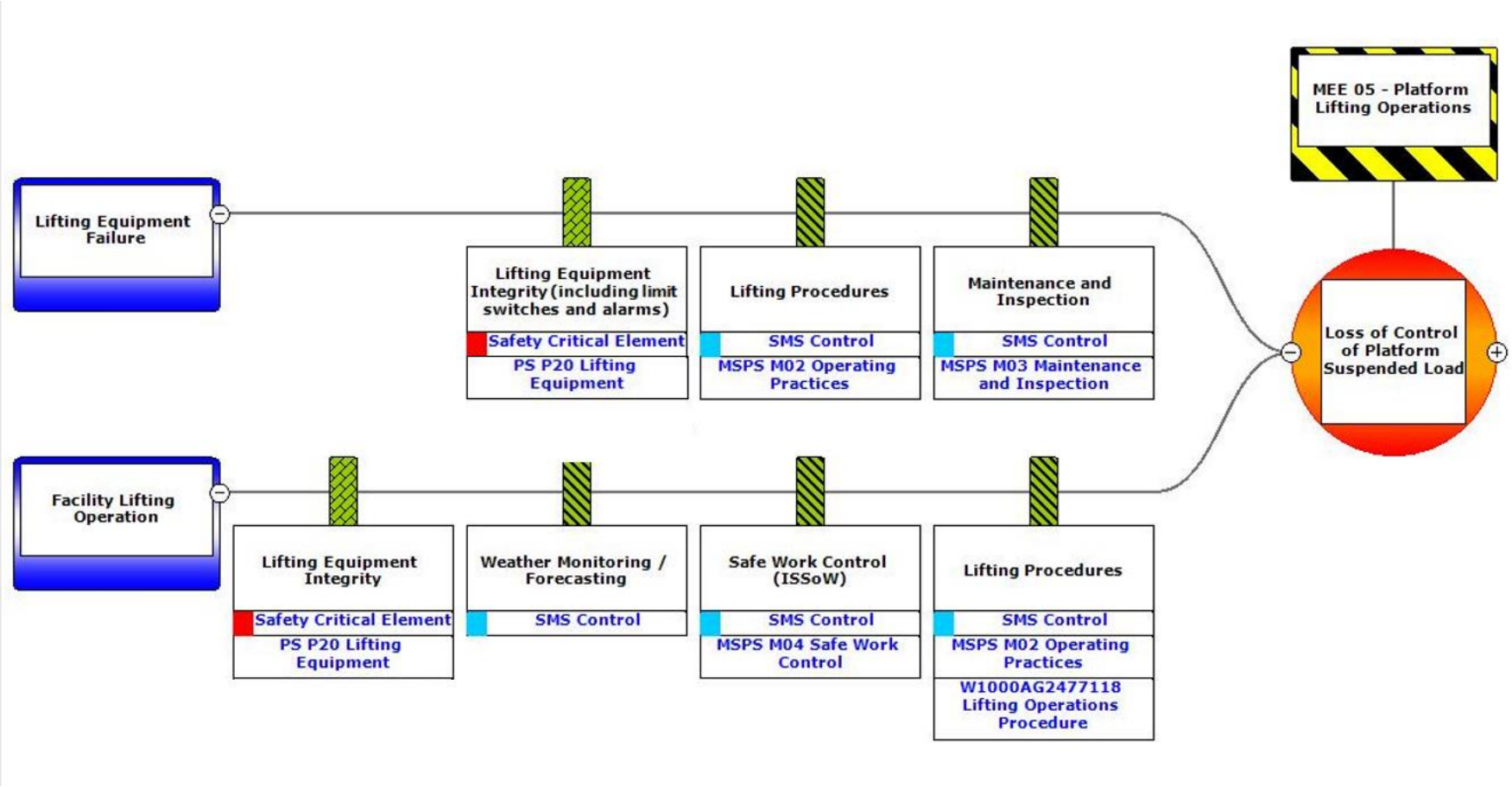


Figure 6-29: MEE 05 Loss of Control of Suspended Load (Causes 1-2)

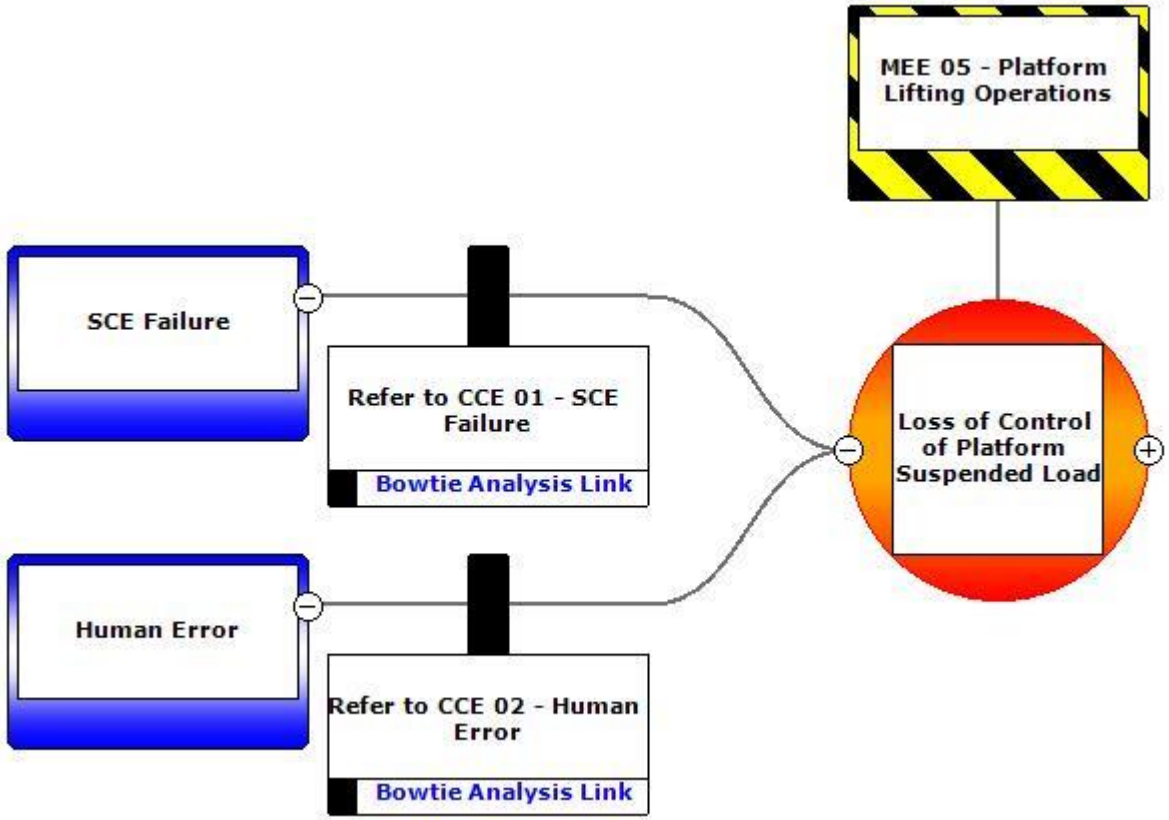


Figure 6-30: MEE 05 Loss of Control of Suspended Load (Causes 3-4)

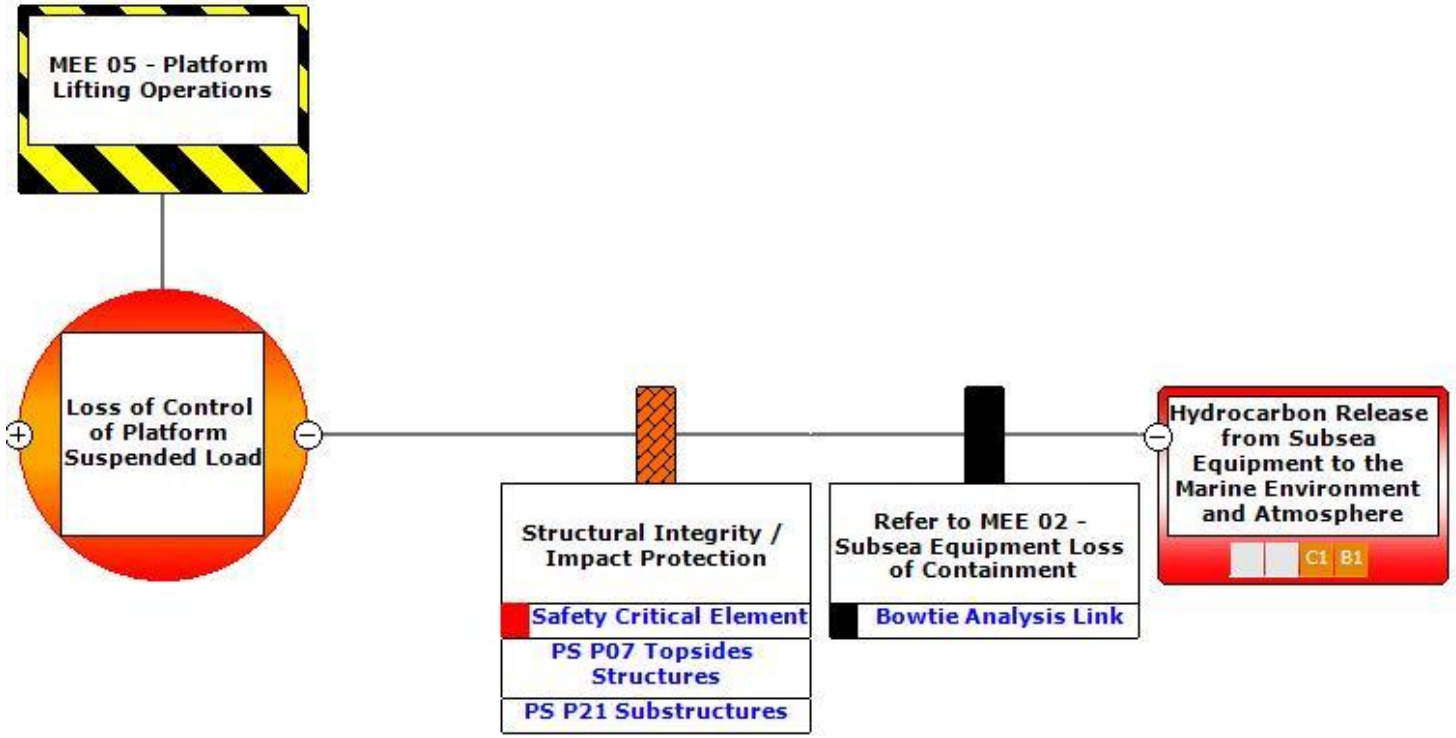


Figure 6-31: MEE-05 Loss of Control of Suspended Load (Outcomes)

MEE-05 Loss of Control of Suspended Load from Platform – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Preventative Barriers – Safety and Environmental Critical Elements				
Elimination	N/A	No elimination or substitution controls were identified beyond those incorporated in design.		
Substitution				
Engineering Controls	Maintaining platform lifting equipment to prevent platform lifting equipment failure or dropped/swinging loads that could result in an MEE.	P20 – Lifting equipment (including cranes)	Prevention (Technical)	Yes C 17.1
Mitigating Barrier – Safety and Environmental Critical Elements				
Impact Protection	Maintaining structural integrity to ensure availability of critical systems during a major accident or environment event, and prevent structural failures from contributing to escalation of an MEE.	P07 – Topsides structures P21 – Substructures	Reduction (Technical)	Yes C 15.1
Legislation Codes and Standards				
Procedures and Administration	OPGGS (Safety) Regulations 2009: Accepted Safety Case for the facility to: identify hazards that have the potential to cause an MAE detail assessment of MAE risks describe the physical barriers SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with an MAE to ALARP, thus contributing to management of associated potential environmental consequences of MAEs.	Pluto A Operations Safety Case	Prevention (Administration) Control based on legislative requirements – must be adopted	Yes C 14.4
Procedures and Administration	Incident reports are raised for unplanned releases within event reporting system.	Woodside Health, Safety and Environment Event Reporting and Investigation Procedure	Prevention/ Mitigation (Administration) Control based on legislative requirements – must be adopted	Yes C 13.5
Management System Specific Measures: Key Standards or Procedures				
Procedures and Administration	Implement management systems to maintain: MSPS 03 – Maintenance and inspections MSPS 04 – Safe work control Procedures – Lifting Operations	MSPS M03 – Maintenance and inspections MSPS M04 – Safe work control Lifting Operations Procedure	Prevention (Administration)	Yes – See Section 7 Implementation Strategy
Risk Based Analysis				

MEE-05 Loss of Control of Suspended Load from Platform – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***

For risks identified as MEEs, a detailed risk-based Bowtie Analysis (as outlined in Section 2.7.3) has been used to identify, analyse and demonstrate that controls in place reduce the risk associated with each MEE to ALARP. Controls have been selected following hierarchy of control principles and consider independence of each barrier and their type of effect in controlling the hazardous event.

Application of Woodside's Risk Management Procedures and implementation of the Pluto A Operations Safety Case and Pluto Export Pipeline Safety Case ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

- ongoing hazard identification, risk assessment and the identification of control measures
- ongoing integrity management of hardware control measures in accordance with the operational performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability.

For each SCE, detailed requirements for equipment functionality, availability, reliability and survivability are incorporated into SCE Performance Standards which also include the relevant assurance tasks (e.g. inspection, maintenance, testing and monitoring requirements) to ensure technical integrity.

A bowtie analysis quantitative spill risk assessment was undertaken to assess MEE-05.

Company Values

Refer to Section 6.8.6 for a discussion of company values in relation to the pipeline and riser loss of containment scenario.

Societal Values

Refer to Section 6.8.6 for a discussion of societal values in relation to the pipeline and riser loss of containment scenario.

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 highly unlikely likelihood unplanned hydrocarbon release as a result of a loss of control of suspended load.

The principle of inherent safety and environmental protection is based on the prevention of the MEE through design of structural integrity and impact protection, and lifting equipment and standards ensuring the systems are operated within their design envelope through operating practices and assurance through maintenance and inspection. If hydrocarbon loss of containment occurs, mitigation measures are in place to minimise the consequence by limiting the inventory which can be released and implementing remediation.

The controls in place for prevention and mitigation of MEEs are specified and assured through implementing the Safety Case(s), SCE management procedures including technical performance standards for SCEs and MSPSs for Safety Critical Procedures.

The application of Woodside Risk Management Procedures, and implementation of the Pluto Export Pipeline and Pluto A Operations Safety Cases ensures the continuous identification of hazards, systematic assessment of risks and ongoing assessment of alternative control measures to reduce risk to ALARP, which includes:

ongoing hazard identification, risk assessment and the identification of control measures

ongoing integrity management of hardware control measures in accordance with the SCE technical performance standards which define requirements to be suitably maintained, such that they retain effectiveness, functionality, availability and survivability.

Given the controls in place to prevent and control loss of containment events and mitigate their consequences, alongside procedural control of facility operations, it is considered that MEE risk associated with a loss of control of suspended load is managed to ALARP.

MEE-05 Loss of Control of Suspended Load from Platform – Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect***	***Control Adopted***
Demonstration of Acceptability				
Acceptability Statement Loss of suspended load has been evaluated as having a 'moderate' level of risk rating. As per Section 2.2.1., Woodside considers 'moderate' risk ratings as broadly acceptable if the adopted controls are implemented. Due to the consequence associated with MEE-05, Decision Type B has been applied, and ALARP is demonstrated using good industry practice, consideration of company and societal values and risk-based analysis, if legislative requirements are met and societal concerns are accounted for and the alternative control measures are grossly disproportionate to the benefit gained. Acceptability is demonstrated with regard to the oil spill risk considerations as described in Section 6.8.5 (MEE-01) (the considerations include principles of Ecologically Sustainable Development, internal context, external context and other requirements (includes laws, policies, standards and conventions).				

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 17 Woodside will manage its activities to prevent loss of suspended load from riser platform events from resulting in material loss of containment to the marine environment. Loss of suspended load from riser platform risks to the environment are managed to limit risk to High[102] through maintenance of prevention and mitigative barriers during the Petroleum Activities Program.	C 17.1 Maintaining platform lifting equipment to prevent platform lifting equipment failure or dropped/swinging loads that could result in an MEE.	PS 17.1 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P20 – Lifting equipment (including cranes), to prevent platform lifting equipment failure or dropped/swinging loads that could result in an MEE by maintaining lifting equipment integrity.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 15.1 Maintaining structural integrity to ensure availability of critical systems during a major accident or environment event, and prevent structural failures from contributing to escalation of an MEE.	PS 15.1 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P21 – Substructures P07 – Topsides/Surface Structures, to together: provide and maintain structural integrity to support SCE systems under all design conditions through service life prevent structural failure from contributing to the escalation of	MC 2.11.1 Records demonstrate implementation of SCE technical Performance Standard(s) and SCE Management Procedure.

[102] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		an MEE by providing support/ protection of SCE systems during an emergency event, and/or support containment of environmentally hazardous material.	
	C 13.5 Incident reports are raised for unplanned releases within event reporting system.	PS 13.5 Incident reports raised for unplanned releases, and Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous[103] chemical - in any 48-hour period.	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response	

[103] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

6.8.10 MEE Common Cause Event Failure Mechanisms: SCE Failure CCE-01 and Human Error CCE-02

This section presents common mode failure causes and controls applicable across MEEs, which are also observed within the bowties of the MEEs discussed within sections above. Controls, EPSs and MCs presented within this section are also considered relevant to MEE 01 to MEE-05.

Pluto: Major Environment Event Datasheet	
MEE Number	All
Hazard Description	Generic SCE Failure
Hazard Description	
Hazard Overview and Scope	
There are a number of causes which contribute to failures of SCEs and other systems which might protect against an MEE. These include: • maintenance errors • defects • electrical supply failure • hydraulic supply failure • adverse environmental conditions. The generic SCE failure bowtie (Figure 6-32 and Figure 6-33) illustrates the causes, outcomes and the controls in place to manage these failure mechanisms.	
Hazard Management (Bowtie Diagrams)	

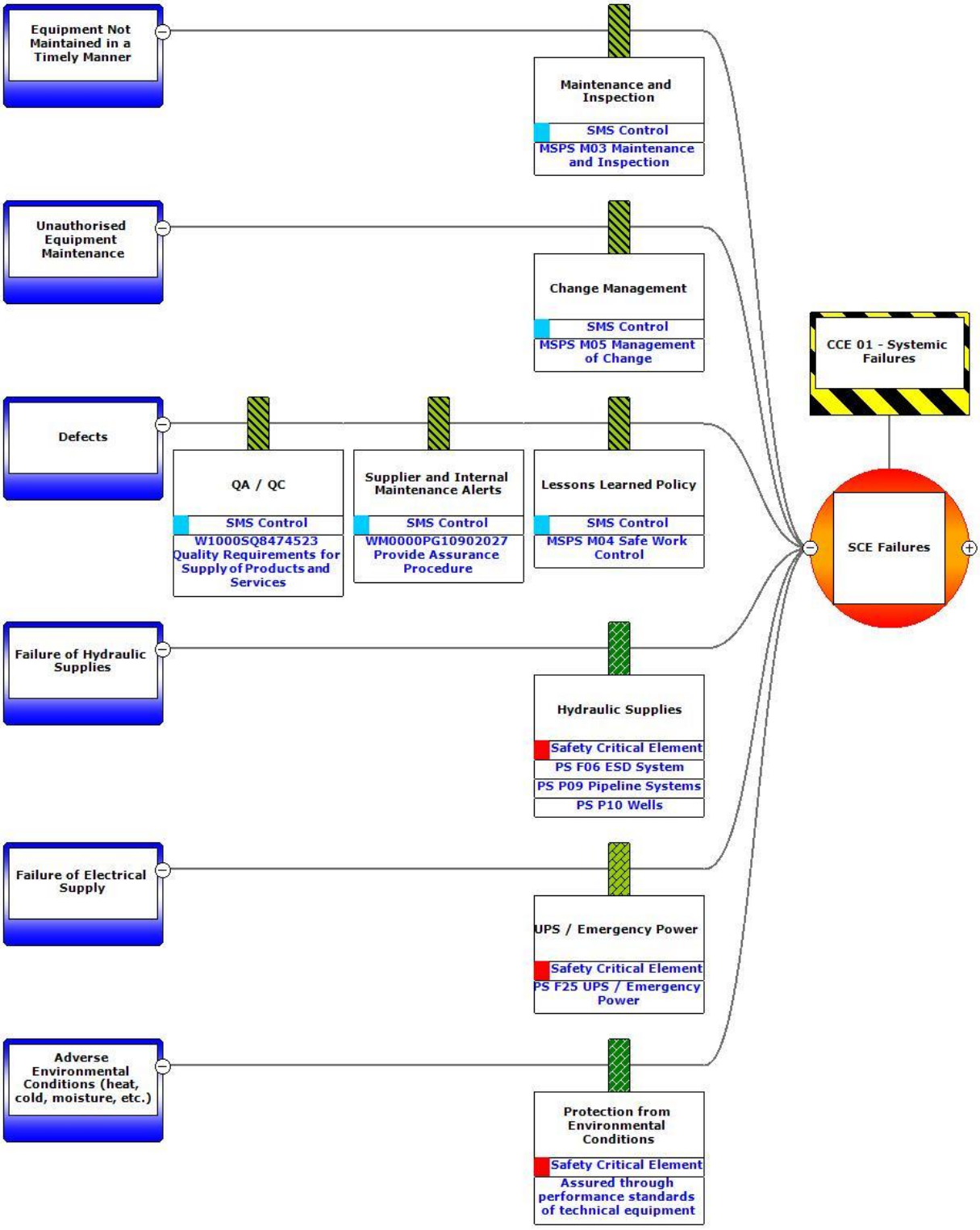


Figure 6-32: CCE 01 Safety Critical Element Failure (Causes)

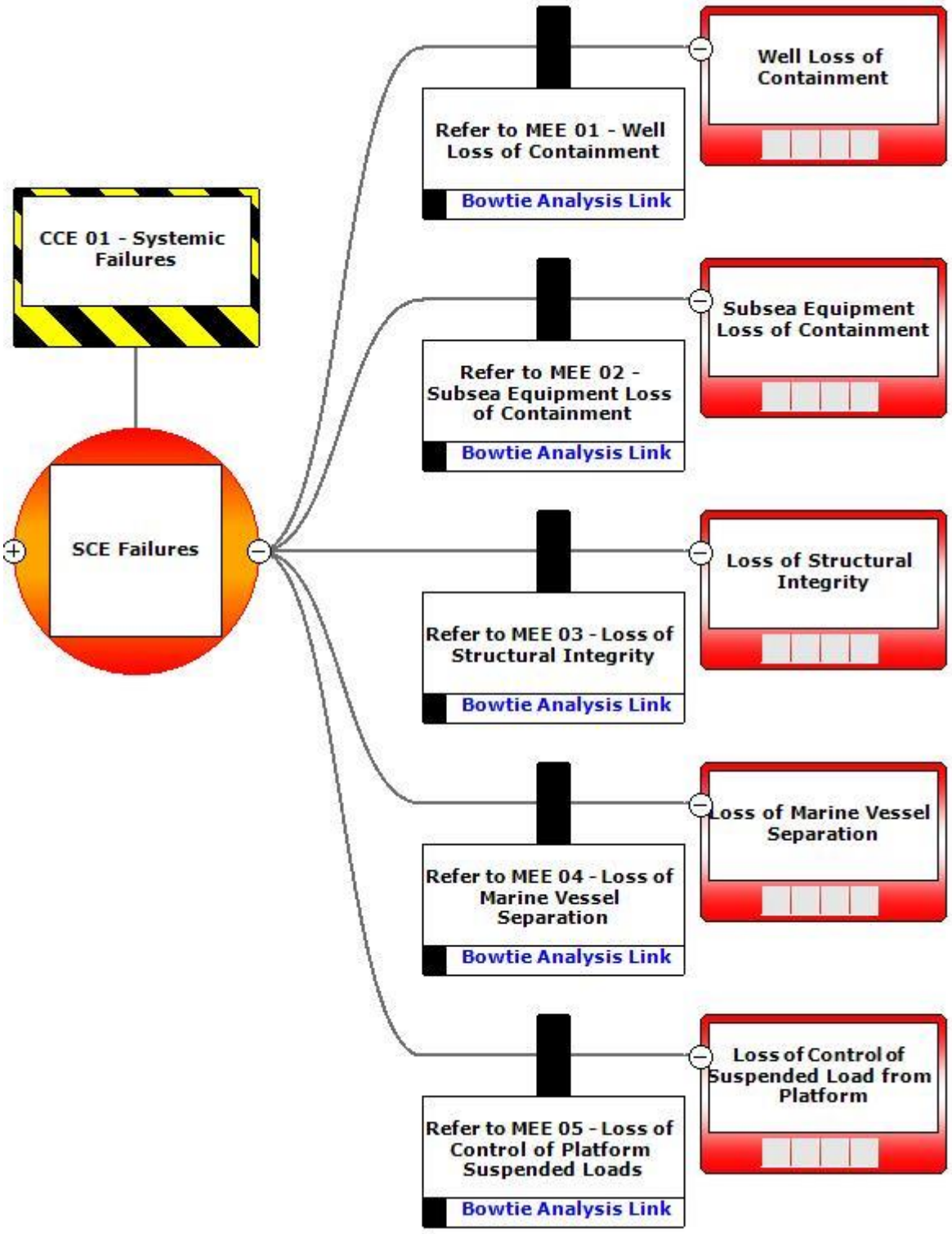


Figure 6-33: CCE 01 Safety Critical Element Failure (Outcomes)

CCE-01 Safety Critical Equipment Failure Risk Analysis and Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect (Refer to Table 6-27)***	***Control Adopted***
Preventative Barriers – Safety and Environmental Critical Elements				
Elimination	Maintain hydraulic supplies (e.g to support Safety Instrumented Systems and actuation of SCE valves/isolations)	F06 – Safety Instrumented System P09 – Pipeline Systems P10 – Wells	Elimination (Technical)	Yes C 17.3
	Maintain protection from environmental conditions	P01 – Pressure Vessels P02 – Heat Exchanger P03 – Rotating Equipment P04 – Tanks P07 – Topsides Structures P08 – Piping Systems P09 – Pipeline Systems P10 – Wells P21 – Substructures	Elimination (Technical)	Yes C 17.4
Substitution	N/A	No elimination or substitution controls were identified beyond those incorporated in design.		
Engineering Controls	Maintain UPS / emergency power system to supply Essential safety systems	F25 – UPS / Emergency Power	Prevention (Technical)	Yes C 17.5
Mitigating Barrier – Safety and Environmental Critical Elements				
Mitigation	N/A	No mitigation controls were identified beyond those incorporated in design.		
Legislation Codes and Standards				
Procedures and Administration	Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: Accepted Safety Case for the Pluto facility to; identify hazards that have the potential to cause a MAE; detail assessment of MAE risks; and describe the physical barriers SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with a MAE to ALARP; thus contributing to management of associated potential environmental consequences of MAEs.	Pluto A Operations Safety Case and Pluto Export Pipeline Safety Case.	Prevention (Administration) Control based on legislative requirements – must be adopted	Yes C 14.4
Management System Specific Measures: Key Standards or Procedures				

CCE-01 Safety Critical Equipment Failure Risk Analysis and Demonstration of ALARP ALARP Control Measures				
Hierarchy	***Control / Barrier***	***SCE / Management System Reference***	***Type of Effect (Refer to Table 6-27)***	***Control Adopted***
Procedures and Administration	Implement management systems to maintain: MSPS 03 Maintenance and Inspection MSPS 04 Safe Work Control MSPS 05 Management of Change Quality Requirements for Supply of Products and Service Provide Assurance Procedure	MSPS-03 – Maintenance and Inspection MSPS-04 –Safe Work Control MSPS-05 – Management of Change Provide Assurance Procedure	Prevention (Administration)	Yes – See Section 7 Implementation Strategy
Risk Evaluation				
Refer to MEEs.				

CCE-01 Safety Critical Element Failure Performance Outcomes, Standards and Measurement Criteria			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
Refer to relevant MEE EPOs: EPOs 13-17	C 17.3 Maintain hydraulic supplies (e.g. to support Safety Instrumented Systems and actuation of SCE valves/isolations).	PS 17.2 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related Damage to SCEs for: F06 – Safety Instrumented System P09 – Pipeline Systems P10 – Wells, to together maintain hydraulic supplies to support Emergency Shutdown Systems and actuation of SCE valves/isolations.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 17.4 Maintain protection from environmental conditions.	PS 17.4 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related Damage to SCEs for: P01 – Pressure Vessels P02 – Heat Exchanger P03 – Rotating Equipment P04 – Tanks	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.

CCE-01 Safety Critical Element Failure Performance Outcomes, Standards and Measurement Criteria			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		P07 – Topsides/Surface Structures P08 – Piping Systems P09 – Pipeline Systems P10 – Wells P21 – Substructures, for each SCE to protect equipment from adverse environmental conditions (e.g. heat, cold, moisture, chemical reaction/ incompatibility).	
	C 17.5 Maintain UPS / emergency power system to supply Essential safety systems.	PS 17.5 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE technical Performance Standard(s) to prevent environment risk related Damage to SCEs for: F25 – UPS / Emergency Power to; provide continuous supply of power (emergency generation and uninterruptable power supply (UPS) to Essential loads following a total (mains) power failure.	MC 1.17.1 Records demonstrate implementation of SCE Technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 14.4 OPGGS (Safety) Regulations 2009: Accepted Safety Case for the facility	PS 14.4 An accepted Safety Case is implemented, and safety notification and reporting is undertaken in accordance with the Regulations (as applicable).	MC 14.4.1 Acceptance letter from NOPSEMA demonstrates acceptance of the Safety Case. Records demonstrate applicable NOPSEMA notification and reporting.

Pluto: Major Environment Event Datasheet	
MEE Number	All
Hazard Description	Generic Human Errors
Hazard Description	
Hazard Overview and Scope	

Pluto: Major Environment Event Datasheet
There are a number of causes of human errors which contribute to MEEs, or which can result in failure or degradation of the barriers in place to protect against MEEs. These are presented in the following bowtie pages and include: task issues, e.g. poor task design; time pressures, task complexity; poor physical interfaces/working environment; provision of inappropriate tools for the task; communication errors, i.e. poor-quality information, lack of clarity in instructions; operator failings, e.g. competence, fitness, impairment or fatigue; and organisational issues, e.g. peer pressure, poor safety culture, inadequate supervision, lack of clarity on roles and expectations. The Generic Human Errors bowtie illustrates the causes, outcomes and the barriers in place for these failure mechanisms. Human Errors are managed solely via the WMS (no SCEs) and the bowtie is included in this section for completeness. Refer to Section 7 Implementation Strategy for applicable Management System Procedures.
Hazard Management (Bowtie Diagrams)

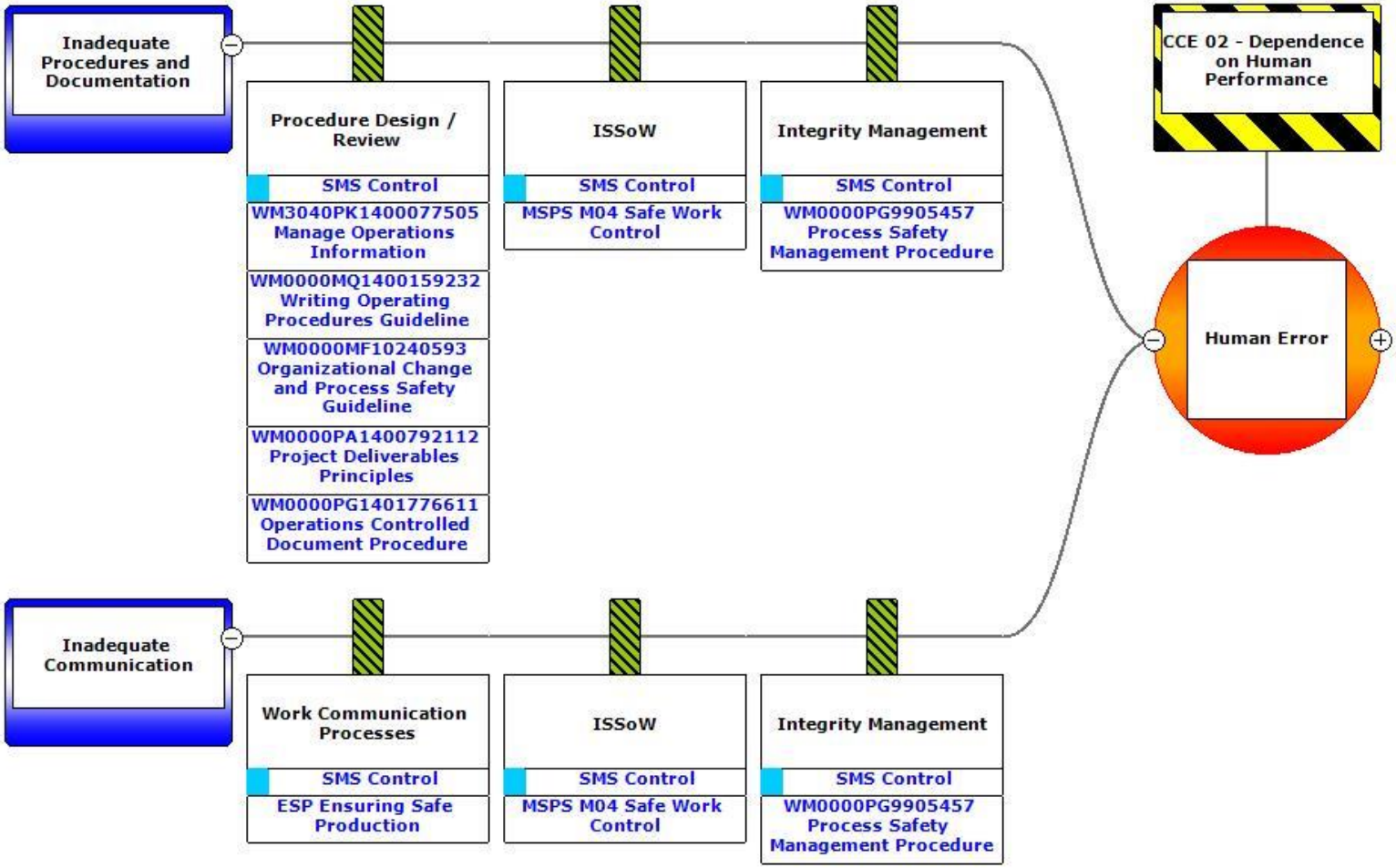


Figure 6-34: CCE 02 Human Errors (Causes 1 – 2)

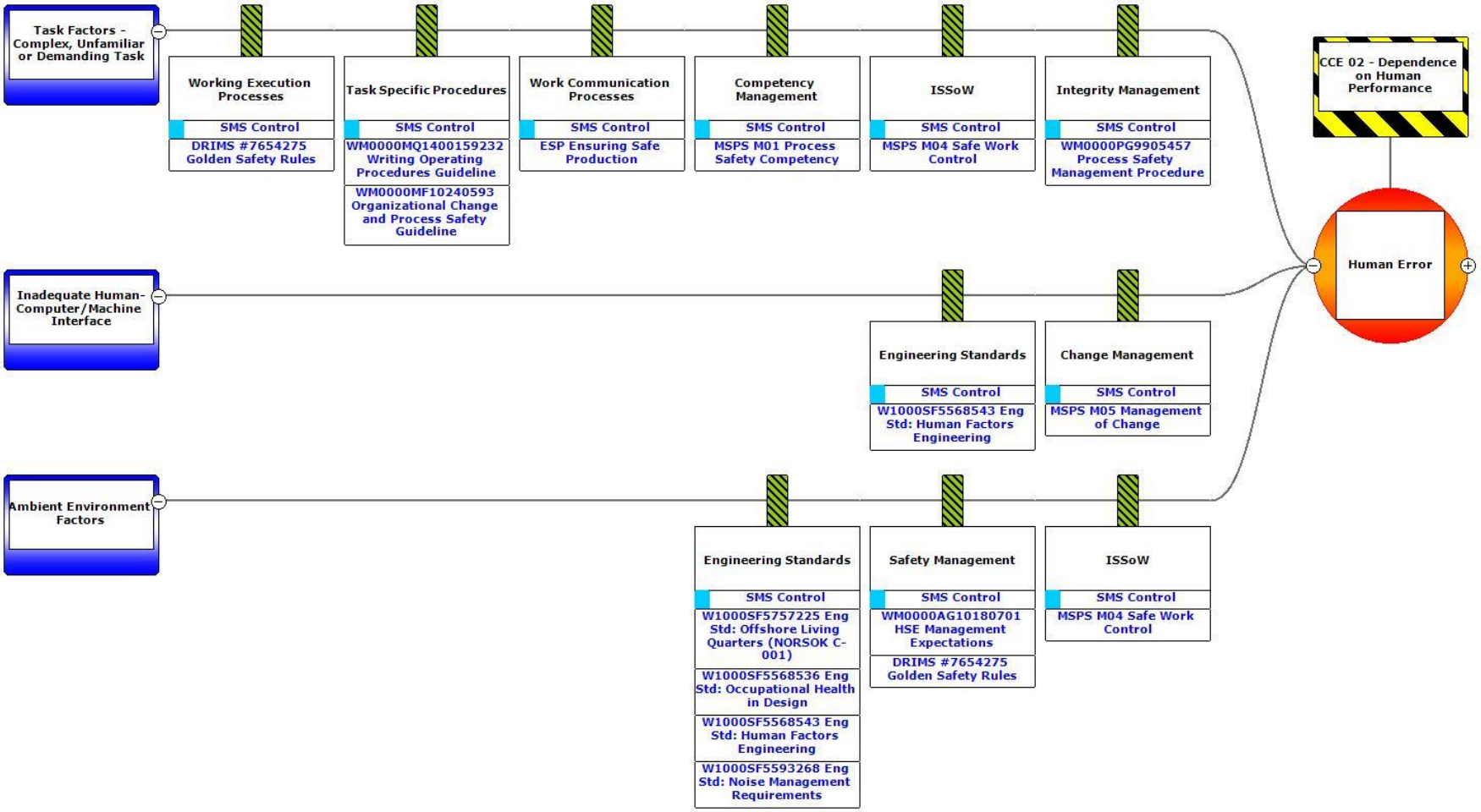


Figure 6-35: CCE 02 Human Errors (Causes 3 – 5)

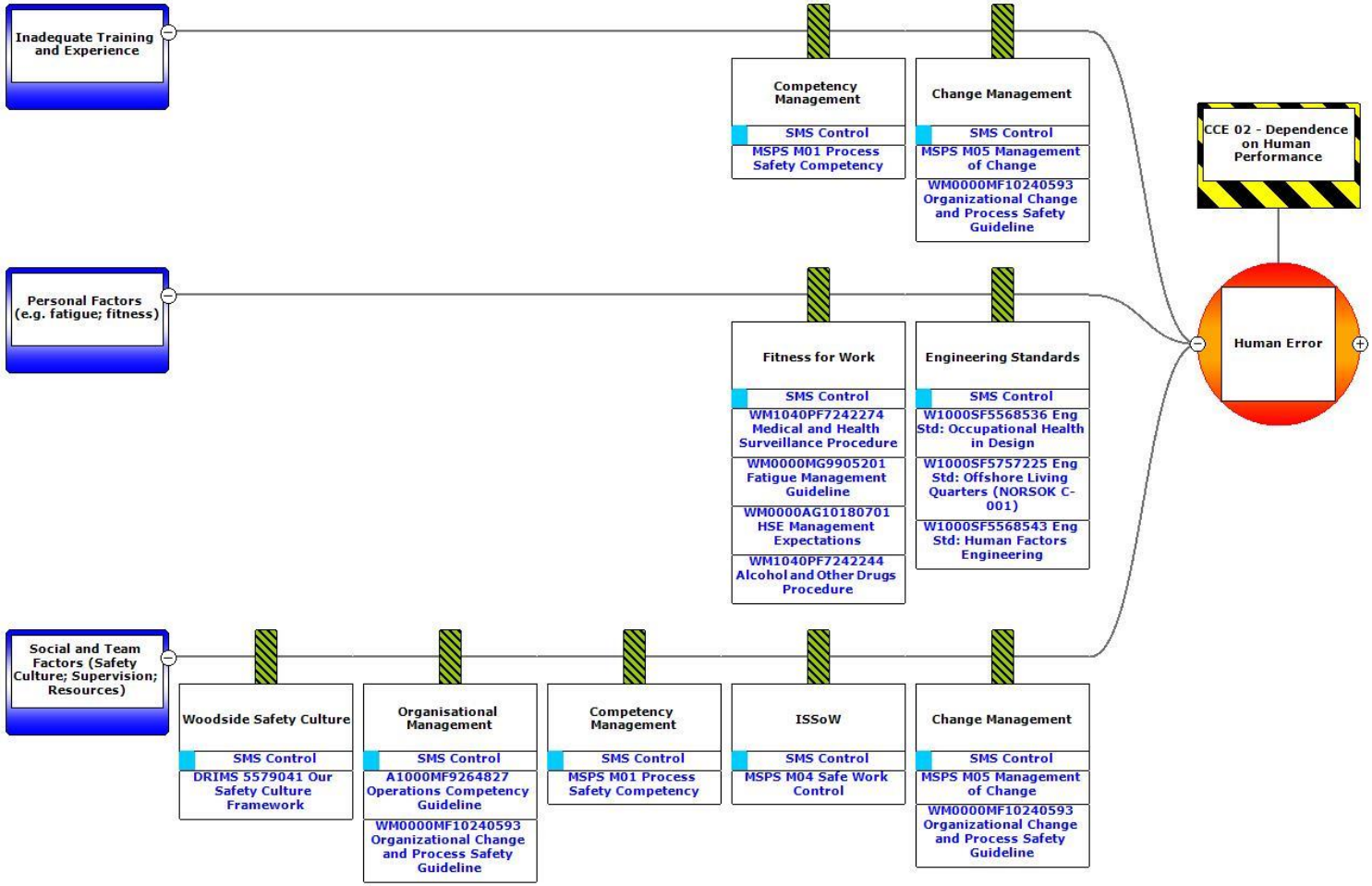


Figure 6-36: CCE 02 Human Errors (Causes 6 – 8)

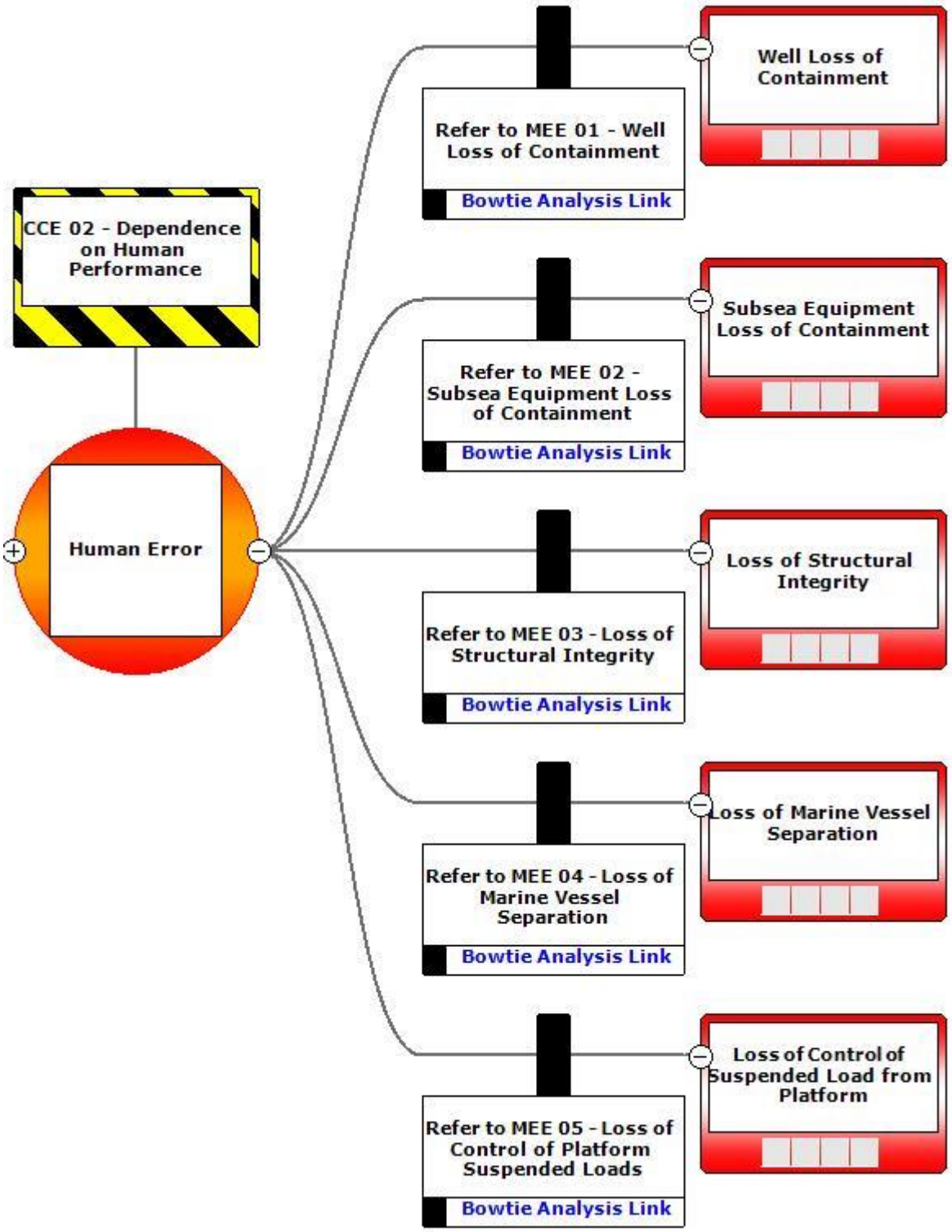


Figure 6-37: CCE 02 Human Errors (Outcomes)

6.9 Unplanned Events (Accidents, Incidents, Emergency Situations)

6.9.1 Unplanned Hydrocarbon Release: Loss of Well Containment during Drilling of Xena-03

Context		
Xena-03 Drilling and Tie-back Activities – Section 3.11	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Protected Places – Section 4.8 Socio-economic Environment – Section 4.9	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	Risk Rating	ALARP Tools	Acceptability	Outcome
Loss of hydrocarbons to marine environment due to loss of well containment during drilling of the Xena-03 well	x	x	x	x	x	x	B	B	1	M	LCS GP PJ RBA CV SV	Acceptable if ALARP	EPO 18

Description of Source of Risk

Woodside has identified a subsea well blowout as the scenario with the worst-case credible environmental outcome as a result of loss of well containment (LOWC) during drilling of the Xena-03 well. A LOWC is an uncontrolled release of reservoir hydrocarbon and/or other well fluids to the environment. A blowout is an incident where formation fluid flows out of the well or between formation layers after all the predefined technical well barriers (e.g. the blow out preventer [BOP]) or activation of the same has failed. Woodside has identified one well blowout scenario:

- Well blowout – full reservoir open to flow in the 9-7/8" hole section
- The LOWC MEE scenario from all Pluto wells during operations is considered separately.

Industry Experience

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

overall national exceedance frequency for oil spills from offshore drilling in Australia is 0.033 for spills > 1 tonne/year decreasing to 0.008 for spills > 100 tonnes/year

probability of a blow-out from a well intervention is 1 x 10-4 (0.0001, or 0.01%), considerably lower than drilling activities (International Association of Oil and Gas Producers 2010).

Woodside has a good history of implementing industry standard practice in well design and construction. In the company's history, it has not experienced any well containment events that have resulted in significant releases or significant environmental impacts.

Credible Scenario – Loss of Well Containment

The credible worst-case scenario to be considered during drilling of the Xena-03 well is an uncontrolled subsea release to environment lasting <64 days. This time frame has been selected because:

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

Quantitative Hydrocarbon Spill Modelling – Loss of Well Containment during Drilling at Xena-03

Spill modelling was undertaken by RPS (2024a), on behalf of Woodside, to determine the fate of hydrocarbon released from the loss of well containment scenario, based on the Xena condensate characteristics. The modelled release rate provided assumes the worst-case scenario for the largest oil volume release. Modelling considered metocean conditions throughout the year; this was done to inform the determination of consequence of loss of well control during intervention at any time of the year.

Table 6-39: Summary of modelled credible scenario – well blowout

Loss of well integrity	
Total discharge[104] at surface	5 days 1,880Sm³
Total discharge at seabed	59 days 44,751 Sm³
Water depth	178 m
Fluid	Eris-1 (and Pluto analogues) condensate

Subsea Plume dynamics

The well blowout surface/subsea release that has been modelled forecasts the size of the hydrocarbon droplets that would be released from the well as determined by the OILMAP model. The results of the OILMAP simulation predict that the discharge will generate a cone of rising gas that will entrain the oil droplets and ambient sea water up to the water surface. In the first week, the mixed plume is initially forecast to jet towards the water surface with a vertical velocity of around 12.3 m/s, gradually slowing and increasing in plume diameter as more ambient water is entrained. The diameter of the central cone of rising water and oil at the point of surfacing is predicted to be about 23 m.

Given the discharge velocity and turbulence generated by the expanding gas plume, the release is predicted to generate droplet sizes ranging from approximately 2,500 µm to 12,884 µm. The results suggest that beyond the immediate vicinity of the blowout, the majority of the released hydrocarbons will be present in the upper layers of the ocean, with the potential for oil to form floating slicks under sufficiently calm local wind conditions.

The ongoing nature of the release combined with the potential for the plume to breach the water surface may present other hazards, including conditions that may lead to high local concentrations of atmospheric volatiles. These issues should be considered when evaluating the practicality of the response operations at or near the blowout site.

Consequence Assessment

Potential Impacts Overview

EMBA

Quantitative hydrocarbon spill modelling results have been used to define the EMBA (Section 4.1) (see RPS, 2024a for further details).

Surface Hydrocarbons

In the event of the loss of well containment scenario occurring, surface hydrocarbons at or above 1 g/m^2 and 10 g/m^2 are forecast to potentially occur up to 100 km and 25 km respectively from the release site. Floating oil concentrations greater than 10 g/m^2 are predicted to contact Montebello AMP at 2% probability.

Entrained Hydrocarbons

Entrained hydrocarbons at concentrations equal to or greater than the 100 ppb threshold are predicted to be found up to 600 km from the release site. Contact by entrained hydrocarbons at concentrations equal to or greater than 100 ppb is predicted to be greatest at Montebello AMP with 81% probability of hydrocarbon contact and worst-case entrained concentration of 1,960 ppb. Several other sensitive receptors are predicted to be contacted at

[104] The discharge volumes are predicted using reservoir modelling software packages that consider a number of factors (well design, reservoir properties and environmental conditions such as water depth, temperature and pressure) to provide a production profile over the oil spill modelling period.

concentrations equal to or greater than 100 ppb include Tryal Rocks (4%), Argo-Rowley Terrace MP (1%), and Gascoyne MP (5%).

Dissolved Hydrocarbons

Dissolved aromatic hydrocarbons at concentrations equal to or greater than the 50 ppb thresholds are predicted to be found up to around 45 km from the release site. Contact by dissolved aromatic hydrocarbons at concentrations equal to or greater than 50 ppb is predicted to be at the Montebello AMP (5%), with a worst-case dissolved concentration of 454 ppb.

Accumulated Hydrocarbons

Shoreline oil concentrations above 10 g/m^2 are predicted to contact Muiron Islands with 18% probability. No shoreline oil impact is predicted at 100 g/m^2.

Table 6-40: Key receptor locations and sensitivities potentially contacted above impact thresholds by the loss of well containment scenario during drilling of Xena-03 with summary hydrocarbon spill contact with ≥ 1% probability (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)																													Probability of hydrocarbon contact and fate (%) Note: the probability is based on stochastic modelling of 100 hypothetical worst-case spills under a variety of weather and metocean conditions					
		Physical		Biological																						Socioeconomic and Cultural					Socio-cultural EMBA		Ecological EMBA			
		Water Quality	*Sediment Quality*	*Marine Primary Producers*				*Other Communities / Habitats*							*Protected Species*									*Other Species*												
		Open water – (pristine)	*Marine Sediment – (pristine)*	*Coral reef*	*Seagrass beds / Macroalgae*	*Mangroves*	*Spawning/nursery areas*	*Open water – Productivity/upwelling*	*Non-biogenic reefs*	*Offshore filter feeders and/or deepwater benthic communities*	*Nearshore filter feeders*	*Sandy shores*	*Estuaries / tributaries / creeks / lagoons (including mudflats)*	*Rocky shores*	*Cetaceans – migratory whales*	*Cetaceans – dolphins and porpoises*	*Dugongs*	*Pinnipeds (sea lions and fur seals)*	*Marine turtles (foraging and internesting areas and significant nesting beaches)*	*Sea snakes*	*Whale sharks*	*Sharks and rays*	*Seabirds and/or migratory shorebirds*	*Pelagic fish populations*	*Resident /Demersal Fish*	Fisheries – commercial	Fisheries – traditional	Tourism and Recreation	Protected Areas / Heritage – European and Indigenous / Underwater Cultural Heritage	Offshore Oil and Gas Infrastructure (topside and subsea)	*Surface hydrocarbon (1-10 g/m2)*	*Accumulated hydrocarbons (10–100 g/m2)*	*Surface hydrocarbon (≥10 g/m2)*	*Entrained hydrocarbon (≥100 ppb)*	*Dissolved aromatic hydrocarbon (≥50 ppb)*	*Accumulated hydrocarbons (>100 g/m2)*
Offshore[105]	Argo-Rowley Terrace AMP	✓						✓							✓	✓			✓			✓	✓	✓		✓				✓					1		
	Montebello AMP	✓	✓	✓			✓	✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓				2	81	5	
	Ningaloo AMP	✓	✓	✓			✓	✓							✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓							
	Gascoyne AMP	✓	✓												✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓				1		
Reefs, Banks and Shoals	Tryal Rocks	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓					4		

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

Summary of Potential Impacts to environmental values

The potential impacts of spilled hydrocarbons to species (protected and otherwise), marine primary producers, other habitats and communities, water quality, marine sediment quality, air quality, protected areas and socio-economic values are described in Section 6.8.5. Potential impacts specific the loss of well containment during drilling of the Xena-03 well are summarised below.

Marine Mammals

A range of cetaceans were identified as potentially occurring within the Xena-03 Operational and wider EMBA (Section 4.6.3). In the event of a LOWC during drilling of Xena-03, surface, entrained, and dissolved hydrocarbons exceeding environmental impact threshold concentrations may drift across habitat for cetacean species. Migratory routes and BIAs of cetaceans considered to be MNES may be affected, including humpback whales and pygmy blue whales (northbound and southbound migrations). As described in Section 4.6.3, cetaceans that have direct physical contact with surface, entrained, or dissolved aromatic hydrocarbons may suffer surface fouling, ingestion of hydrocarbons (from prey, water and sediments), aspiration of oily water or droplets, and inhalation of toxic vapours (Deepwater Horizon Natural Resource Damage Assessment Trustees [DHNRDT] 2016).

Pygmy blue whales and humpback whales are known to migrate seasonally through the Xena-03 Operational Area, the PAA and the modelled EMBA. Pygmy Blue Whale migration BIA intersects the Xena-03 Operational Area. A major spill in May to November would coincide with humpback whale migration through the waters off the Pilbara and North West Cape (Section 4.6.3). A major spill in April–August or October would coincide with pygmy blue whale migration (Section 4.6.5). Both pygmy blue and humpback whales are baleen whales, so are most likely to be significantly impacted by toxic effects when feeding. However, feeding during migrations is low level and opportunistic, with most feeding for both species occurring in the Southern Ocean. Fresh hydrocarbons (i.e. typically in the vicinity of the release location) may have a higher potential to cause toxic effects when ingested, while weathered hydrocarbons are considered to be less likely to result in toxic effects. As such, the risk of ingestion of hydrocarbons is low. Pygmy blue whale and humpback whale migrations are protracted through time and space (i.e. the whole population will not be within the EMBA), and as such, a spill from the loss of well integrity is unlikely to affect an entire population.

Coastal populations of small cetaceans and dugongs are known to reside or frequent nearshore waters, including the Ningaloo Coast, Muiron Islands, Montebello/Barrow Islands and Pilbara Southern Island Group which may be potentially impacted by entrained or dissolved hydrocarbons exceeding threshold concentrations in the event of a loss of well containment. The Exmouth Gulf is a known humpback whale aggregation area on the annual southern migration (September to December), as well as overlapping foraging, breeding, nursing and calving BIAs for dugongs (~207 km south of the Xena-03 Operational Area).; therefore, migratory humpbacks moving into the Gulf, or more residential dugongs, may be exposed to entrained or dissolved hydrocarbons above thresholds levels. However, entrained and dissolved hydrocarbons concentrations above the threshold are not expected within Exmouth Gulf itself. No hydrocarbon contact at or above threshold concentrations for the ecological EMBA is expected for Camden Sound, an important calving area for humpback whales.

The potential impacts of exposure are discussed above. However, nearshore populations of cetaceans and dugongs are known to exhibit site fidelity and are often resident populations. Therefore, avoidance behaviour may have greater impacts to population functioning. Nearshore dolphin species (e.g. spotted bottlenose dolphins) may exhibit higher site fidelity than oceanic species, although Geraci (1988) observed relatively little impacts beyond behavioural disturbance. Additional potential environment impacts may also include the potential for dugongs to ingest hydrocarbons when feeding on oiled seagrass stands, or indirect impacts to dugongs due to loss of this food source due to dieback in worst-affected areas.

In summary, a LOWC during drilling of Xena-03 has the potential to result in major long-term impacts to cetacean species and dugongs, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.

Marine Reptiles

The Xena-03 Operational Area is unlikely to represent an important habitat for marine turtles as there is an absence of potential nesting or foraging habitat (i.e. no emergent islands, reef habitat or shallow shoals) and the water is deep (70-130 m). There is the potential for marine turtles to be present at submerged shoals within the EMBA, such as Rankin Bank and Glomar Shoals, however these receptors have a low probability of being contacted by dissolved hydrocarbons only above the threshold concentration (<1%).

An internesting BIA for the flatback turtle overlaps the Xena-03 Operational Area (Section 4.6.2). However, there are significant nesting and foraging sites along the mainland coast and islands of the region, including the Montebello Islands, and a number of BIAs and habitat critical for the survival of marine turtles overlap the EMBA (Section). In particular, the internesting BIAs and habitat critical to the survival of a species for green, loggerhead and hawksbill turtles extend for ~20 km from known nesting locations, and for ~60 km for flatback turtles. It is noted that the drilling of the Xena-03 well is proposed to be undertaken in Q2 2025, indicating species may be present, however avoids the peak nesting period (October to January) (refer to Section 4.6.5). Oil from an ongoing loss of containment could be present during nesting season for all hawksbill, flatback and green turtles depending on the timing of a spill. No floating or accumulated hydrocarbons above ecological threshold concentrations are predicted at shoreline locations,

although the nearshore waters of these turtle habitat areas have a low probability (1-2%) of contact with dissolved and/or entrained hydrocarbons.

In summary, a LOWC during drilling of Xena-03 has the potential to result in major long-term impacts to offshore foraging and nesting marine turtles, with consequence severity dependent on the actual timing, duration and extent of a spill in relation to species' migratory movements and distributions.

In general, sea snakes are found in continental shelf waters around offshore islands and potentially submerged shoals (water depths <100 m. Sea snakes may be present in the wider EMBA at the submerged shoals, Rankin Bank and Glomar Shoals, as well as the submerged reefs and shoals of Barrow Island and southern Pilbara islands. Sea snakes may also be present in nearshore waters of the mainland and islands which, along with submerged reefs and shoals, have the potential to be contacted by entrained and/or dissolved hydrocarbons above the threshold concentrations. Their abundance is not expected to by high given the water depth and offshore environment. However, sea snake species in Australia generally show strong habitat preferences (Heatwole and Cogger, 1993); species that have preferred habitats associated with submerged shoals may be disproportionally affects by a hydrocarbon spill affecting such habitat.

Therefore, a loss of well containment during drilling of Xena-03 may have a minor disruption to some individuals in the offshore environment. Population level impacts to sea snake species are not, however, considered credible.

Fish, Sharks and Rays

Shark and ray species may occasionally transit through the area and may potentially be exposed to hydrocarbons from a loss of well containment during drilling of the Xena-03 well, including species such as whale sharks and manta rays. Whale sharks may transit offshore open waters when migrating to and from Ningaloo Reef, where they aggregate for feeding from March to July. Both the Xena-03 Operational Area and EMBA overlap the whale shark foraging BIA identified in Section 0. Should sharks or rays be present in offshore waters near the PAA during the spill, direct impacts may occur if foraging within surface slicks or in the upper 20 to 30 m of the water column containing entrained hydrocarbons and dissolved aromatics. Contamination of their food supply and the subsequent ingestion of this prey may also result in long term impacts as a result of bioaccumulation. Impacts are predicted to be limited to a small number of animals given the absence of key habitat and the low numbers of animals that may transit through the area during the short period when spilled hydrocarbons are present.

Seabirds and Migratory Shorebirds

Offshore waters of the PAA are potential foraging grounds for seabirds associated with the coastal roosting and nesting habitat (e.g. Ningaloo, Muiron Islands and the Barrow/Montebello Islands). A breeding BIA for the wedge-tailed shearwater overlaps the Xena-03 Operational Area. Foraging and breeding BIAs for a number of seabirds and migratory shorebirds overlap with the EMBA (Section 4.6.4). A hydrocarbon spill may result in surface slicks disrupting a significant portion of the foraging habitat for seabirds, including foraging BIAs, which are generally associated with breeding habitats. Seabird distributions are typically concentrated around islands, so hydrocarbons near nesting/roosting areas may result in increased numbers of seabirds being impacted, with many species of seabirds, such as the wedge-tailed shearwater and the various species of tern, foraging relatively close to breeding islands/colonies. Potential impacts on seabirds and shorebirds are expected to be major and long-term in the unlikely event of a loss of well control. However, given the volatile and non-persistent nature of the hydrocarbons and lack of shoreline accumulation predicted, the extent of impacts is not expected to result in a threat to the overall viability of seabird or shorebird populations in the wider region.

Other Habitats, Species and Communities

There is potential for plankton communities to be impacted where entrained hydrocarbon threshold concentrations are exceeded due to a loss of well containment during drilling of the Xena-03 well. A range of lethal and sublethal impacts may occur to plankton exposed to entrained or dissolved hydrocarbons within the EMBA. Communities are expected to recover quickly (weeks/months) due to high population turnover (ITOPF, 2011). It is therefore considered that any potential impacts would be low magnitude and temporary in nature.

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

Other communities (e.g. demersal fish, benthic infauna and epifauna) and key sensitivities (e.g. KEFs identified in Section 4.7) occur within the EMBA and may potentially be exposed to entrained hydrocarbons from a loss of well containment.

Water Quality

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

Protected Areas

Entrained and/or dissolved hydrocarbons at or exceeding the 100 ppb and 50 ppb threshold, respectively, have a low probability of contacting the Argo-Rowley Terrace AMP, Montebello AMP, Gascoyne AMP and Ningaloo AMP and WHA. Entrained and dissolved hydrocarbons are only predicted within the surface waters of the deep open waters of these protected areas, with no contact to seabed habitats or to shoreline contact. Potential impacts to water quality and the natural values (e.g. mobile protected species) in these areas would be temporary and localised in nature due to the rapid dispersion and weathering of the condensate, as described above. Visible surface hydrocarbons (at or exceeding 1 g/m2) are not predicted to reach any protected areas.

Socio-economic

A spill resulting from a loss of well containment during drilling of the Xena-03 well is considered unlikely to cause significant direct impacts on the target species fished by Commonwealth State active fisheries identified in Section 4.10.1 which overlap with the EMBA. The fisheries management areas that overlap with the EMBA are predominantly for demersal fish species (demersal finfish and crustaceans) that inhabit waters in the range of >60–200 m depth, or pelagic species which are highly mobile. Therefore, a spill from a loss of well control is expected to only result in negligible impacts, considering that hydrocarbons are confined to the upper layers of the water column beyond the immediate area of the spill. Visible surface hydrocarbons at or exceeding 1 g/m2 may also occur up to 100 km from the release site, which may result in fouling of fishing gear and a perception of impacts to fish stocks by fisheries stakeholders and the public. There is the potential that a fishing exclusion zone would be applied in the area of the spill, which would put a temporary ban on fishing activities and therefore potentially lead to subsequent economic impacts on commercial fishing operators if they were planning to fish within the area of the spill. Such measures would likely be in place for less than a week and would not result in widespread or long term impacts to fishing activities.

Cultural Heritage

There are a number of historic shipwrecks identified within the EMBA, but none identified within 50 km of the PAA (Section 4.10).

The modelling results do not predict surface slicks contacting the identified wrecks, and the majority of entrained hydrocarbons are expected to occur close to the surface. However, shipwrecks in the subtidal zone could be exposed to entrained and dissolved hydrocarbons. Marine life that shelter and take refuge in and around these wrecks may be affected by in-water toxicity of dispersed hydrocarbons. The consequences of such hydrocarbon exposure may include large fish species moving away and resident fish species and sessile benthos such as hard corals exhibiting sub-lethal and lethal impacts (which may range from physiological issues to mortality).

Within the wider EMBA are several designated heritage places (Section 4.10). These places are also covered by other designations such as WHA. Potential impacts are discussed in the sections above.

Summary of Potential Impacts to Environmental Value(s)

In the highly unlikely event of a major hydrocarbon spill due to a loss of well containment during drilling of the Xena-03 well, the EMBA includes AMPs as well as other sensitive marine environments and associated receptors of the Muiron Islands, Ningaloo Coast, Rankin Bank, Montebello/Barrow Islands and the Pilbara Southern Islands Group. Long term impacts may occur at these locations, including socio cultural effects as a result of a major spill of condensate from drilling activities within the PAA.

Given the adopted controls, the overall risk rating for an unplanned hydrocarbon due to a loss of well containment during drilling of the Xena-03 well is Moderate based on a Major consequence (long-term impact (10–50 years) on highly valued ecosystem, species, habitat or physical or biological attributes, or to a community, social infrastructure or highly valued area/item of cultural significance), and a remote likelihood.

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F106***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
OPGGS (Resource Management and Administration) Regulations 2011: accepted WOMP which describes the well design and barriers to be used to	F: Yes. CS: Minimal cost. Standard practice.	Compliance with an accepted WOMP will ensure a number of barriers are in place and verified, reducing the likelihood of a loss of well integrity event	Controls based on legislative requirements – must be adopted.	Yes C 10.4

[106] Qualitative measure

prevent a loss of well integrity, which aligns with specifically: All zones with flow potential penetrated by the well bore, containing hydrocarbons, shall be isolated from the surface environment by a minimum of two barriers (primary and secondary). The barriers shall: be effective over the lifetime of well construction and abandonment (fluid barriers) remain monitored and provide sufficient pressure to counter pore pressure during well construction and abandonment (cementing barriers, including conductor, casing and liners) conform to the relevant minimum standards set out in the Woodside Barrier Standard. Verification: Effectiveness of primary and secondary barriers shall be verified (physical evidence of the correct placement and performance) during the permanent plugging of the well (if required).		occurring. Although the consequence of a blowout would not be reduced, the reduction in likelihood reduces the overall risk.		
In the event of a spill, emergency response activities implemented in accordance with the Xena-03 Tie-Back Oil Pollution First Strike Plan.	F: Yes. CS: Costs associated with implementing response strategies, vary dependant on nature and scale of spill event. Standard practice.	This control would not reduce the likelihood, but response activities may reduce the consequence.	Benefits outweigh cost/sacrifice.	Yes C 18.1
Arrangements supporting the activities in the Xena-03 Tie-Back Oil Pollution First Strike Plan will be tested to ensure the Xena-03 Tie-Back Oil Pollution First Strike Plan can be implemented as planned.	F: Yes. CS: Moderate costs associated with exercises. Standard practice.	Testing the Xena-03 Tie-Back Oil Pollution First Strike Plan activities would not reduce the likelihood, but response activities may reduce the consequence.	Benefits outweigh cost/sacrifice.	Yes C 18.2
As-built checks that shall be completed during well operations to establish a minimum acceptable standard of well integrity is achieved.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of occurrence. No reduction in consequence will occur.	Benefits outweigh cost/sacrifice.	Yes C 10.5

In the event of requirement to abandon well, implement requirements for permanent well abandonment: Well barrier as per the internal Woodside Standard and Procedure Placement, length, material and verification of a permanent barrier.	F: Yes. CS: Minimal cost. Standard practice.	Reduce the likelihood hydrocarbon release.	Benefits outweigh cost/sacrifice.	Yes C 18.3
An approved Activity Source Control Emergency Response Plan (SCERP) shall exist prior to drilling the well, including feasibility and any specific considerations for relief well kick.	F: Yes. CS: Minimal cost. Standard practice.	The SCERP will describe the responses to a loss of well control including ROV intervention on BOP, use of capping stack to contain well, and the relief well. All of these responses are aimed at reducing the duration of the gas release, resulting in a reduction in consequence and overall risk.	Benefits outweigh cost/sacrifice.	Yes C 18.4
Incident reports are raised for unplanned releases within event reporting system	F: Yes CS: Minimal cost. Standard Practice	Requirement based on Woodside Health, Safety and Environment Event Reporting and Investigation Procedure	Control based on Woodside Standard – must be adopted	Yes C 13.5
Good Practice				
BOP installed and tested during drilling operations. The BOP shall include: • one annular preventer; Detailed specifications and • two pipe rams (excluding the test rams); • a minimum of two sets of shear rams, one of which must be capable of sealing; • deadman functionality; • the capability of ROV intervention; and • independent power systems. Function testing shall be in accordance with the minimum standards for the expected drilling	F: Yes. CS: Standard practice. Required by Woodside standards.	Testing of the BOP will reduce the likelihood of a blowout resulting in release of hydrocarbons to the marine environment. In the event of a blowout, this control would not reduce the consequence, although the reduction in likelihood reduces the overall risk ranking.	Benefits outweigh cost/sacrifice.	Yes C 10.6

conditions, as detailed in the Woodside Engineering Standard Rig Equipment , Woodside Engineering Well Control Manual, Original Equipment Manufacturer (OEM) Standards and API Standard 53 4th Edition.				
Project specific Mooring Design Analysis.	F: Yes. CS: Standard practice. Required by Woodside standards.	Ensure adequate MODU station holding capacity to prevent loss of station keeping. This will reduce the likelihood of a blowout resulting in release of hydrocarbons to the marine environment.	Benefits outweigh cost/sacrifice.	Yes C 2.8
Professional Judgement – Eliminate				
Do not drill well.	F: No. CS: Inability to achieve program objectives.	A hydrocarbon release would not be credible.	Disproportionate. Given the extremely low likelihood of a loss of well control due to the systematic implementation of Woodside's policies, standards, procedures and processes relating to drilling activities, the cost/sacrifice outweighs the benefit gained.	No
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls identified.				
Risk Based Analysis				
A quantitative spill risk assessment was performed (refer Section 6.8.2)				
Company Values				
Woodside's corporate values require all personnel a to comply with appropriate policies, standards, procedures and processes while being accountable for their actions and holding others to account in line with Our Values. As detailed above, the Petroleum Activities Program will be performed in line with these policies, standards and procedures that include suitable controls to prevent loss of well integrity, and response should a loss of well integrity occur.				
Societal Values				
Due to the Petroleum Activities Program's potential extent of the EMBA, the loss of well integrity current risk rating presents a Decision Type B, in accordance with the decision support framework described in Section 2.6.1. Consultation was conducted for this program to identify the views and concerns of relevant persons, as described in Section 5. Woodside has consulted with AMSA and WA DoT on spill response strategies. In accordance with the MoU between Woodside and AMSA, a copy of the Oil Pollution First Strike Plan was provided to AMSA.				

ALARP Statement

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type B, Section 2.6.1), Woodside considers the adopted controls appropriate to manage the risks and consequences of a highly unlikely unplanned hydrocarbon release as a result of a loss of well integrity. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.

Demonstration of Acceptability

Acceptability Criteria and Assessment

Loss of well integrity during drilling of the Xena-03 well was evaluated and the risk was rated as high due to the scale of potential environmental impacts. However, the loss of well integrity occurring is considered highly unlikely. As outlined in Section 2.6.1 , Woodside considers the current risk ratings for a Decision Type B to be acceptable, if ALARP is demonstrated using good industry practice, consideration of company and societal values and RBA, if legislative requirements are met and societal concerns are accounted for, and the alternative control measures are grossly disproportionate to the benefit gained.

Principles of ESDev

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

- decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.

Internal Context

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

- Woodside Environment and Biodiversity Policy
- Engineering Standards – Well Barriers
- Well Acceptance Criteria Procedure
- Global, Wells and Seismic – Well Control Procedure
- Woodside Engineering Standard – Rig Equipment
- Source Control Emergency Response Planning Guideline (SCERP Guidelines)
- Oil spill preparedness and response strategies are considered applicable to the nature and scale of the risk and associated impacts of the response are reduced to ALARP.

Monitoring and Evaluation (operational monitoring) as a key response in the highly unlikely event of a hydrocarbon release will assess and track the extent of the hydrocarbon contact and revise the predicted extent of impact.

In addition, the Planning Area for scientific monitoring can be re-assessed in the unlikely event of hydrocarbon release with consideration of the conservation values and social-cultural values of state and commonwealth protected areas (including AMPs), National and Commonwealth Heritage Listed places; tourism and recreation; and fisheries. The post-response SMP will consider assessment and monitoring in line with the affected receptors such as habitat and species, AMPs and fisheries.Woodside corporate values include working sustainably with respect to the environment and communities in which we operate, listening to internal and external stakeholders, and considering HSE when making decisions. consultation, outlined below, has been performed prior to the Petroleum Activities Program.

External Context

During consultation with relevant persons, DoT requested to be consulted on spill risks with a potential to impact State Waters (Section 5). Woodside has also consulted with AMSA on spill response strategies. In accordance with the MoU between Woodside and AMSA, a copy of the Oil Pollution First Strike Plan was provided to AMSA and DoT. No additional queries or concerns relating to a loss of well integrity hydrocarbon spill risk during drilling of the Xena-03 well were raised during consultation.

Other Requirements

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

API Standard 53 for subsea BOP function testing

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

OPGGS (Resource Management and Administration) Regulations 2011 to have an accepted WOMP and application to permanently plug for abandonment of the wells .

NOPSEMA will be notified of reportable and recordable incidents, if required (Section 7). A mutual aid MoU for relief well drilling is in place and the Woodside Head of Projects/Region (Global Wells and Seismic)maintains a list of rigs that are currently operating in WA.

The EMBA overlaps a number of BIAs for threatened and migratory species, as well as a number of State and Commonwealth MPAs and the Ningaloo Coast WHA. The residual risk of accidental hydrocarbon release from loss of well integrity during drilling of the Xena-03 well is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential impacts. The Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice.

Acceptability Statement

The impact assessment has determined that an accidental hydrocarbon release as a result of a loss of well integrity represents a moderate cu–rent risk rating and may result in major, long-term impacts (10 - 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes. A number of BIAs for protected species overlap with the BIA and EMBA. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice.

The likelihood of a loss of well integrity during drilling of the Xena-03 well occurring is highly unlikely, given the adopted controls. The adopted controls are considered consistent with industry legislation, codes and standards, and professional judgement and a risk-based assessment has been conducted to better understand the potential consequences and plan oil spill response. The adopted controls also meet the requirements and expectations of Australian Marine Orders, AMSA and AHO identified during impact assessment and consultation. As demonstrated in Section 6.10 the potential impacts of hydrocarbon release from loss of well integrity is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans. Regard has been given to relevant conservation advice during the assessment of potential risks.

On the basis of the environmental impact assessment outcomes and Woodside's criteria for acceptability outlined in Section 2.8.2 this is considered an acceptable level of risk.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 18 Woodside will manage its activities to prevent well loss of containment events from occurring. during Tie-back Activities.	C 10.4 OPGGS (Resource Management and Administration) Regulations 2011: accepted WOMP which describes the well design and barriers to be used to prevent a loss of well integrity, specifically: All zones with flow potential penetrated by the well bore, containing hydrocarbons, shall be isolated from the surface environment by a minimum of two barriers (primary and secondary). The barriers shall: be effective over the lifetime of well construction and abandonment	PS 10.4.1 Wells drilled in compliance with the accepted WOMP, including implementation of barriers to prevent a loss of well integrity.	MC 10.4.1 Acceptance letter from NOPSEMA demonstrates the WOMP and application to drill were accepted by NOPSEMA prior to the drilling and plug and abandonment activities commencing. MC 10.4.2 Records demonstrate minimum of two verified barriers (a single fluid barrier may be implemented during the initial stages of well construction if appropriateness is confirmed by a shallow hazard study) were in place for all permeable

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	(fluid barriers) remain monitored and provide sufficient pressure to counter pore pressure during well construction and abandonment (cementing barriers, including conductor, casing and liners) conform to the relevant minimum standards set out in the Woodside Barrier Standard. Verification: Effectiveness of primary and secondary barriers shall be verified (physical evidence of the correct placement and performance) during the permanent plugging of the well (if required).		zones penetrated by the wellbore. MC 10.4.2 Records demonstrate composition and weight of drilling fluids were applicable to down hole conditions.
	C 18.1 In the event of a spill emergency response activities implemented in accordance with the Xena-03 Tie-Back Oil Pollution First Strike Plan.	PS 18.1 In the event of a spill the Xena-03 Tie-Back Oil Pollution First Strike Plan (per Table 7-9) requirements are implemented.	MC 18.1.1 Completed incident documentation.
	C 18.2 Arrangements supporting the activities in the Xena-03 Tie-Back Oil Pollution First Strike Plan will be tested to ensure the Xena-03 Tie-Back Oil Pollution First Strike Plan can be implemented as planned.	PS 18.2.1 Exercises/tests will be conducted in alignment with the frequency identified in Section 7.14.2.	MC 18.2.1 Testing of arrangement records confirm that emergency response capability has been maintained.
		PS 18.2.2 Woodside's procedure demonstrates a minimum level of trained personnel, for core roles in the Xena-03 Tie-Back Oil Pollution First Strike Plan, are maintained.	MC 18.2.2 Emergency Management dashboard confirms that minimum level of personnel trained for core the Xena-03 Tie-Back Oil Pollution First Strike Plan roles are available.
	C 10.5 As-built checks shall be completed during well operations.	PS 10.5 Achieve a minimum acceptable standard of well integrity.	MC 10.5.1 Records show Well Acceptance criteria are developed for the well. MC 10.5.2 Records demonstrate Well Acceptance criteria have been met.
	C 18.3 In the event of requirement to abandon well, implement requirements for permanent well abandonment:	PS 18.3 Abandonment conducted in accordance with criteria identified in accepted WOMP.	MC 18.3.1 Records demonstrate abandonment conducted in accordance with well acceptance criteria and accepted WOMP.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	well barrier as per the internal Woodside Standard and Procedure placement, length, material and verification of a permanent barrier.		
	C 18.4 An approved SCERP shall exist prior to drilling, including feasibility and any specific considerations for relief well kill.	PS 18.4 The SCERP is in place to ensure feasibility of responding to a source control incident.	MC 18.4.1 An approved Source Control Emergency Response Plan.
	C 10.6 BOP installed during drilling operations. To ensure no loss of hydrocarbons from loss of well integrity, the BOP shall have, at minimum: one annular preventer; Detailed specifications and two pipe rams (excluding the test rams); a minimum of two sets of shear rams, one of which must be capable of sealing; deadman functionality; the capability of ROV intervention; and independent power systems. Function testing shall be in accordance with the minimum standards for the expected drilling conditions, as detailed in the Woodside Engineering Standard Rig Equipment, Woodside Engineering Well Control Manual, Original Equipment Manufacturer (OEM) Standards and API Standard 53 5th Edition.	PS 10.6 Subsea BOP specification, installation and function testing compliant with internal Woodside Standards and international requirements (API Standard 53) as agreed by Woodside and MODU contractor.	MC 10.6.1 Records demonstrate that BOP and BOP control system specifications and function testing were in accordance with minimum standards for the expected drilling conditions as agreed by Woodside and MODU contractor.
	C 2.8 Project specific MODU Mooring Design Analysis.	PS 2.8 Seabed disturbance from MODU mooring limited to that required to ensure adequate MODU station holding capacity.	MC 2.8.1 Records demonstrate Mooring Design Analysis approved and implemented during anchor deployment.
	C13.5 Incident reports are raised for unplanned releases within event reporting system. Refer Section 6.8.5	PS 13.5 Incident reports raised for unplanned releases, and Recordable Incidents notified for material unplanned liquid releases to sea, of:	MC13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous[107] chemical, in any 48-hour period. Refer Section 6.8.5	Refer Section 6.8.5
	Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are presented in Appendix H.		

[107] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

6.9.2 Unplanned Hydrocarbon Release: Pluto-A Topsides Loss of Containment

Context		
Topsides – Section 3.4.1 Process Description – Section 3.4.6 Hydrocarbon and Chemical Inventories and Selection – Section 3.9	Physical Environment – Section 4.4 Protected Species – Section 4.6	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Hydrocarbon release from Pluto-A topsides equipment to the marine environment and atmosphere.			x	x		x	x	A	D	1	M	LCS GP PJ	Broadly Acceptable	EPO 19

Description of Source of Risk

The facility has a range of topsides process and non-process equipment. A loss of containment from the topsides includes hydrocarbon inventories that could be released to the environment from high pressure process gas equipment and piping manifolds, and non-process hydrocarbon and chemical inventories.

Hazards that could lead to loss of containment from the topsides are:

- corrosion
- erosion
- material defect
- welding defect
- piping/equipment repair/defect
- vibration fatigue failure
- equipment overpressure
- uncontrolled transfer

Escalation from MEEs can cause topsides loss of containment:

- Loss of Structural Integrity (MEE-03) (Section 6.8.7)
- Loss of Marine Vessel Separation (MEE-04) (Section 6.8.8)
- Loss of Control of Suspended Load from facility lifting operations (MEE-05) (Section 6.8.9).
- A number of common failure causes due to human error and SCC failures are presented in the generic Human Error and SCE Failure bowties in Section 6.8.10.

Topsides Loss of Containment – Credible Scenarios

Topsides process and non-process hydrocarbon inventories, and therefore, worst case credible spill scenarios, are relatively low for PLA riser platform in comparison to other offshore facilities, due to reservoir composition and the integrated Pluto Development design including NNC offshore philosophy, meaning limited offshore processing and storage inventory. The maximum credible process-hydrocarbon loss scenario includes the loss of the potential

condensate inventory within process vessels such as the production separator and produced water/condensate separator and cooler with potential ~30 m3 condensate inventory. The maximum potential non-process hydrocarbons loss of containment scenario on the topsides is associated with the largest diesel storage inventory in the crane pedestal storage tank (80 m3). While a number of hydrocarbon release scenarios were determined to constitute MEEs, the consequence assessment for a topsides loss of containment determined this source of risk is not an MEE.

Other smaller condensate and hydrocarbon inventories also present on the topsides (Section 3.4.1). Smaller volumes of stored diesel, hydraulic and lube oils and waste oil may also be released in case of loss of containment. While a number of hydrocarbon release scenarios were determined to constitute MEEs, the consequence assessment for a topsides loss of containment determined this source of risk is not an MEE.

Quantitative Hydrocarbon Risk Assessment

Spill modelling was performed by RPS, on behalf of Woodside to determine the fate of marine diesel (modelled as marine gas oil) released from loss of marine vessel separation within the PAA (RPS, 2024e) – as described in Section 6.8.8. The modelling assessed the extent of a marine diesel spill volume of 1000 m^3 for all seasons, using an historic sample of wind and current data for the region. The results of the modelling can be used to demonstrate that a marine diesel spill within the PAA has an EMBA that is not predicted to include any shoreline contact or accumulation at impact thresholds. A total of 200 replicate simulations were modelled over an annual period (50 per quarter). As stated above, the largest topsides loss of containment diesel storage tank volume is 80 m3; therefore, the modelling of 1000 m^3 is considered conservative for Topsides loss of containment scenarios. Historical spill risk assessment modelling undertaken for a smaller diesel spill (105 m3 released in under ten minutes) at the Greater Western Flank Project (GWF) location near the GWA facility, located 75 km north east of the facility (APASA 2016) also provides as an approximate analogue for the topside loss of containment scenario – which indicated floating hydrocarbons may occur above threshold criteria up to 10 km from the release site.

Hydrocarbon Characteristics

Marine diesel oil (MDO) is a mixture of both volatile and persistent hydrocarbons. Modelling conducted on a comparable marine gas oil (MGO) more typical of vessel fuel. Predicted weathering of marine diesel, based on typical conditions in the region, indicates that around 72% of the oil mass is forecast to have entrained and a further 24% is forecast to have evaporated over the first 24 hours (RPS, 2024e). After this time the majority of the remaining hydrocarbon is entrained into the upper water column, leaving only a small proportion of the oil floating on the water surface (<1%). Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay and/or evaporate over time scales of several weeks to a few months, thereby extending the area of potential effect.

Given the environmental conditions experienced in the PAA, marine gas oil is expected to undergo rapid spreading and this, together with evaporative loss, is likely to result in a rapid dissipation of the spill. Marine gas oil distillates tend not to form emulsions at the temperatures found in the region. The characteristics of the marine gas oil are given in Section 6.8.2.

Consequence Assessment

Consequences associated with hydrocarbon release due to a Topsides loss of containment event are similar, however substantially more localised than consequences presented in this EP for diesel loss of containment events detailed in Section 6.8.8 Unplanned Hydrocarbon Release: Loss of Marine Vessel Separation (MEE-04) and Section 6.9.3 Unplanned Hydrocarbon Release: Vessel Collision during Drilling and Tie-back Activities

Once released to the open offshore setting around the riser platform (refer to Section 4), the potential for impacts to environmental receptors is limited to those in the open ocean, up to 10 km from the riser platform.

Given the density of the hydrocarbon, this decrease in water quality will be restricted to the top few metres of the water column. As such, impacts to demersal or benthic receptors (e.g. Ancient Coastline or continental slope demersal fish KEF) are not considered credible.

Water Quality

There may be a minor short-term decrease in water quality in the immediate vicinity of the release location. The soluble fraction of condensate may cause acute toxic effects to planktonic organisms. Given the short generation times and high productivity of planktonic communities, this impact would be localised and have no lasting effect on planktonic species populations.

Air Quality

A topsides release of Pluto condensate may be potentially accompanied by release of a limited volume of methane and ethane released to atmosphere. The gas plume is expected to mix and disperse rapidly in the atmosphere. Hence, it has limited potential to impact fauna in the vicinity of the release location. Impacts, such as asphyxiation, would be highly localised and of no lasting effect to species populations.

Marine Fauna

A range of marine species may be present around the riser platform, such as cetaceans, marine turtles, whale sharks, fishes and birds. These species are widely distributed relative to the potential EMBA that would result from a topsides loss of containment (due to the relatively small volume of hydrocarbons compared to the scenarios considered in

Section 6.8.8). Many large marine fauna in the region are migratory and are seasonally present in the PAA, which reduces the likelihood of exposure. Air breathing marine species may be impacted by the reduction in air quality (refer above); however, the potential for this impact is very limited. Marine fauna at or near the sea surface may be contacted by liquid-phase hydrocarbons, resulting in oiling. This may lead to impacts such as irritation of sensitive mucous membranes (e.g. eyes, mouth and digestive tract), matting of feathers (leading to inability to fly and loss of insulation) or clogging of filtering structures (e.g. gills). Pelagic and site attached fish (i.e. those resident around risers and jackets) may be exposed to spilled hydrocarbons, but are expected to avoid areas of high concentrations. Depending on the degree of exposure and the sensitivity of the receptor, these impacts may lead to injury or death. Mortality of larger fauna is not expected to occur. No impacts to ecosystem function are expected. Given the volatile nature of the hydrocarbons and the relatively small release volume, the potential for these impacts is largely constrained to the initial 12 hours immediately after the release. Hence, the potential impacts to species would be localised and of no lasting effect to species populations.

Socio-economic

Slight, short term impacts may occur to other marine users (e.g. commercial fisheries); however, as the worst case marine diesel spill would weather rapidly, and there is already no fishing within PSZ and limited fishing within the Operational Area, it is unlikely that there would be any significant impact to commercial fishers.

Summary

Given the adopted controls, the overall risk rating for an unplanned hydrocarbon due to a Pluto-A Topsides Loss of Containment is Moderate based on a Minor consequence (short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute, or to a community or highly valued area/item of cultural significance community), and a highly unlikely likelihood.

Demonstration of ALARP

While the loss of topsides containment does not constitute an MEE, it is considered to be a potential MAE in the Pluto A Operations Safety Case. As such, this source of risk is managed under the SCE management system (Section 7.4) for the facility. Specific measures and controls presented below are drawn from this management system.

Control Considered	Control Feasibility (F) and Cost/Sacrifice (CS)	Benefit in Impact/Risk Reduction	Proportionality	Control Adopted
Legislation, Codes and Standards				
Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: Accepted Safety Case for the facility.	F: Yes. CS: Minimal cost. Standard practice.	Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009: Accepted the Pluto A Operations Safety Case to: identify hazards that have the potential to cause an MAE detail assessment of MAE risks describe the physical barriers SCEs and the safety management systems identified as being required to reduce the risk to personnel associated with an MAE to ALARP, thus contributing to management of associated potential environmental consequences of MAEs.	Control based on legislative requirements – must be adopted.	Yes C 19.1
Good Practice				
Incident reports are raised for unplanned releases within event reporting system.	F: Yes. CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance	Control based on Woodside standard and regulatory	Yes C 13.5

		with regulatory reporting requirements.	requirements – must be adopted	
Professional Judgement – Elimination				
None identified beyond those integrated within PLA facility design.				
Professional Judgement – Substitute				
None identified beyond those integrated within PLA facility design.				
Professional Judgement – Engineered Solution				
Maintain topsides hydrocarbon-containing infrastructure integrity (P01 – Pressure Vessels, P04 Tanks).	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of topsides loss of containment through inspection and assurance of key hydrocarbon containing vessels/tanks.	Benefits outweigh cost sacrifice.	Yes C 19.2
Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	F: Yes. CS: Minimal cost. Standard practice.	Safety instrumented systems reduce the risk of topsides loss of containment by detecting and responding to pre-defined conditions and/or initiate responses that put the process plant and equipment in a safe condition so as to prevent or mitigate the effects of an MAE/MEE.	Benefits outweigh cost sacrifice.	Yes C 13.3
Maintaining facility's open hazardous and non-hazardous drain system integrity as far as practicable (F22 – Open Hazardous and Diesel Drains).	F: Yes. The riser platform has been designed with an integral drains system (as practicable to suit NNC facility safety design requirements) to prevent escalation associated with hazardous inventories and support the appropriate containment of environmentally hazardous liquids. CS: Inherent feature of riser platform design ALARP. Some safety philosophy sacrifice.	Reduces the likelihood of environmental harm by: limiting escalation of an incident following loss of containment, fire and/or explosion by removing or containing flammable liquid from hazardous areas; supporting appropriate containment and disposal of environmentally hazardous liquids.	Benefits outweigh cost sacrifice.	Yes C 6.4
Emergency Response				

Mitigation – Emergency and Hydrocarbon Spill Response.	Standard practice to implementing management systems to maintain: Pluto Offshore Facility Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response

ALARP Statement:

The controls for the Topsides loss of containment are based on the controls similar to those identified for MEE-03, MEE-04 and MEE-05 (Sections 6.8.7 to 6.8.9) and are supported by specific measures presented in Section 7.2. On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the risks of a topsides loss of containment. As no reasonable additional/alternative controls were identified that would further reduce the consequences and risks without grossly disproportionate sacrifice, the risks are considered ALARP.

Demonstration of Acceptability

Acceptability Statement:

The consequence assessment has determined that, given the adopted controls, a highly unlikely worst case hydrocarbon release from topside loss of containment represent a Moderate risk rating. Consequences are unlikely to result in a consequence greater than Minor, short-term impacts. Further opportunities to reduce the risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and consistent with the safety case. The potential risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of process hydrocarbon release from loss of containment to a level that is broadly acceptable.

EPOs, EPSs and MC for Pluto Facility Operations

Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 19 Woodside will manage its activities to prevent material Topsides loss of containment events from occurring. Topsides loss of containment risks to the marine environment are managed to limit risk to Moderate[108] through maintenance of prevention and mitigative barriers during the Petroleum Activities Program.	C 14.4 OPGGS (Safety) Regulations 2009: Accepted Safety Case for the facility	PS 14.4 An accepted Safety Case is implemented, and safety notification and reporting is undertaken in accordance with the Regulations (as applicable).	MC 14.4.1 Acceptance letter from NOPSEMA demonstrates acceptance of the Safety Case. Records demonstrate applicable NOPSEMA notification and reporting.
	C 13.5 Incident reports are raised for unplanned releases within event reporting system.	PS 13.5 Incident reports raised for unplanned releases, and Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous109 chemical, in any 48-hour period.	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.
	C 19.1	PS 19.1	MC 1.17.1

[108] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5.

[109] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

	Maintaining topsides hydrocarbon-containing infrastructure integrity.	Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related Damage to SCEs for P01 – Pressure Vessels, and P04 – Tanks to: provide minimum required mechanical integrity for identified pressure vessel systems for operation within defined integrity limits to prevent an MAE/MEE or worst-case diesel loss of containment.	Records demonstrate implementation of SCE Performance Standard(s) and Safety Critical Element Management Procedure
	C 13.2 Maintaining Safety Instrumented System (Safety Instrumented Functions and ESD actions) and valves to detect and respond to pre-defined initiating conditions, and/or initiating responses that put the process plant, equipment, and the wells in a safe condition to prevent or mitigate the effects of an MEE	PS 13.2 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for F06 – Safety Instrumented System to: detect and respond to pre-defined initiating conditions and/or initiate responses that put the process, plant equipment and wells in a safe condition to prevent or limit the escalation of an MAE/MEE.	MC 1.17.1 Records demonstrate implementation of SCE Performance Standard(s) and Safety Critical Element Management Procedure
	C 6.4 Facility open hazardous and diesel drain system integrity maintained as far as practicable.	PS 6.4 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for F22 – Open Hazardous and Diesel Drains, to: prevent escalation of an incident following loss of containment, fire and/or explosion by removing or containing flammable liquid from hazardous areas support appropriate containment and disposal of environmentally hazardous liquids to avoid damage to the environment.	MC 1.17.1 Records demonstrate implementation of SCE Performance Standard(s) and Safety Critical Element Management Procedure.
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 and Appendix H for discussion around the ALARP assessment of controls related to hydrocarbon spill response	

6.9.3 Unplanned Hydrocarbon Release: Vessel Collision during Drilling and Tie-back Activities

Context		
Vessel-based Activities for Xena-03 Tie-back -Section 3.12	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Socio-economic Environment – Section 4.9	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	Risk Rating	ALARP Tools	Acceptability	Outcome
Loss of hydrocarbons to marine environment due to a vessel collision during drilling and tie-back of the Xena-03 well		x		x	x	x	A	C	1	M	LCS GP PJ	Broadly Acceptable	EPO 20

Description of Source of Risk

Background

The temporary presence of the MODU, AHVs, installation and support vessels in the Xena-03 Operational Area during Xena-03 Tie-back activities will result in a navigational hazard within the immediate area

Spill scenarios involving the MODU are not considered likely for a hydrocarbon release given the collision points, vessel speeds and locations of the vessel tanks. MODU fuel tanks are located in the MODU pontoons, typically located on the inner sides of pontoons and can be over 10 m below the waterline.

The installation vessel is expected to have a total fuel capacity of 2200 m^3, with the largest tank holding approximately 340 m^3 (Section 3.12.2). AHVs and other support vessels for the Xena-03 Tie-back activities are likely to have multiple isolated marine diesel tanks distributed throughout the hull of the vessel, typically ranging from 22 to 105 m^3.

In the unlikely event of a vessel collision involving the installation vessel or a support vessel during the Xena-03 Tie-back activities, 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. It is noted that a hydrocarbon spill from a loss of vessel separation during operational activities is assessed in Section 6.8.8.

Industry Experience

Registered vessels or foreign flag vessels in Australian waters are required to report events to the Australian Transport Safety Bureau (ATSB), AMSA or Australian Search and Rescue (AusSAR).

From a review of the ATSB marine safety and investigation reports, one vessel collision occurred in 2011/12 that resulted in a spill of 25–30 L of hydrocarbon into the marine environment as a result of a collision between a tug and support vessel off Barrow Island. Two other vessel collisions occurred in 2010, one in the port of Dampier, where a support vessel collided with a barge being towed. Minor damage was reported and no significant injury to personnel or pollution

occurred. The second 2010 vessel collision involved a vessel under pilot control in port connecting with a vessel alongside a wharf, causing it to sink. No reported pollution resulted from the sunken vessel. These incidents demonstrate the likelihood of only minor volumes of hydrocarbons being released during the highly unlikely event of a vessel collision.

From 2010 to 2011, the ATSB's annual publication defines the individual safety action factors identified in marine accidents and incidents: 42% related to navigation action (2011). Of those, 15% related to poor communication and 42% related to poor monitoring, checking and documentation (ATSB, 2011). The majority of these related to the grounding instances.

Credible Scenario

For a vessel collision to result in the worst-case scenario of a hydrocarbon spill potentially impacting an environmental receptor, several factors must align as follows:

- The identified causes of vessel interaction must result in a collision.
- The collision must have enough force to penetrate the vessel hull.
- The collision must be in the exact location of the fuel tank.
- The fuel tank must be full, or at least of volume which is higher than the point of penetration.

The environmental risk analysis and evaluation identified and assessed a range of potential scenarios that could result in a loss of vessel structural integrity, resulting in damage to fuel storage tank(s) and a loss of marine diesel to the marine environment. Spill scenarios involving the MODU are not considered likely for a hydrocarbon release given collision points, vessel speeds and locations of the vessel tanks. Instead, the most credible scenarios are associated with the collision of an installation vessel with a support vessel in the event that one should be used within the field.

In summary, it is not a credible scenario that the total storage volume of the MODU, installation and support vessels would be damaged or lost, as fuel is stored in more than one tank and stored within the hull, behind the bilge tanks, below the waterline.

The last scenario considered was a collision between a project vessel with a third-party vessel (i.e. other petroleum related vessel or commercial fishing vessel). This was assessed as being credible but highly unlikely, given the standard vessel operations and equipment in place to prevent collision at sea, the standby role of a support vessel (low vessel speed) and its operation in close proximity to the MODU (exclusion areas), and the construction and placement of storage tanks. Potential spill volumes for these scenarios are summarised in Table 6-41. Given the offshore location of the PAA, vessel grounding is not considered a credible risk.

Table 6-41: Summary of credible hydrocarbon spill scenario as a result of vessel collision

Scenario	Hydrocarbon Volumes	Preventative and Mitigation Controls	Credibility
Loss of containment from MODU as a result of vessel collision	Submerged marine diesel tanks up to an individual capacity of 500 m3.	Fuel tanks are located on the inside of pontoons and protected by location below water line, protection from other tanks, e.g. bilge tanks. The draught of vessel and location of tanks in terms of water line prevent the tanks from being breached.	Not credible Due to location of tanks.
Breach of support vessel fuel tanks due to support vessel – other vessel collision including commercial, shipping/fisheries.	Activity support vessel has multiple marine diesel tanks typically ranging between 22– 105 m^3 each.	Typically, double wall, tanks which are located midship (not bow or stern). Vessels are not anchored and steam at low speeds when relocating within the PAA or providing stand-by cover. Normal maritime procedures would apply during such vessel movements.	Credible Activity support vessel – other vessel collision could potentially result in the release from a fuel tank.
Breach of installation vessel fuel tanks due to collision with another vessel including	The installation vessel has multiple isolated tanks, largest volume of a single tank is unlikely to exceed 500 to 1000 m^3.	Tank locations midship (not bow or stern). Installation vessel will be holding station during installation activities or steaming at low speeds when relocating within the PAA.	Credible – Worst Case Installation vessel – third party vessel collision could potentially result in the release from a fuel tank.

commercial shipping/fisheries.			

Quantitative Hydrocarbon Risk Assessment

Spill modelling was performed by RPS, on behalf of Woodside to determine the fate of marine diesel (modelled as marine gas oil) released from a collision within the PAA (RPS, 2024e). The modelling assessed the extent of a marine diesel spill volume of 1000 m³ for all seasons, using an historic sample of wind and current data for the region. The results of the modelling can be used to demonstrate that a marine diesel spill within the PAA has an EMBA that is not predicted to include any shoreline contact or accumulation at impact thresholds. A total of 200 replicate simulations were modelled over an annual period (50 per quarter). As stated above, the largest tank volumes on an installation vessel is expected to be 500 m3; therefore, the modelling of 1000 m³ is considered conservative for a vessel collision scenario during drilling and tie-back activities.

Hydrocarbon Characteristics

Marine diesel oil (MDO) is a mixture of both volatile and persistent hydrocarbons. Modelling conducted on a comparable marine gas oil (MGO) more typical of vessel fuel. Predicted weathering of marine diesel, based on typical conditions in the region, indicates that around 72% of the oil mass is forecast to have entrained and a further 24% is forecast to have evaporated over the first 24 hours (RPS, 2024e). After this time the majority of the remaining hydrocarbon is entrained into the upper water column, leaving only a small proportion of the oil floating on the water surface (<1%). Given the large proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay and/or evaporate over time scales of several weeks to a few months, thereby extending the area of potential effect.

Given the environmental conditions experienced in the PAA, marine gas oil is expected to undergo rapid spreading and this, together with evaporative loss, is likely to result in a rapid dissipation of the spill. Marine gas oil distillates tend not to form emulsions at the temperatures found in the region. The characteristics of the marine gas oil are given in Table 6-42.

Table 6-42: Characteristics of the marine gas oil

Hydrocarbon type	Initial density (g/cm³) at 25 ºC	Viscosity (cP @ 25 ºC)	Component BP (ºC)	Volatiles %<180	Semi volatiles % 180–265	Low volatility (%) 265-380	Residual (%) >380
				Non-Persistent			Persistent
Marine Gas Oil	0.829	4.0	% of total	6	34.6	54.4	5

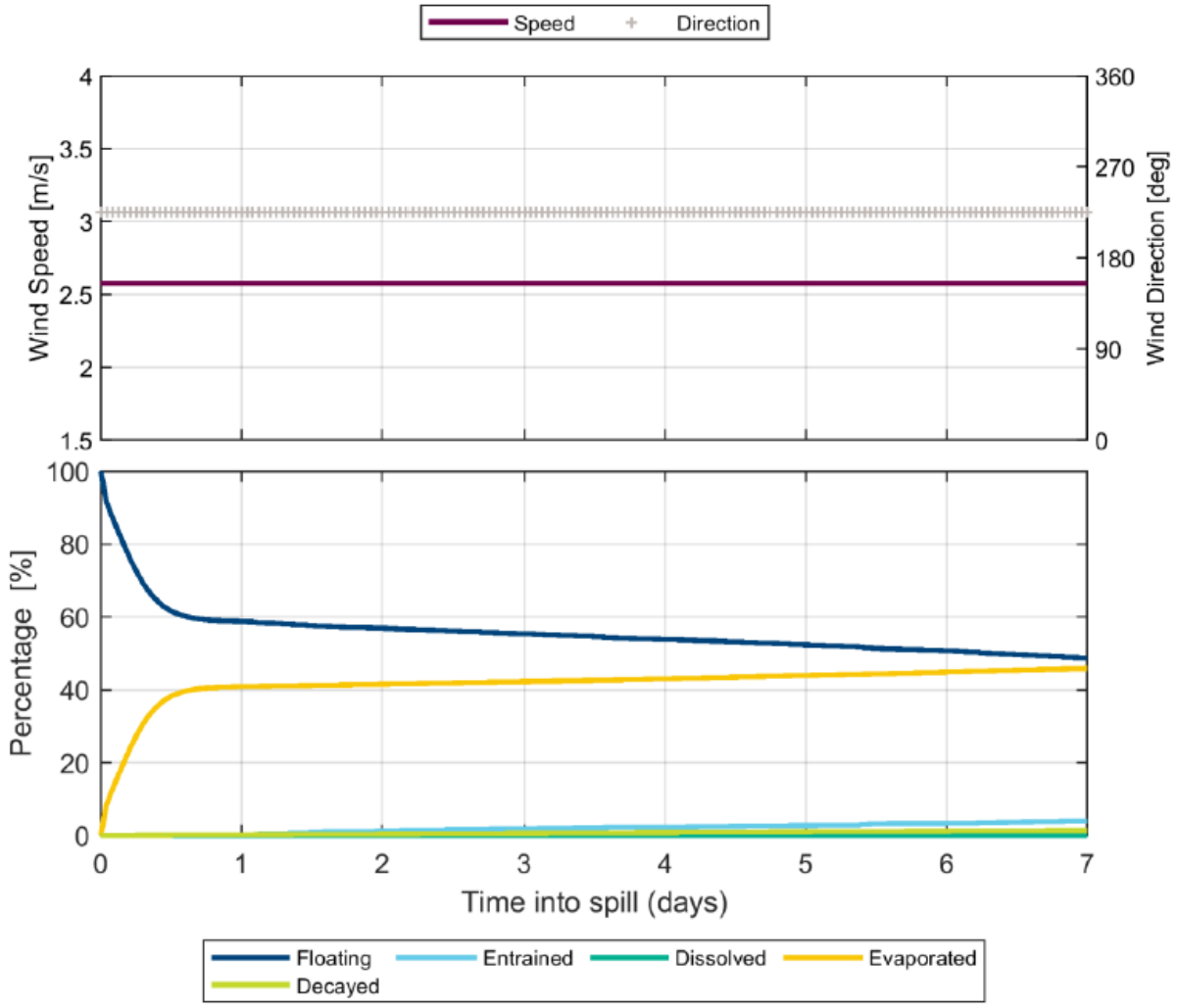


Figure 6-38: Proportional mass balance plot representing the weathering of MGO spilled onto the water surface as a one-off release (50 m3) and subject to a constant 5 kn (2.6 m/s) wind at 27 °C water temperature and 25 °C air temperature. (RPS Group, 2024e)

Consequence Assessment

Environment that May Be Affected

In the event of a 1000 m³ release of marine diesel spill due to vessel collision during drilling and tie-back activities, the modelling predicts a low probability of receptors being contacted by entrained hydrocarbons >100 ppb or dissolved aromatic hydrocarbons >50 ppb (RPS, 2024e).

The greatest likelihood of contact is at the Montebello AMP (24% probability for surface hydrocarbons, 57.5% probability for entrained and 19.5% for dissolved). All other sensitive locations identified are predicted to have a 0.5% probability or less of contact at threshold concentrations. Further, entrained hydrocarbons reaching these environments will be highly weathered, with the volatile and water soluble (often the most toxic) components expected to have dissipated. No surface hydrocarbons above 10 g/m2 are predicted to contact sensitive receptors and no shoreline oiling above 100 g/m2 is predicted (RPS, 2024e).

Potential Impacts to Environmental Value(s)

The potential impacts from a hydrocarbon release caused by a vessel seperation (Pluto Operations) are discussed in Section 6.8.8 (MEE-04). Taking into consideration that the EMBA derived from hydrocarbon spill modelling for a marine diesel spill (during drilling and operations), will fall within the EMBA of the spill from a loss of well containment outlined in Section 6.9.1 Moreover, given the expected maximum fuel tank size of the installation vessel (350 m3) is much lower than the modelled scenario (1000 m3), this assessment is considered to be conservative. A summary of the potential environmental impacts specific to a vessel collision scenario during drilling and tie-back activities are provided below.

Water Quality

There may be a short-term decrease in water quality in the immediate vicinity of the release location. Given the localised area of the potential EMBA and the rapid dispersion, dilution and weathering of a marine diesel spill, it is expected that any potential impacts will be minor and temporary in nature.

Marine Sediment Quality

Low probabilities (<2%) of entrained hydrocarbons were predicted to contact a few nearshore receptors, such as the Ningaloo Coast, Montebello Islands and Shoals, Barrow Island and Muiron Islands. No shorelines were predicted to be exposed to either shoreline accumulation or floating surface hydrocarbons at any threshold (RPS, 2024e). However, hydrocarbon contact from this scenario may lead to reduced marine sediment quality by processes such as adherence to sediment and deposition seabed habitat away from shoreline areas.

Protected Species

Cetaceans

As identified in Section 4, protected species including migrating pygmy blue whales may be encountered near the PAA, and therefore could be impacted in close proximity to the marine diesel spill location, where the volatile, water soluble and most toxic components of the diesel may be present. However, the window for exposure to hydrocarbons with the potential for any toxicity effects in these waters would be limited to a few days following the spill. Potential impacts may include behavioural impacts (e.g. avoidance of impacted areas), sub-lethal biological effects (e.g. skin irritation, irritation from ingestion or inhalation, reproductive failure) and, in rare circumstances, organ or neurological damage leading to death. Given the absence of critical habitats or aggregation areas, cetaceans in the area are expected to be transient, and impacts are expected to be limited to individuals or small groups of animals. Impact on the overall population viability of cetaceans are not predicted.

There is also the potential for migrating humpback whales, dugongs and coastal dolphin populations to be exposed in nearshore waters, however, the low concentrations and advanced degree of weathering of hydrocarbons in these nearshore waters is not expected to result in any discernible sublethal or lethal impacts to cetaceans.

Marine Turtles

The EMBA modelled for a release of hydrocarbons following a vessel collision overlaps with BIAs for marine turtle internesting habitat, as identified in Section 4.6.2. Turtle internesting habitats, such as those in waters adjacent to the Dampier Archipelago Islands, are predicted to have very limited or no exposure to surface or dissolved hydrocarbons above their respective impact threshold concentrations. Some marine turtles in these areas may be exposed to patchy occurrences of entrained hydrocarbons, which would be in an advanced state of weathering with reduced toxicity. Low concentrations are only capable of causing sublethal impacts to the most sensitive marine organisms and no lethal or sub-lethal impacts to marine turtles are expected in the BIAs. The potential for lethal and sub-lethal impacts to marine turtles is limited to small numbers of transient individuals that may be present in offshore waters near the release location.

Seabirds

Seabirds may also be exposed to marine diesel on the sea surface or upper water column, if resting or foraging in waters near to the release in the event of a marine diesel spill during drilling and tie-back activities. Impacts may include mortality due to oiling of feathers or the ingestion of hydrocarbons. However, due to the limited spatial extent of a marine diesel spill and limited window for exposure, population level impacts are not expected.

Other species

Other protected species that may occasionally transit through the area and may potentially be exposed to a marine diesel spill during drilling and tie-back activities, include shark and ray species such as whale sharks and manta rays. Should sharks or rays be present in offshore waters near the PAA during the spill, direct impacts may occur if foraging within surface slicks or in the upper 20 to 30 m of the water column containing entrained hydrocarbons and dissolved aromatics. Contamination of their food supply and the subsequent ingestion of this prey may also result in long term impacts as a result of bioaccumulation. Impacts are again predicted to be limited to a small number of animals given the absence of key habitat and the low numbers of A quickly (weeks/months) due to high population turnover (ITOPF, 2011). It is therefore considered that any potential impacts would be low magnitude and temporary in nature.

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

Other communities (e.g. demersal fish, benthic infauna and epifauna) and key sensitivities (e.g. KEFs identified in Section 4.7) occur within the combined EMBA, however will not be directly exposed or impacted by a marine diesel spill as hydrocarbons are confined to the upper layers of the water column (0-10m).

Protected Areas

Entrained hydrocarbons at or exceeding the 100 ppb threshold have a low probability of contacting the Montebello AMP, Gascoyne AMP, and Ningaloo MPWHA in the event of a vessel collision during drilling and tie-back activities (RPS, 2024e). Entrained hydrocarbons are only predicted within the surface waters of the deep open waters of these protected areas, with no contact to seabed habitats or to shoreline contact. Potential impacts to water quality and the natural values (e.g. mobile protected species) in these areas would be temporary and localised in nature due to the rapid dispersion and weathering of the marine diesel, as described above. Dissolved and visible surface hydrocarbons (at or exceeding 1 g/m2) are not predicted to reach any other protected areas.

Socio-economic

A marine diesel spill is considered unlikely to cause significant direct impacts on the target species fished by the Commonwealth and State active fisheries identified in Section 4.10.1 which overlap with the combined EMBA. The fisheries that operate within the EMBA predominantly target demersal fish species (demersal finfish and crustaceans) that inhabit waters in the range of >60–200 m depth, or pelagic species which are highly mobile. Therefore, a marine diesel spill is expected to only result in negligible impacts, considering that hydrocarbons are confined to the upper layers of the water column (0-10m). There is the potential that a fishing exclusion zone would be applied in the area of the spill, which would put a temporary ban on fishing activities and therefore potentially lead to subsequent economic impacts on commercial fishing operators if they were planning to fish within the area of the spill. Such measures would likely be in place for less than a week and would not result in widespread or long term impacts to fishing activities.

Demonstration of ALARP

Given the adopted controls, the overall risk rating for an unplanned hydrocarbon release resulting from a vessel collision during drilling and tie-back activities is Moderate based on a Minor consequence (short term impact: 1-2 years), to the high value receptors (marine fauna, AMPs, KEFs and commercial fishing), and a highly unlikely likelihood.

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)9F*[110]	Benefit in Impact/Risk Reduction	Proportionality	Control Adopted
Legislation, Codes and Standards				
Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 21 (Safety of navigation and emergency procedures) 2016 Marine Order 27 (Safety of navigation and radio equipment) 2016 Marine Order 30 (Prevention of Collisions) 2016.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed, reduces the likelihood of interference with other marine users resulting in a collision.	Controls based on legislative requirements – must be adopted.	Yes C 1.1
Establishment of a 500 m safety exclusion zone around MODU and communicated to marine users.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirements to be followed reduce the likelihood of a collision	Controls based on legislative requirements – must be adopted.	Yes C 1.2
Arrangements supporting the activities in the Xena-03 Tie-Back Oil Pollution First Strike Plan (per Section 7.14) will be tested to ensure the Xena-03 Tie-Back Oil Pollution First Strike Plan can be implemented as planned.	F: Yes. CS: Minimal cost. Standard practice.	Legislative requirement based on vessel class. Unlikely to have a significant reduction in consequence.	Controls based on legislative requirements – must be adopted.	C 18.2
Good Practice				
Support vessel on standby as required during the Petroleum Activities Program	F: Yes. CS: Minimal cost – support vessels	Given the legislative controls in place, use of a support vessel, as defined in the One	Benefits outweigh cost/sacrifice.	Yes C 20.1

[110] Qualitative measure

to assist in third-party vessel interactions. When a support vessel is designated for standby it will undertake actions to prevent unplanned interactions, such as: maintain a 24-hour radio watch on designated radio channel(s) undertake continuous surveillance and warn the MODU/ installation vessel of any approaching vessels reaching 500 m safety exclusion zone. Surveillance shall be conducted by a combination of: visual lookout radar watch other electronic systems available including Automatic Identification System (AIS) monitoring any additional/ agreed radio communications channels all other means available. While complying with the International Regulations for Preventing Collisions at Sea (COLREGS), approach any vessel attempting to transit through the 500 m zone and contact vessel by all available means. Monitor and advise the MODU if: MODU navigation signals are defective. visibility becomes restricted. Any buoys in the area are not holding position or are not working as expected.	available routinely in PAA during Petroleum Activities Program. Standard practice.	Marine Charterers Instructions, will provide a small reduction in likelihood of a collision with a third-party vessel.		
Notify Australian Hydrographic Office (AHO) no less than four weeks prior to scheduled activity commencement date.	F: Yes. CS: Minimal cost. Standard practice.	Notification of AHO will enable them to issue a Maritime Safety Information Notifications (MSIN) and Notice to Mariners (NTM) thereby reducing the likelihood of unplanned interactions with other vessels.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes C 1.8
Notify AMSA JRCC of activities and movements of the activity 24 to 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 should	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes C 1.9

		emergency response be required.		
Notify DoD no less than four weeks before Xena-03 Tie-back activities commence.	F: Yes CS: Additional cost. Standard practice.	In accordance with request made by DoD during consultation.	Benefits outweigh cost/sacrifice	Yes C 1.11
Notify government departments, fishing industry representative bodies and licence holders of activities prior to commencement and upon completion of the Xena-03 Tie-back activities.	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 interference with other marine users.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes C 1.12
Develop a SIMOPS Plan to manage rig interactions with other facilities/vessels, where multiple campaigns occur within the PAA (i.e. during xmas tree installation).	F: Yes. CS: Minimal cost. Standard practice.	SIMOPS Plan contains detail such as communications requirements, exclusion zones and entry/exit requirements and roles and responsibilities – which can help reduce likelihood of vessel collision.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes C 1.16
Mitigation: Oil Spill Response	Refer to Appendix H			
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				
ALARP Statement: On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, Section 2.6.1), Woodside considers the adopted controls appropriate to manage the risks and consequences of an unplanned loss of hydrocarbon as a result of a vessel collision during drilling and tie-back activities. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without grossly disproportionate sacrifice, the risks and consequences are considered ALARP.				
Demonstration of Acceptability				
Acceptability Statement The impact assessment has determined that an accidental hydrocarbon release as a result of a vessel collision during drilling and tie-back activities represents a moderate current risk rating and is unlikely to result in a risk consequence greater than Minor. Relevant recovery plans and conservation advice have been considered during the impact assessment, and the Petroleum Activities Program is not considered to be inconsistent with the overall recovery objectives and actions of these recovery plans and conservation advice. The adopted controls are considered consistent with industry legislation, codes and standards, good practice and professional judgement and meet the requirements and expectations of Australian Marine Orders, AMSA and AHO identified during impact assessment and consultation.				

The potential risks and consequences are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks and consequences of a loss of vessel structural integrity to a level that is broadly acceptable.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 20 Woodside will manage its Tieback activities to prevent loss of hydrocarbons to the marine environment as a result of vessel collision. .	C 1.1 Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 21 (Safety of navigation and emergency procedures) 2016 Marine Order 27 (Safety of navigation and radio equipment) 2016 Marine Order 30 (Prevention of Collisions) 2016.	PS 1.1 Vessels contracted whose practices comply with Marine Order as applicable to vessel size, type and class (Marine Orders 21, 27 and 30).	MC 1.1.1 Marine verification records demonstrate compliance with standard maritime safety procedure (Marine Orders 21, 27 and 30).
	C 1.2 Establishment of a 500 m safety exclusion zone around MODU and 500 m exclusion zone around the installation vessel and communicated to marine users.	PS 1.3 No entry of unauthorised vessels within the 500 m safety exclusion zone.	MC 1.3.1 Daily Operations Reports and Incident records demonstrate breaches by unauthorised vessels within the safety exclusion zone are recorded.
	C 18.1 In the event of a spill emergency response activities implemented in accordance with the Xena-03 Tie-Back Oil Pollution First Strike Plan.	PS 18.1 In the event of a spill the Xena-03 Tie-Back Oil Pollution First Strike Plan requirements are implemented. Refer to Section 6.9.1	MC 18.1.1 Completed incident documentation.6.9.1
	C 18.2 Arrangements supporting the activities in the Xena-03 Tie-Back Oil Pollution First Strike Plan will be tested to ensure the Xena-03 Tie-Back Oil Pollution First Strike Plan can be implemented as planned. Refer Section 6.9.1	PS 18.2.1 Exercises/tests will be conducted in alignment with the frequency identified in Section 7.14.2. Refer Section 6.9.1	MC 18.2.1 Testing of arrangement records confirm that emergency response capability has been maintained. Refer Section 6.9.1
		PS 18.2.2 Woodside's procedure demonstrates a minimum level of trained personnel, for core roles in the Xena-03 Tie-Back Oil Pollution First Strike Plan, are maintained.	MC 18.2.2 Emergency Management dashboard confirms that minimum level of personnel trained for core the Xena-03 Tie-Back Oil Pollution First Strike Plan roles are available.

	C 20.1 Support vessel on standby as required during the Petroleum Activities Program to assist in third-party vessel interactions. When a support vessel is designated for standby it will undertake actions to prevent unplanned interactions, such as: Maintain a 24-hour radio watch on designated radio channel(s) Perform continuous surveillance and warn the MODU/ installation vessel of any approaching vessels reaching 500 m petroleum safety zone. Surveillance shall be conducted by a combination of: visual lookout radar watch other electronic systems available including Automatic Identification System (AIS) monitoring any additional/agreed radio communications channels all other means available. While complying with the International Regulations for Preventing Collisions at Sea (COLREGS), approach any vessel attempting to transit through the 500 m zone and contact vessel by all available means. Monitor and advise the MODU if: MODU navigation signals are defective visibility becomes restricted.	PS 20.1 Define role of support vessels in maintaining petroleum safety zone, preventing unplanned third-party vessel interactions, monitoring the effectiveness of navigation controls (e.g. signals), and warning third-party vessels of navigation hazards.	MC 20.1.1 Daily Drilling Report will include details on the support vessel that is on standby. Non-conformance will be detailed in an incident report.

	Advise if any buoys in the area are not holding position or are not working as expected.		
	C 1.8 Notify AHO of activities no less than four weeks prior to scheduled activity commencement date. Refer to Section 6.7.1	PS 1.8 Notification to AHO of activities and movements to allow generation of navigation warnings (MSIN and NTM) (including AUSCOAST warnings where relevant)). Refer to Section 6.7.1	MC 1.8.1 Consultation records demonstrate that AHS has been notified before commencing an activity to allow generation of navigation warnings (MSIN and NTM (including AUSCOAST warnings where relevant)). Refer to Section 6.7.1
	C 1.9 Notify AMSA Joint Rescue Coordination Centre (JRCC), of activities where vessels will be in the Operational Area, but outside of the Petroleum Safety Zone >3 weeks, 24 to 48 hrs before activities commence.	PS 1.9 AMSA's JRCC is notified 24 to 48 hrs before mobilisation, for activities in the Operational Area, but outside of the Petroleum Safety Zone >3 weeks, for awareness should emergency response be required.	MC 1.9.1 Records demonstrate a once-off notification provided to AMSA's JRCC within required timeframes before mobilisation.
	C 1.11 Notify DoD of activity no less than four weeks before operations commence.	PS 1.11 Woodside will provide DoD activity notification no less than four weeks prior to commencement of drilling, well interventions / work-overs or subsea installation activities.	MC 1.11.1 Consultation records demonstrate that DoD and AHO have been notified prior to commencement of drilling or subsea installation activities.
	C 1.12 Notify relevant government departments, fishing industry representative bodies and licence holders of activities prior to commencement and upon completion of activities.	PS 1.12 AFMA, DCCEEW, CFA, DAFF – Fisheries, Recfishwest, DPIRD, WAFIC and relevant Fishery Licence Holders (North West Slope and Trawl Fishery, Western Deepwater Trawl Fishery) will be notified no less than ten days before activity commences and following completion of activities.	MC 1.12.1 Consultation records demonstrate that listed relevant persons have been notified prior to commencement and following completion of drilling or subsea installation activities.
	Detailed preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are presented in Appendix H.		

6.9.4 Unplanned Hydrocarbon or Chemical Release: Hydrocarbon Release during Bunkering, Refuelling and Chemical Release during Transfer, Storage and Use, Rupture of Chemical Supply Lines – Pluto Operations

Context		
Operational Details – Section 3.5 Utility Systems – Section 3.6 Support Vessel Operations - Section 3.8 Hydrocarbon and Chemical Inventories and Selection – Section 3.9 Subsea chemical use – Section 3.10.2.5	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Socio-economic Environment – Section 4.9	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Accidental discharge of marine diesel/hydrocarbons to the marine environment during bunkering or refuelling,			x		x	x	x	A	D	2	M	LCS GP PJ 4	Broadly Acceptable	EPO 21
Accidental discharge of chemicals to the marine environment from transfer, storage and use, or rupture of chemical supply lines			x		x	x	x	A	D	1	M			
Accidental release of MEG from chemical supply lines			x		x	x	x	A	E	2	M			

Description of Source of Risk

Operations: Marine Diesel Bunkering and Refuelling

Marine diesel fuel is transferred to the facility (during crewed visits) and ASV by bunkering. Two key scenarios for the loss of containment of marine diesel during bunkering operations were identified:

- Partial or total failure of a bulk transfer hose or fittings during bunkering, due to operational stress or other integrity issues could spill marine diesel to the deck and/or into the marine environment. This would be less

than 200 L, based on the likely volume of a bulk transfer hose (assuming a failure of the dry break and complete loss of hose volume).

- Partial or total failure of a bulk transfer hose or fittings during bunkering or refuelling, combined with a failure in procedure to shutoff fuel pumps, for a period of up to five minutes, resulting in approximately 8 m3 marine diesel loss to the deck and/or into the marine environment.

Mechanisms are available to capture potential topsides diesel spillage from process/piping associated with the PLA bunkering station and manual fuel transfers, enabling drainage flow to be routed inboard to the open drains collections tank when the facility is crewed and during specific activities. The diesel unloading stations have isolation and vent valves to allow draining of bunkering hoses between uses.

Diesel system storage and use risks are covered in Topsides Loss of Containment risk Section 6.9.2.

Chemical Transfer, Bunkering, Storage and Use

Transfer and bunkering

Operational process chemicals are transferred to the facility in a dedicated MEG supply line, or transportable containers. Operational non-process and facility maintenance chemicals, such as subsea control fluid, cleaning products, paint, degreaser, etc., are typically transferred to the facility in containers.

Spills have the potential to occur during transfer to the facility (e.g. transport or lifting incidents). Given the small volumes being handled, the worst credible release volumes are relatively small (e.g. the typical largest chemical transfer is via transportable 4-6 m3 ISO containers of MEG, corrosion inhibitor and water clarifier).

Installation of the produced water handling module provided equipment to facilitate chemical bunkering of corrosion inhibitor and water clarifier, however this is not used - with a long-term isolation in place.

MEG loss of containment risks associated with supply and distribution is discussed below.

Storage and Use

Spills of chemicals (including non-process hydrocarbons stored in transportable containers) can originate from stored hydrocarbons/chemicals or equipment on the platform, vessel decks or subsea (refer to Section 6.7.5 for an assessment of the impacts of planned routine and non-routine chemical discharges).

The chemical planned to be stored in the largest volume on the riser platform is corrosion inhibitor (28 m3 stainless steel tank associated with the water handling module). Therefore, the worst-case credible chemical spill scenario could result in up to 28 m3 of corrosion inhibitor being discharged from the riser platform if all controls were to fail.

Selection of operational chemicals and those used during IMR activities is undertaken in accordance with the Woodside Chemical Selection and Assessment Environment Guideline.

Operational process chemicals are typically stored in dedicated vessels which have similar controls of those related to mitigating hydrocarbon releases, e.g. permanent piping to the process, isolatable by valves, open drain systems and collection tanks, and assurance through risk-based inspection in accordance with the Maintenance and Inspection regimes under the Maintain Assets Process (Section 6.1.1.2).

The riser platform and support vessels also store other non-process chemicals and hydrocarbons, in various volumes. Operational non-process chemicals and facility maintenance chemicals present on the riser platform and support vessels are typically held in low quantities (usually less than 50 L).

Chemical storage areas are typically set up in cabinets, or bunded storage areas to contain any releases to deck from transportable containers (e.g. ISOs, IBCs, barrels, drums, etc.). Releases from equipment are predominantly from the failure of hoses or minor leaks from process components, or spills during decant or refuelling of equipment, which can either be located within bunded/drained areas or outside of bunded/drained areas (e.g. over grating on cranes).

Subsea Support Vessels undertaking IMR activities may also store quantities of chemicals for subsea use. Subsea chemical selection process and use is described in Section 3.9. Accidental releases of small quantities of subsea chemicals may occur (e.g. deck spills). Operational experience indicates potential volumes of such spills is small (< 20 L).

ROV hydraulic fluid is supplied through hoses containing approximately 20 L of fluid. Hydraulic lines to the ROV arms and other tooling may become caught resulting in minor leaks to the marine environment. Small volume hydraulic leaks may occur from equipment operating via hydraulic controls subsea (subsea control fluid). These include the diamond wire cutter, bolt tensioning equipment, ROV tooling, etc.

Six-inch chemical supply and four-inch chemical supply lines

MEG may be released from 6-inch chemical supply and 4-inch chemical supply lines due to a rupture of the lines. Subsea umbilicals transport production chemicals such as corrosion inhibitor for distribution to wells and manifolds. The worst-case credible spill scenario has been determined to be a loss of containment of lean MEG from the 6inch chemical supply line due to a rupture caused by external impact (such as a vessel's anchor). If a rupture occurs the likely volume to be released to the marine environment is 35 m3 through the depressurisation of the MEG pipeline from its operating pressure of 25 MPag to seabed pressure. Additional MEG losses may occur if:

- there are severe tidal movements around the rupture location causing sea water ingress into the chemical supply line and displacing the MEG to the marine environment, or

- there is a downward flow of MEG due to gravity, dependent on the location of the rupture.

In the unlikely event that there is a continuous leak which does not trigger alarms due to flow differential between onshore and offshore, MEG release could be in the order of 30 m3/day resulting in a worst-case release of 420 m3, over two weeks, until detection based on consumption trends.

Surface Spill (Hydrocarbons/Chemicals)

Small diesel spills will rapidly spread on the water surface, with the diesel expected to evaporate and disperse rapidly (National Oceanic and Atmospheric Administration (NOAA) 2006). Woodside has commissioned RPS APASA to model several small marine diesel spills, including surface spill volumes of 8 m3 in the offshore waters of northwest WA. The results of these models have indicated that exposure to surface hydrocarbons above the 10 g/m2 threshold s limited to the immediate vicinity of the release site, with little potential to extend beyond 1 km. Based on these modelling results, the potential impacts of the credible marine diesel and chemical spill scenarios described above are reasonably expected to occur within 1 km of the release location.

The impact assessment assumes this release location to be the riser platform, as this is where all platform-based and most vessel-based spills will potentially occur. Given the nature and scale of the risk, along with the relatively low sensitivity of the receiving environment, no additional modelling studies were considered necessary to inform the impact assessment of unplanned discharges of hydrocarbons or chemicals during transfer, storage and use.

Hydrocarbon Characteristics

Refer to Section 6.8.2 for a description of the characteristics of marine diesel, including detail on the predicted fate and weathering of a spill to the marine environment.

Consequence Assessment

Marine Diesel

Given the low viscosity of marine diesel, along with the high portion of volatile components, a spill of up 8 m3 of marine diesel during transfer, storage or use would spread and weather rapidly. Environmental receptors at risk would be restricted to those in the vicinity (< 1 km from the release location).

Consequences to marine environmental receptors are assessed as consistent with diesel loss of containment impacts described in Section 6.9.2 however with an order of magnitude lower volume potential, and hence spatial extent.

Given the adopted controls, the overall risk rating for an unplanned bunkering loss of containment is Moderate based on a Minor consequence (short-term impact (1–2 years) on species, habitat (but not affecting ecosystem function), physical or biological attribute, or to a community or highly valued area/item of cultural significance community), and a unlikely likelihood.

Chemicals and Non-Process Hydrocarbons

MEG is considered PLONOR; however, very high concentrations of MEG (> 50%) may cause irritation to sensitive areas of larger marine fauna (e.g. eyes, gills). Woodside undertook ecotoxicity testing on the lean Pluto MEG (90% monoethylene glycol, ~10% demineralised water and 0.05% corrosion inhibitor). Seven tests, comprised of five different species representing five different taxonomic groups (algae, echinoderm, crustacea, molluscs and fish), were used. The toxicity of the MEG was found to be low, 240 mg/l for 99% species protection and 780 mg/l for 95% species protection (SKM, 2014). MEG is water soluble and will dilute rapidly in the marine environment to low concentrations. Impacts may occur as described above if marine fauna are within the mixing zone when the MEG is released. However, given MEG's low toxicity impacts, it is unlikely there would be any measurable effects on marine species resident in the vicinity of the release. The maximum credible spill of MEG is expected to mix rapidly with the local receiving environment with short term environmental impact.

Accidental releases of chemicals (including corrosion inhibitor) or non-process hydrocarbons decrease the water quality in the immediate area of the release; however, the worst-case loss of containment consequences are expected to be minor with a short-term impact given the water depths, the open ocean mixing environment, Operational Area distance from sensitive receptors and relatively low credible release volumes. Depending on the chemical released the toxicity and/ or potential to bioaccumulate may potentially result in impacts to pelagic fish or other marine species in the vicinity of the discharge.

Potential impacts to plankton from an accidental chemical spill may include acute toxicity resulting in mortality of planktonic organisms. Given the rapid turnover of plankton communities and nature and scale of the credible releases, these impacts will be short-lived (hours to days). Impacts to fish are expected to be of no lasting effect, as fish species are mobile and expected to avoid the area affected by an accidental chemical spill. Impacts to air-breathing fauna such as cetaceans, birds and marine turtles, are expected to be restricted to irritation of sensitive membranes such as the eyes, mouth, and digestive system.

Slight, short term impacts may occur to other marine users (e.g. commercial fisheries); however, as there is limited fishing within the Operational Area, it is unlikely there would be any significant impact to commercial fishers.

Summary of Potential Impacts to environmental values(s)

Given the adopted controls, the overall risk rating for an unplanned hydrocarbon or chemical release to the marine environment resulting from bunkering, transfer, storage and use is Moderate based on a maximum of Minor

consequence (short term impact: 1-2 years) to species, habitat (but not affecting ecosystems function), physical and biological attributes, or to a community or highly valued area/item of cultural significant, and an unlikely likelihood.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Contract vessels complying with Marine Order 91 (Marine pollution prevention – oil) for safe vessel operations. Compliance with Marine Order 91 reduces the risk of accidental hydrocarbon release during transfer.	F: Yes. CS: Minimal cost. Standard practice.	Marine Order 91 is required under Australian regulations; implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Control based on legislative requirement – must be adopted.	Yes C 6.1
Vessel or ASV helicopter fuel storage areas (if applicable) are bunded or secondarily contained when they are not being handled/moved temporarily in accordance with the Australian Government Civil Aviation Safety Authority CAAP 92-4(0) 'Guidelines for the development and operation of offshore helicopter landing sites, including vessels. No helicopter refuelling occurs on PLA.	F: Yes. CS: Minimal cost. Standard practice.	Reduced the likelihood of an unplanned release during helicopter operations. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes C 21.1
Implementation of bunkering procedures to reduce the risk of a hydrocarbon release as a result of a bunkering incident.	F: Yes. CS: Minimal cost. Standard practice.	Reduced the likelihood of an unplanned release	Benefits outweigh cost/sacrifice	Yes C 21.2
Good Practice				
PLA Bunkering equipment controls: All bulk transfer hoses shall be pressure-rated at purchase to reduce the risk of accidental hydrocarbon release during bunkering. There shall be dry-break couplings on fuel hoses. There shall be an adequate number of appropriately stocked, located and maintained spill kits.	F: Yes. CS: Minimal cost. Standard practice.	By ensuring the appropriate equipment is in place, tested and maintained appropriately, the likelihood of a spill occurring is reduced. Although no significant reduction in consequence could result, the overall risk is reduced.	Benefits outweigh cost/sacrifice	Yes C 21.3
Contractor procedures include requirements to be implemented during vessel bunkering/refuelling operations, including:	F: Yes. CS: Minimal cost. Standard practice.	By ensuring the appropriate equipment is in place, tested and maintained	Benefits outweigh cost/sacrifice.	Yes C 21.4

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
A completed PTW and/or job safety analysis (JSA) shall be implemented for the hydrocarbon bunkering/refuelling operation. Visually monitoring of gauges, hoses, fittings and the sea surface during the operation. Hoses will be checked before starting. 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.		appropriately, the likelihood of a spill occurring is reduced. Although no significant reduction in consequence could result, the overall risk is reduced.		
Safely storing chemicals and diesel to prevent the release to the marine environment.	F: Yes. CS: Minimal cost. Standard practice.	Reduces risk of unplanned chemical/diesel release.	Benefits outweigh cost sacrifice.	Yes C 21.5
Chemical Selection and Assessment Environment Guideline (Woodside Doc No. WM0000MG9905057). Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required If chemicals with a different OCNS rating, sub warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the procedure prior to use.	F: Yes. Woodside routinely implements a chemical selection process based on OCNS at the facility. CS: Minimal. The OCNS is widely used throughout the industry and chemical suppliers are aware of the requirements of the scheme.	Selection and assessment of chemicals in accordance with the Woodside process, reduces environmental impacts associated with planned chemical discharge.	Benefits outweigh cost sacrifice.	Yes C 5.1
Incident reports are raised for unplanned releases within event reporting system.	F: Yes. CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance with regulatory reporting requirements.	Control based on Woodside standard and regulatory requirements.	Yes C 13.5
Inspecting MEG Pipeline by ROV at the same frequency that the hydrocarbon export trunkline is inspected.	F: Yes. CS: Minimal cost. Standard practice.	Good practice to inspect integrity of MEG pipeline.	Benefit outweighs cost sacrifice.	Yes C 21.8

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Monitoring MEG use, investigating material discrepancies, and monitoring flow discrepancy to support identification of potential integrity failures.	F: Yes. The use of MEG is monitored to maintain adequate fluid in the system. CS: Minimal cost.	Chemical inventory monitoring and surveillance limits the volumes of MEG potentially discharged to the marine environment.	Benefit outweighs cost sacrifice.	Yes C 21.9
Professional Judgement – Substitute				
None identified				
Professional Judgement – Substitute				
None identified				
Professional Judgement – Engineered Solution				
Facility open hazardous and non-hazardous drain system integrity maintained, as far as practicable.	F: Yes. The riser platform has been designed with an integral drains system (as practicable to suit NNM facility safety design requirements) to prevent escalation associated with hazardous inventories and support the appropriate containment of environmentally hazardous liquids. CS: Inherent feature of riser platform design to ALARP. Some safety philosophy sacrifice.	The drains system can support the appropriate segregation and containment of environmentally hazardous liquids in case of unplanned loss of containment before it reaches the environment.	Benefit outweighs cost sacrifice.	Yes C 6.4
Emergency Response				
Mitigation – Emergency and Hydrocarbon Spill Response.	Standard practice to implementing management systems to maintain: Pluto Offshore Facility Emergency Response Plan Pluto Offshore Facility Oil Pollution First Strike Plan Oil Pollution Emergency Arrangements – Australia Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response			
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 of accidental spills of hydrocarbons from bunkering/refuelling, chemicals transfer, storage, and use, and accidental release of 6-inch MEG chemical supply line and 4-inch chemical supply lines. As no reasonable additional/alternative controls were identified that would further reduce the consequences and risks without grossly disproportionate sacrifice, the risks are considered ALARP				

Demonstration of Acceptability
Acceptability Statement: The consequence assessment has determined that, given the adopted controls, accidental spills during bunkering/refuelling, or spills from storage, transfer and use and from a release of 6-inch MEG chemical supply line and 4-inch chemical supply lines represent a moderate risk rating that is unlikely to result in a consequence greater than Minor, short-term impacts. Further opportunities to reduce the risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet requirements of Australian Marine Orders. The potential risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of bunkering/refuelling, and storage, transfer and use, and the release of 6-inch MEG chemical supply line and 4-inch chemical supply lines to a level that is broadly acceptable.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 21 Woodside will manage its hydrocarbon bunkering, refuelling and chemical use activities to prevent material loss of containment events from occurring. Hydrocarbon and chemical spill risks to the marine environment are managed to limit risk to Moderate[111] during the Petroleum Activities Program.	C 6.1 Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 91 (Oil) Refer Section 6.7.6	PS 6.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Orders 91). Refer Section 6.7.6	MC 6.1.1 Records demonstrate vessels are compliant with standard maritime safety procedures (Marine Orders 91). Refer Section 6.7.6
	C 21.1 Helicopter fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily in accordance with the Australian Government Civil Aviation Safety Authority CAAP 92-4(0) 'Guidelines for the development and operation of off-shore helicopter landing sites, including vessels	PS 21.1 Failure of primary containment in storage areas does not result in loss to the marine environment.	MC 21.1.1 Records confirm all fuels are stored in bunded/secondarily contained areas when not being handled/moved temporarily.
	C 21.2 Implementation of PLA bunkering procedures to reduce the risk of a hydrocarbon release as a result of a bunkering incident	PS 21.2 Implement Diesel Fuel System – Loading Bunkers – Standard Operating Procedure. Key requirements include: Routine bunkering to be carried out when adequate lighting is available for spill detection unless following an activity-specific risk assessment approved by the OIM. Communications between the supply	MC 21.2.1 Records demonstrate bunkering undertaken in accordance with facility and contractor bunkering procedures.

[111] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		vessel and facility bunker station will be maintained during bunkering. Hoses and connections to be visually checked during refuelling. Tank levels will be monitored throughout bunkering. Spill clean-up equipment will be available near the bunker station. Bunkering hose inventory will be drained to the supply vessel before disconnection.	
	C 6.4 Facility open hazardous and diesel drain system integrity maintained as far as practicable.	PS 6.4 Integrity will be managed in accordance with SCE Management Procedure (Section 7.4) and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for F22 – Open Hazardous and Diesel Drains, to: prevent escalation of an incident following loss of containment, fire and/or explosion by removing or containing flammable liquid from hazardous areas support appropriate containment and disposal of environmentally hazardous liquids to avoid damage to the environment.	MC 1.17.1 Records demonstrate implementation of SCE Performance Standard(s) and Safety Critical Element Management Procedure.
	C 21.3 PLA Bunkering equipment controls: All bulk transfer hoses shall be pressure-rated at purchase to reduce the risk of accidental hydrocarbon release during bunkering.	PS 21.3.1 All diesel transfer hoses to have dry break couplings and pressure rating suitable for intended use.	MS 21.3.1 Records confirm presence of dry break of couplings and flotation on fuel hoses.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	There shall be dry-break couplings on fuel hoses. There shall be an adequate number of appropriately stocked, located and maintained spill kits.	PS 21.3.2 To ensure adequate resources are available to allow implementation of Ship Oil Pollution Emergency Plan (SOPEP).	MS 21.3.2 Records confirm presence of spill kits.
	C 21.4 Contractor procedures include requirements to be implemented during vessel bunkering/refuelling operations, including: A completed PTW and/or job safety analysis (JSA) shall be implemented for the hydrocarbon bunkering/refuelling operation. Visually monitoring of gauges, hoses, fittings and the sea surface during the operation. Hoses will be checked before starting. 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 21.4 Compliance with Contractor procedures for the management of vessel bunkering/helicopter operations.	MC 21.4.1 Records demonstrate bunkering/refuelling undertaken in accordance with contractor bunkering procedures.
	C 21.5 Chemicals and diesel stored safely to prevent the release to the marine environment.	PS 21.5 Chemical/diesel storage areas for transportable containers on the riser platform will have adequate containment in place to contain an accidental chemical/diesel spill.	MC 21.5.1 Riser platform chemical/diesel storage areas for transportable containers provided with adequate bunding/containment.
	C 13.5 Raising incident reports within event reporting system for unplanned releases.	PS 13.5 Incident reports raised for unplanned releases Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		1000 L or more of environmentally hazardous chemical112, in any 48 hour period.	
	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed.
	C 21.6 Monitoring and maintenance of subsea infrastructure to ensure integrity management (MEG lines inspected during hydrocarbon system ROV inspection)	PS 14.1 Integrity will be managed in accordance with SCE Management Procedure and SCE Technical Performance Standard(s) to prevent environment risk related damage to SCEs for: P09 – Pipeline Systems, to maintain the minimum required mechanical integrity to prevent loss of containment.	MC 1.17.1 Records demonstrate implementation of SCE technical Performance Standard(s) and Safety Critical Element Management Procedure.
	C 21.7 Monitoring MEG use, investigating material discrepancies, and monitoring flow discrepancy to support identification of potential integrity failures (instruments in scope of P31).	PS 21.7 Instrumentation integrity will be managed in accordance with SCE Management Procedure (Section 6.1.5.2) and SCE technical Performance Standard(s) to prevent environment risk related Damage to SCEs for: P31 - Environmental Emissions Monitoring and Controls to;	MC 1.17.1 Records demonstrate implementation of SCE technical Performance Standard(s) and Safety Critical Element Management Procedure.

[112] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which
have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		- ensure monitoring data is available to identify and investigate potential material MEG use discrepancies.	
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 for discussion around the ALARP assessment of controls related to hydrocarbon spill response	

6.9.5 Unplanned Hydrocarbon or Chemical Release: Bunkering, Deck and Subsea Spills – Xena-03 Tieback

Context		
Xena—3 Drilling and Tie-back Activities – Section 3.11 Vessel-based Activities for the Xena-03 Tie-back – Section 3.12	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Socio-economic Environment – Section 4.9	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	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental discharge of marine diesel/hydrocarbons to the marine environment during bunkering and/or refuelling.		x			x		A	D	2	M	LCS GP	Broadly Acceptable	EPO 21b
Accidental discharge of other hydrocarbons and chemicals from MODU or project vessels deck activities and equipment (e.g., cranes) including subsea ROV hydraulic leaks		x		x	x		A	F	1	L	LCS GP	Acceptable if ALARP	

Description of Source of Risk

Marine Diesel Bunkering/Refuelling

Bunkering of marine diesel between the MODU and project vessels as well as the possible refuelling of cranes, and other equipment may take place on the MODU.

Three credible scenarios for the loss of containment of marine diesel during bunkering operations have been identified:

- Partial or total failure of a bulk transfer hose or fittings during bunkering, due to operational stress or other integrity issues could spill marine diesel to the deck and/or into the marine environment. This would be in the order of less than 200 L, based on the likely volume of a bulk transfer hose (assuming a failure of the dry break and complete loss of hose volume).
- Partial or total failure of a bulk transfer hose or fittings during bunkering, combined with a failure in procedure to shutoff fuel pumps, for a period of up to fifteen minutes, resulting in approximately 24 m3 marine diesel lost to the deck and/or into the marine environment.

- Partial or total failure of a bulk transfer hose or fittings during helicopter refuelling could spill aviation jet fuel to the helicopter deck and/or into the marine environment. All helicopter refuelling activities are closely supervised and leaks on the helideck are considered to be easily detectable. In the event of a leak, transfer would cease immediately. The credible volume of such a release during helicopter refuelling would be in the order of <100 L.

Quantitative Spill Risk Assessment

Small diesel spills rapidly spread on the water surface, with the diesel expected to evaporate and disperse rapidly (National Oceanic and Atmospheric Administration (NOAA) 2006). Woodside commissioned RPS to model several small marine diesel spills in the offshore waters of northwest WA. The results of these models have indicated that exposure to surface hydrocarbons above the 10 g/m2 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 24 m3 surface spill from MODU bunkering activities would be well within the EMBA for the vessel collision scenario detailed in Section 6.9.3. Given this, the offshore location of the Xena-03 Operational Area, and the fact that the same hydrocarbon type is involved for both scenarios, specific modelling for an 24 m3 marine diesel release was not undertaken for this Petroleum Activities Program.

Hydrocarbon Characteristics

Refer to Section 6.9.3 for a description of the characteristics of marine diesel (comparable characteristics for marine gas oil used in the modelling), including detail on the predicted fate and weathering of a spill to the marine environment.

Chemical Spills – Deck and Subsea

MODU, Installation Vessel and ROV Operations

Deck spills can result from spills from stored chemicals or equipment. Installation vessels typically store chemicals in various volumes (20 L, 205 L; up to approximately 4000–6000 L). Storage areas are typically set up with effective primary and secondary bunding to contain any deck spills. Releases from equipment are predominantly from the failure of hydraulic hoses, which can either be located within bunded areas or outside of bunded or deck areas (e.g. over water on cranes). Helicopter refuelling may also take place within the PAA, on the helipad of the MODU and project vessels.

Chemicals that will be used and may be accidentally released include:

- non process chemicals (maintenance and cleaning chemicals)
- non process hydrocarbons - i.e. hydraulic fluids used in machinery (including cranes, winches, ROVs), small volumes of fuel
- drilling and well fluids
- pre-commissioning chemicals used for leak testing (MEG / treated water mixture).

Non-Process Chemicals

Non-process chemicals, such as wash chemicals, cleaning chemicals, maintenance and solvents, are generally held onboard in low quantities (typically <50 L containers) and are located within chemical cabinets or bunded storage areas on the project vessels and MODU. Non-process chemical spills may result from human error or damage to a chemical container during handling. Spills are generally captured by the drain system and routed to a holding tank for treatment or disposal onshore. In the event that a spill is not contained on deck or within a bunded area, there would be a release to the marine environment of an estimated up to 50 L.

Non-Process Hydrocarbons

Woodside's operational experience demonstrates that non-process hydrocarbon spills are most likely to originate from hydraulic hoses and are typically less than 100 L, with an approximate average volume <10 L.

Non-process hydrocarbons (hydraulic fluids) are used in hydraulic-powered machinery, such as winches, cranes and ROVs, and are hydrocarbon-based with added chemical component additives. Unplanned discharges are predominantly due to failure of hydraulic hoses or minor leaks from process components, or spills during periodic refuelling of hydraulic hoses. Spills or leaks from hydraulic hoses are usually very small volumes (~1 L) and are typically contained within a bunded or drained area under the equipment mounted on deck. These small on-deck spills are unlikely to reach the marine environment. A burst hydraulic hose on an extended crane could potentially result in hydraulic fluid being sprayed in a fine jet out over the water. However, this would only result in a small volume (~25 L) being released, due to the small capacity of hydraulic hoses.

Subsea leaks or spills can result from a loss of containment of fluids from subsea equipment including the BOP or ROVs. Subsea chemical use is described in Section 3.9. Typically, subsea spills during Woodside drilling activities generally do not exceed 26 L.

The ROV hydraulic fluid is supplied through hoses containing approximately 20 L of fluid. Hydraulic lines to the ROV arms and other tooling may become caught resulting in minor leaks to the marine environment. Small volume hydraulic leaks may occur from equipment operating via hydraulic controls subsea (subsea control fluid).

Hydraulic fluids are medium oils of light to moderate viscosity. They have a relatively rapid spreading rate and will dissipate quickly, particularly in high sea states. Lubricating oils may also be held onboard, typically stored with the non process chemicals and held in low quantities. These hydrocarbons are more viscous, so in the event of an unplanned discharge, the spreading rate of a slick of these oils would be slightly slower.

Contingency Activities

Wireline Operations

Minor unplanned leaks of hydrocarbons or chemicals during wireline activities with a live well include leaks such as:

- leaks from the lubricator, stuffing box and hose or fitting failure, which are expected to be less than 10 L (0.01 m3)
- loss of containment – fluids – surface holding tanks
- backloading of raw slop fluids in an IBC
- stuffing box leak/under pressure
- draining of lubricator contents
- excess grease/lubricant leaking from the grease injection head
- wind-blown lubricant dripping from cable/on deck
- lubricant used to lubricate hole.

Consequence Assessment

Marine Diesel

Given the low viscosity of marine diesel, along with the high portion of volatile components, a surface spill of marine diesel during transfer, storage or use would spread and weather rapidly. Environmental receptors at risk would be restricted to those in the vicinity (< 1 km from the release location). The biological consequences of a small volume diesel spill on identified open water sensitive receptors relate to the potential for minor consequences to megafauna, plankton and fish populations (surface and water column biota). Impacts to plankton may include acute toxicity resulting in mortality of planktonic organisms. Given the rapid turnover of plankton communities, these impacts will be short-lived (hours to days). Impacts to fish are expected to be of no lasting effect, as fish species are mobile and expected to avoid the area affected by a marine diesel spill incident. Impacts to larger fauna such as cetaceans and marine turtles may be light fouling, potentially resulting in irritation of sensitive membranes such as the eyes, mouth and digestive system (Helm et al. 2015). Mortality of larger fauna is not expected to occur. No impacts to ecosystem function are expected.

Hydrocarbons may extend into the Multiple Use Zone of the Montebello Marine Park and impacts would be as described above for open ocean receptors. No impacts are predicted to Continental Slope Demersal Fish Communities and the Ancient Coastline at 125 m Depth Contour KEFs. Although they do overlap the operational area, they are outside the predicted spill impact zone.

Slight, short term impacts may occur to other marine users (e.g. commercial fisheries); however, there is already no fishing within PSZ and limited fishing within the Operational Area it is unlikely that there would be any significant impact to commercial fishers.

Accidental spills of hydrocarbons or chemicals from the MODU, installation vessel and support vessels will decrease the water quality in the immediate area of the spill; however, the impacts are expected to be temporary and very localised due to dispersion and dilution in the open ocean environment.

Given the offshore/open water location, receptors such as marine fauna may be affected if they come in direct contact with a release (i.e., by traversing the immediate spill area). In the event that marine fauna come into contact with a release, they could suffer fouling, ingestion, inhalation of toxic vapours, irritation of sensitive membranes in the eyes, mouth, digestive and respiratory tracts, and organ or neurological damage. Cetaceans may exhibit avoidance behaviour patterns and given they are smooth skinned, hydrocarbons and other chemicals are not expected to adhere. Given the small area of the potential spill and the dilution and weathering of any spill, the likelihood of ecological impacts to marine fauna (protected species), other communities and habitats is expected to be have no lasting effect.

No impacts on socio-economic receptors are expected due to the low levels of fishing activity in the Xena-03 Operational Area, the small volumes of hydrocarbons/chemicals that could be accidentally spilled, and the localised and temporary nature of the impacts.

Summary of Potential Impacts to environmental values(s)

Given the adopted controls, it is considered that hydrocarbon spills to the marine environment from bunkering will not result in a potential impact greater than minor, short term local impacts on species, habitat (but not affecting ecosystems function), physical and biological attributes (i.e., Consequence – D). Further, other hydrocarbon and chemical spills to the marine environment from deck/subsea is expected to have no lasting effect (<1 month), localised impact not significant to environmental receptor (i.e., Consequence – F).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[113]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 91 (marine pollution prevention—oil) 2014, requires SOPEP (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 6.1
Helicopter fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily in accordance with the Australian Government Civil Aviation Safety Authority CAAP 92-4(0) 'Guidelines for the development and operation of offshore helicopter landing sites, including vessels.	F: Yes. CS: Minimal cost. Standard practice.	Reduced the likelihood of an unplanned release during helicopter operations. The consequence is unchanged.	Controls based on legislative requirements – must be adopted.	Yes C 21.2
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 22.1
Good Practice				
Bunkering equipment controls: All hoses that have a potential environmental risk following damage or failure shall be placed on a hose register that is linked to the MODU's preventative maintenance system.	F: Yes. CS: Minimal cost. Standard practice.	By ensuring the appropriate equipment is in place, tested and maintained appropriately, the likelihood of a spill occurring is reduced. Although no significant reduction in consequence could result, the overall risk is reduced.	Benefits outweigh cost/sacrifice.	Yes C21.5

[113] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[113]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
All bulk transfer hoses shall be pressure-rated at purchase to reduce the risk of accidental hydrocarbon release during bunkering. 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.				
Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: A completed PTW and/or job safety analysis (JSA) shall be implemented for the hydrocarbon bunkering/refuelling operation. Visually monitoring of gauges, hoses, fittings and the sea surface during the operation. Hoses will be checked before starting. 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.	By ensuring the appropriate equipment is in place, tested and maintained appropriately, the likelihood of a spill occurring is reduced. Although no significant reduction in consequence could result, the overall risk is reduced.	Benefits outweigh cost/sacrifice.	Yes C 21.6
Where there is potential for loss of primary containment of oil and chemicals	F: Yes. CS: Minimal cost. Standard practice.	Requirements for deck drainage and management of oily water would reduce	Benefits outweigh cost/sacrifice.	Yes C 6.2

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[113]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
on the MODU, deck drainage must be collected via a drainage water management system.		the likelihood of contaminated deck drainage water being discharged to the marine environment. No change in consequence would occur.		
For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the consequence of impacts resulting from discharges to the marine environment by ensuring chemicals have been assessed for environmental acceptability. Planned discharges are required for safely executing activities; therefore, no reduction in likelihood can occur.	Benefits outweigh cost/sacrifice.	Yes C 5.5
Contractor procedure for managing project fluids transfers onto, around and off the MODU, which requires: emergency shutdown systems for stopping losses of containment (e.g. burst hoses) break-away dry-break couplings for oil-based mud hoses transfer hoses to have floatation devised to allow detection of a leak the valve line-up will be checked prior to commencing mud transfers constant monitoring of the transfer process direct radio communications completed PTW and JSA showing contractor	F: Yes. CS: Minimal cost. Standard practice for Woodside to review contractor systems prior to performing activity.	Reduces the likelihood of an unplanned release occurring. Although no change in consequence would occur, the reduction in likelihood decreases the overall risk, providing environmental benefit.	Benefits outweigh cost/sacrifice.	Yes C 22.2

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[113]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
procedures are implemented recording and verification of volumes moved to identify any losses mud pit dump valves locked closed when not in use for mud transfers and operated under a PTW.				
Check for the functionality of: additional SCE (augers and cuttings dryers) mud tanks mud tank room transfer hoses NWBM base fluid transfer lines NWBM base fluid transfer station base fluid storage.	F: Yes. CS: Minimal cost. Standard practice	Reduces the likelihood of an event occurring and reduces the potential consequences (by limiting volume released).	Benefits outweigh cost/sacrifice.	Yes C 22.3
Spill kits positioned in high risk locations around the rig (near potential spill points such as transfer stations).	F: Yes. CS: Minimal cost. Standard practice.	Spill kits would reduce the likelihood of a deck spill from entering the marine environment. The consequence is unchanged.	Benefits outweigh cost/sacrifice.	Yes C 22.3
Installation and support vessels have self-containing hydraulic oil drip tray management system.	F: Yes. CS: Minimal cost. Standard practice.	Requirements for self-containing hydraulic oil drip tray management system would reduce the likelihood of contaminants being discharged to the marine environment. No change in consequence would occur.	Benefits outweigh cost/sacrifice.	Yes C 22.4
Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning),	F: Yes. Woodside routinely implements a chemical selection process based on OCNS at the facility. CS: Minimal. The OCNS is widely used throughout the industry and	Selection and assessment of chemicals in accordance with Woodside process reduces environmental impacts associated	Benefits outweigh cost/sacrifice.	Yes C 5.1

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[113]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub warning or non OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	chemical suppliers are aware of the requirements of the scheme.	with planned chemical discharge.		
Incident reports are raised for unplanned releases within event reporting system.	F: Yes. CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance with regulatory reporting requirements.	Control based on Woodside standard and regulatory requirements.	Yes C 13.5
Professional Judgement – Eliminate				
No refuelling of helicopter on MODU.	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.
The MODU/project vessel brought into port to refuel.	F: No. Does not eliminate the fuel transfer risk. It is not operationally practical to transit MODU/project vessel back to port for refuelling based on the frequency of the refuelling requirements and distance from the	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.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[113]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
	nearest port (Dampier). CS: Significant due to schedule delay and vessel transit costs and day rates.			
Professional Judgement – Substitute				
No additional controls identified				
Professional Judgement – Engineered Solution				
Below-deck storage of all hydrocarbons and chemicals.	F: No. During operations there is a need to keep small volumes near activities and within equipment requiring use of hydrocarbons and chemicals and can result in increased risk of leaks from transfers via hose or smaller containers. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
A reduction in the volumes of chemicals and hydrocarbons stored onboard MODU/ project 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 drilling 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, Woodside considers the adopted controls appropriate to manage the risks and consequences of unplanned release of chemicals and hydrocarbons from bunkering, deck and subsea spills during Xena-03 Tieback activities. 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 consequence assessment has determined that, given the adopted controls, accidental spills during bunkering/refuelling from Xena-03 Tieback activities represent a moderate risk rating that is unlikely to result in a consequence greater than Minor, short-term impacts. Other accidental hydrocarbon or chemical spills to Deck/subsea during Xena-03 Tieback activities represent a low 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 risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet requirements of Australian Marine Orders.

The potential risks are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of unplanned hydrocarbon or chemical release from bunkering, deck and subsea spills to a level that is broadly acceptable.

EPOs, EPSs and MC for Drilling and Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 21b Woodside will manage its Tieback activities to prevent material unplanned liquid releases to the marine environment, limiting adverse impacts to less than slight[114].	C 6.1 Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 91 (Oil) Refer Section 6.7.6	PS 6.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Orders 91). Refer Section 6.7.6	MC 6.1.1 Records demonstrate vessels are compliant with standard maritime safety procedures (Marine Orders 91). Refer Section 6.7.6
	C 13.5 Raising incident reports within event reporting system for unplanned releases. Refer Section 6.8.5	PS 13.5 Incident reports raised for unplanned releases. Recordable Incidents notified for material unplanned liquid releases to sea, of: • 80 L or more of hydrocarbons, or • 1000 L or more of environmentally hazardous chemical[115], • in any 48 hour period. • Refer Section 6.8.5	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed. Refer Section 6.8.5
	C 21.2 Helicopter fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily in accordance with the Australian Government Civil Aviation Safety Authority CAAP 92-4(0) 'Guidelines for the development and operation of off-shore helicopter landing sites, including vessels.	PS 21.2 Failure of primary containment in storage areas does not result in loss to the marine environment.	MC 21.2.1 Records confirm all fuels are stored in bunded/secondarily contained areas when not being handled/moved temporarily.

[114] Defined in Section 2.6.3

[115] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

EPOs, EPSs and MC for Drilling and Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	C 21.5 Bunkering equipment controls: All bulk transfer hoses shall be pressure-rated at purchase to reduce the risk of accidental hydrocarbon release during bunkering. 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 21.5.1 All diesel transfer hoses to have dry break couplings and pressure rating suitable for intended use.	MS 21.5.1 Records confirm presence of dry break of couplings and flotation on fuel hoses.
		PS 21.5.2 To ensure adequate resources are available to allow implementation of Ship Oil Pollution Emergency Plan (SOPEP).	MS 21.5.2 Records confirm presence of spill kits.
	C 21.6 Contractor procedures include requirements to be implemented during bunkering/refuelling operations, including: A completed PTW and/or job safety analysis (JSA) shall be implemented for the hydrocarbon bunkering/refuelling operation. Visually monitoring of gauges, hoses, fittings and the sea surface during the operation. Hoses will be checked before starting. 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 21.6 Compliance with Contractor procedures for the management of bunkering/helicopter operations.	MC 21.6.1 Records demonstrate bunkering/refuelling undertaken in accordance with contractor bunkering procedures.
	C 6.2 Where there is a potential for loss of primary containment of oil and chemicals on the MODU, deck drainage must be collected via a drainage water management system. Refer Section 6.7.6	PS 6.2 Contaminated drainage contained, treated and/or separated prior to discharge. Refer Section 6.7.6	MC 6.2.1 Environmental inspection records demonstrate MODU has a functioning bilge/oily water management system. Refer Section 6.7.6

EPOs, EPSs and MC for Drilling and Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	C 5.5 For Xena-03 Tie-back activity fluids, six-monthly chemical reviews are performed during active drilling campaigns. Refer Section 6.7.5	PS 5.5 Acceptability of previously approved chemicals are re-evaluated to ensure ALARP and alternatives are considered. Refer Section 6.7.5	MC 5.5.1 Records confirm six-monthly reviews have occurred during active drilling campaigns, and any actions/changes are being tracked to closure. Refer Section 6.7.5
	C 22.2 Contractor procedure for managing project fluids transfers onto, around and off the MODU, which requires: emergency shutdown systems for stopping losses of containment (e.g. burst hoses) break-away dry-break couplings for oil-based mud hoses transfer hoses to have flotation devised to allow detection of a leak the valve line-up will be checked prior to commencing mud transfers constant monitoring of the transfer process direct radio communications completed PTW and JSA showing contractor procedures are implemented recording and verification of volumes moved to identify any losses mud pit dump valves locked closed when not in use for mud transfers and operated under a PTW.	PS 22.2 Compliance with Contractor procedures to limit accidental loss to the marine environment.	MC 22.2.1 Records demonstrate drilling fluid transfers are performed in accordance with the applicable contractor procedures.
	C 22.1 Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily.	PS 22.1 Failure of primary containment in storage areas does not result in loss to the marine environment.	MC 22.1.1 Records confirms all liquid chemicals and fuel are stored in bunded/secondarily contained areas when not being handled/moved temporarily.
	C 22.3 Spill kits positioned in high risk locations around the rig	PS 22.3 Spill kits to be available for use to clean up deck spills.	MC 22.3.1 Environmental inspection records confirm that spill kits

EPOs, EPSs and MC for Drilling and Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	(near potential spill points such as transfer stations).		are present, maintained, and suitably stocked.
	C 22.4 Installation and support vessels have self-containing hydraulic oil drip tray management system.	PS 22.4 To contain any on-deck spills of hydraulic oil.	MC 22.4.1 Environmental inspection records demonstrate project installation vessels are equipped with self-containing hydraulic oil drip tray management system.
	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use. Refer Section 6.7.5	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable. Refer Section 6.7.5	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed. Refer Section 6.7.5
	For oil spill response outcomes, standards and measurement criteria refer to Appendix H.		

6.9.6 Unplanned Discharges: Drilling Fluids

Context		
Xena-03 Drilling and Tie-back Activities – Section 3.11	Physical Environment – Section 4.4 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Socio-economic Environment – Section 4.9	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	Risk Rating	ALARP Tools	Acceptability	Outcome
Accidental discharge of project fluids (WBM/NWBM/base oil) and cement to marine environment		x		x	x	x	A	E	1	L	LCS GP	Acceptable if ALARP	EPO 23

Description of Source of Risk

Drilling Fluids - Transfers

A project vessel will undertake bulk transfer of drilling muds or base oil to the MODU, if and when required during tie-back activities. Failure of a transfer hose or fittings during a transfer or backload, as a result of an integrity or fatigue issue, could result in a spill of mud or base oil to either the bunded deck or into the marine environment.

The most likely spill volume of mud is likely to be less than 0.2 m2 based on the volume of the transfer hose and the immediate shutoff of the pumps by personnel involved in the bulk transfer process. However, the worst-case credible spill scenario could result in up to 8 m^3 of mud being discharged. This scenario represents a complete failure of the bulk transfer hose combined with a failure to follow procedures requiring transfer activities to be monitored, coupled with a failure to immediately shut off pumps (e.g. mud pumped through a failed transfer hose for a period of about five minutes).

Drilling Fluids - Slip Joint Packer Failure

The slip joint packer enables compensation for the dynamic movement of the MODU (heave) in relation to the static location of the BOP. A partial or total failure of the slip joint packer could result in a loss of mud to the marine environment. The likely causes of this failure include a loss of pressure in the pneumatic (primary) system combined with loss of pressure in the back up (hydraulic) system.

Catastrophic sequential failure of both slip joint packers (pneumatic and hydraulic) would trigger the alarm and result in a loss of the volume of fluid above the slip joint (conservatively 1.5 m^3) plus the volume of fluid lost in the one minute (maximum) taken to shut down the pumps. At a flow rate of 3800 L (1000 gallons) per minute this volume would equate to an additional 3.8 m^2. In total, it is expected that this catastrophic failure would result in a loss of 5.3 m2.

Failure of either of the slip joint packers at a rate not large enough to trigger the alarms could result in an undetected loss of 20 bbl (3 m^3) maximum assuming a loss rate of 10 bbl/hr and that MODU personnel would likely walk past the moon pool at least every two hours.

Loss of a drilling chemical container or drum during transfer from the supply vessel to the MODU may occur due to crane operator error or machinery failure. The maximum container that could be lost is an intermediate Bulk Container (IBC) which can hold 1 m³ of chemicals. In the event that an IBC or drum is lost to the marine environment and cannot be recovered the contents will discharge, either immediately or over a period depending on the damage to the drum or container.

NWBM Drilling Fluid System

The selection of a NWBM drilling fluid system (if required) will be based on Woodside processes; however, for the purposes of this risk assessment, an example base oil (Saraline 185V) has been used. Saraline 185V is a mixture of volatile to low volatility hydrocarbons. Predicted weathering of base oil, based on typical conditions in the region, indicates that about 50% by mass is predicted to evaporate over the first day or two. At this time, most of the remainder could be entrained into the water column. In calm conditions, entrained hydrocarbons are likely to resurface with up to 100% able to evaporate over time.

Table 6-43: Characteristics of the non water-based mud base oil

Oil type	Initial density (kg/m³)	Viscosity (cP @ 20 °C)	Volatiles (%) <180	Semi volatiles (%) 180–265	Low volatility (%) 265–380	Residual (%) >380	Aromatic (%) of whole oil <380 °C BP
Base oil (Saraline 185V)			***Non-Persistent***		***Persistent***		
	0.7760	2.0 @ 40°C	8.5	41.1	50.4	0	0

Cement

Bulk cement is transferred as powder from the supply vessel to the MODU prior to being mixed into a slurry in the cement unit. Additives are required to form a cement slurry; these are transferred to the MODU in drums from the supply vessel to the MODU. Unplanned discharge to the marine environment may occur due to crane operator error or machinery failure resulting in loss of a drum of cement additive, which cannot be recovered. Cement additives are typically stored in drums <100 litres.

Contingency Activities

Activation of the Emergency Disconnect Sequence

The EDS is an emergency system that provides a rapid means of shutting in the well (i.e. BOP closed) and disconnecting the MODU from the BOP. The EDS could be manually activated due to an identified threat to the safety of the MODU, including loss of MODU station keeping resulting from loss of multiple moorings, potential collision by a third-party vessel or a loss of well control. During operations, this could result in a subsurface release of a combination of WBM and/or NWBM and solids at the seabed and a release of base fluid. The volume of material released depends on the water depth and, hence, the length of the riser (i.e. the entire riser volume would be lost). The base oil of the NWBM would remain in an emulsion with the other components of the mud system. Approximately 103 m3 of base oil could be released in the event of the riser being disconnected when drilling with NWBM.

Consequence Assessment

Potential impacts to environmental values

Some drilling fluids/cement may be spilt at the sea surface (e.g., transfer failure) and some in the water column potentially close to the seabed (e.g., in the event of an EDS or Slip Joint Packer Failure). Due to water depth in the PAA (70-130 m), this will determine the exposure pathway, and hence potential impacts and receptors.

Water Quality

NWBM is made up of a number of components including base oil, which generally has a high volatile to semi-volatile fraction. If released to the marine environment at surface, this generally evaporates within the first 48 hours, with the remaining fraction being on the sea surface and weathering at a slower rate. As a result of this volatility, combined with the worst-case credible spill scenario volumes (8 m3, during bulk transfer from supply vessel to MODU), and based on Woodside's experience of modelling base oil, it is considered there would be an extremely small footprint area associated with any release. Therefore, any surface oil would be confined to open waters with a minor surface slick that would not reach any sensitive receptors. Therefore, impacts on water quality would be minor and temporary in nature. The material safety datasheet for Saraline 185V indicates that it is readily biodegradable, non-toxic in the water column and has low sediment toxicity (Shell, 2014). Marine fauna may be affected if they come in direct contact with a release (i.e., by traversing the immediate spill area), but due to the small footprint of such a spill, it is anticipated that any impacts would be negligible and temporary in nature.

WBM is made up of a number of components including a variety of chemicals, incorporated into the selected drilling fluid system to meet specific technical requirements. If released to the marine environment at surface, there would be an extremely small impact footprint area associated with a release. Any release would be confined to the open waters of the Operational Area that would not reach any sensitive receptors. Components of the WBM would settle out in the

water column and be subject to dilution. Given the low toxicity of WBM and its planned discharge during drilling, any impacts on water quality would be slight and temporary in nature.

The EMBA associated with the release of NWBM from the activation of the EDS would be small and limited to deeper water seabed surrounding the well site (the release point). The environmental consequence of such a release would include a highly localised area at the discharge location. Lethal impacts to the underlying infauna may occur but are considered unlikely, and recolonisation would occur over time. Elevated hydrocarbon and metal concentrations in the localised area of deposition would also occur, with reduction over time. It is likely that any impacts to water and sediment quality and low-sensitivity deeper water benthos would be short term, localised and a full recovery expected.

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 of the chemicals selected are acceptable, ALARP and meet Woodside's expectation for environmental performance. Therefore, any chemicals selected and potentially released are expected to be of low toxicity and biodegradable.

Base oil has a high volatile to semi-volatile fraction. A surface spill would typically evaporate within 48 hours, with the remaining portion to weather at a slow rate. The example base oil, Saraline 185V, is readily biodegradable, non-toxic in the water column and has low sediment toxicity (Shell, 2014). Due to it's volatility, and small worst-case credible spill scenario, there would be a very localised footprint unlikely to reach any sensitive receptors.

Given the occasional nature of unplanned chemical discharge, the small volumes, and the offshore location of the PAA, the change to water quality resulting from unplanned discharge of chemicals will not be substantial.

Therefore, any potential impact of a change in water and sediment quality and low-sensitivity deeper water benthos would be short-term and localised, with a full recovery expected. Receptor sensitivity of water quality is low (low value, open ocean), and therefore the consequence of a release of hydrocarbons/chemicals on water and sediment quality would be no lasting effect (F).

Marine Fauna

Injury or Mortality to Marine Fauna

As a result of a change in water quality, further impacts to receptors may occur, which may include injury or mortality to marine fauna resulting from exposure to toxins in the released drilling fluids. Neff (2010) explains that the lack of toxicity and low bioaccumulation potential of the drilling muds means that the effects of the discharges are highly localised and are not expected to spread through the food web (of which planktonic species are the basis). Given that surface discharges are rapidly dispersed, potential impacts would be highly localised and temporary.

Local increases in turbidity from cement spills may affect zooplankton with variations in predator prey dynamics, which favours planktonic feeders over visual feeders (Gophen, 2015), while impacts to phytoplankton may occur due to decreases in available light, therefore reducing productivity (Dokulil, 1994). The magnitude of potential impact to marine fauna is no lasting effect, which results in a consequence of Slight (E) based on the high receptor sensitivity.

Suspended sediment levels greater than 500mg/L are likely to produce a measurable impact on larvae of most fish species, and levels of 100 mg/L may affect the larvae of some species if exposed for periods greater than 96 hours (Jenkins and McKinnon, 2006). In addition, levels of 100 mg/L may affect the larvae of several marine invertebrate species. Dilution estimates (e.g. Hinwood et al., 1994; Neff, 2005) would suggest that suspended sediment concentrations from unplanned cement discharge, loss of drilling mud from Slip Joint Packer Failure, or activation of the EDS, would dilute rapidly with instantaneous exposures of 500 mg/L unlikely and exposure times of 100 mg/L well below 96 hours.

Due to the low levels of planktonic productivity in the offshore area, the fact that the Xena-03 Operational Area (70-130 m depth) is outside of the highly productive shelf break situated on the 200 m isobath, plankton populations on a regional scale are not expected to be adversely affected by drill and project fluid spills. In addition, due to the open nature of the marine environment of the Xena-03 Operational Areas and associated environmental conditions (i.e. windy, strong currents, etc.), the content and dispersive nature of drilling muds within the marine environment and the high population replenishment of these organisms, it is expected that impacts to plankton species will be limited to within tens of metres of the discharge point and return to previous conditions within a relatively short period of time. On this basis, the risk to plankton from unplanned discharges during Xena-03 Tie-back activities is low and would result in consequences no greater than slight, short-term effects.

Seafloor receptors (benthic communities and cultural heritage sites)

The impact area associated with release of NWBM from activation of the EDS would be small, limited to the seabed surrounding the well. Base fluids for NWBM are designed to be biodegradable in offshore marine sediments. Biodegradation can result in a low oxygen (anoxic) environment resulting in changes in benthic community structure. NWBMs are designed to be low in toxicity and are not readily bioavailable, based on their physical/chemical properties, for bioaccumulation to infauna and epifauna. Deleterious impacts to the infauna may still occur to a limited extent, together with increased hydrocarbon and metal concentrations in the area of deposition. The ability for the infauna communities to recolonise following a small localised disturbance within the Xena-03 Operational Area would mean impacts are short-term and slight.

Drill cuttings from unplanned loss of used drilling fluids would increase turbidity and TSS levels above ambient, where coarser material will deposit on the seabed and finer sediment material (WBM) will temporarily cause elevated TSS above the seabed surrounding the well. This would rapidly disperse and dilute with the prevailing seabed currents.

Accumulation of drill cuttings, grit and flocculent on the seabed causes changes in the physical properties of the seabed sediment such as the particle size distribution (PSD), the introduction of contaminants (metals such as barium) from retained drilling fluids (WBM) and associated ecological effects.

Impacts associated with unplanned drill and project fluid discharges will be largely limited to an area surrounding the well. The low sensitivity of the benthic communities/habitats within and in the vicinity of the Xena-03 Operational Area, combined with the low toxicity of WBMs and residual NWBMs, insoluble mineralised salts (the source of barium) having low bioavailability to benthic biota, and the highly localised nature and scale of predicted physical impacts to seabed biota, affirm that any predicted impact is considered likely but of a short-term environmental consequence.

Cultural Heritage

As described in Section 4.10, the Xena-03 Operational Area is located further offshore than the Ancient Coastline at 125 m depth contour KEF. Seabed disturbance resulting from Xean-03 Tie-back activities does not pose a threat to Indigenous Cultural features of the Ancient Landscape.

Summary of Potential Impacts to Environmental Values(s)

Given the adopted controls, it is considered that unplanned discharges of drilling fluids or cement to the marine environment will not result in a potential impact greater than slight and short-term impacts on species, habitat (but not affecting ecosystems function), physical and biological attributes (i.e. Environment Impact – E).

Demonstration of ALARP

Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[116]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Marine Order 91 (marine pollution prevention—oil) 2014, requires SOPEP (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 6.1
Good Practice				
Marine riser's telescopic joint to be: comprised of a minimum of two packers (one hydraulic and one pneumatic) pressure tested in accordance with manufacturers recommendations	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of equipment failure leading to an unplanned release of drilling fluids. Although the consequence of an unplanned release would be reduced, the reduction in likelihood reduces the overall risk providing an overall environmental benefit.	Benefits outweigh cost/sacrifice.	Yes C 23.1
Implement Woodside's Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected –	F: Yes. CS: Minimal cost. Standard practice.	Environmental assessment of chemicals may reduce the consequence of impacts resulting from discharges to the marine environment by ensuring chemicals have been assessed	Benefits outweigh cost/sacrifice.	Yes C 5.1

[116] Qualitative measure

no further control required; and If chemicals with a different OCNS rating, sub warning or non-OCNS rated chemicals are required chemicals will be assessed in accordance with the guideline prior to use.		for environmental acceptability. Planned discharges are required for the safe execution of activities and therefore no reduction in likelihood can occur.		
Contractor procedure for managing project fluids transfers onto, around and off the MODU, which requires: emergency shutdown systems for stopping losses of containment (e.g. burst hoses) break-away dry-break couplings for oil-based mud hoses transfer hoses to have floatation devised to allow detection of a leak the valve line-up will be checked prior to commencing mud transfers constant monitoring of the transfer process direct radio communications completed PTW and JSA showing contractor procedures are implemented recording and verification of volumes moved to identify any losses mud pit dump valves locked closed when not in use for mud transfers and operated under a PTW.	F: Yes. CS: Minimal cost. Standard practice for Woodside to review contractor systems prior to performing activity.	Reduces the likelihood of an unplanned release occurring. Although no change in consequence would occur, the reduction in likelihood decreases the overall risk, providing environmental benefit.	Benefits outweigh cost/sacrifice.	Yes C23.2
Check for the functionality of: additional SCE (augers and cuttings dryers) mud tanks mud tank room transfer hoses NWBM base fluid transfer lines NWBM base fluid transfer station base fluid storage.	F: Yes. CS: Minimal cost. Standard practice	Reduces the likelihood of an event occurring and reduces the potential consequences (by limiting volume released).	Benefits outweigh cost/sacrifice.	Yes C 23.3
Where there is potential for loss of primary containment of oil and chemicals on the MODU,	F: Yes. CS: Minimal cost. Standard practice	Reduces the likelihood of contaminated deck drainage water being discharged to the	Benefits outweigh cost/ sacrifice.	Yes C 5.2

deck drainage must be collected via a closed drainage system. E.g., drill floor.		marine environment. No change in consequence would occur.		
Incident reports are raised for unplanned releases within event reporting system.	F: Yes. CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance with regulatory reporting requirements.	Control based on Woodside standard and regulatory requirements.	Yes C 13.5
Professional Judgement – Eliminate				
No additional controls identified				
Professional Judgement – Substitute				
Only use WBM during drilling.	F: Not feasible. While the base case is to use WBM, a contingent NWBM drilling fluid system is required for safety and technical reasons; therefore option to use must be maintained. CS: Not considered – control not feasible.	Not considered – control not feasible.	Not considered – control not feasible.	No
Professional Judgement – Engineered Solution				
Use a MODU which may have a larger tank storage capacity for WBM. As such, there would be fewer bulk transfer movements.	F: Not feasible. The use of a MODU with greater storage capacity cannot be confirmed. CS: Significant cost and schedule delay would occur if the MODU was limited to greater storage capacity.	Not considered – control not feasible.	Not considered – control not feasible.	No

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 unplanned release of project fluids. 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, unplanned discharges of drilling fluids represent a low current risk rating that is unlikely to result in a potential impact greater than minor and/or temporary contamination above background levels and/or national/international quality standards and/or known biological effect concentrations on a localised scale. Further opportunities to reduce the risks and consequences have been investigated above.

The adopted controls are considered good oil-field practice/industry best practice. The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside

considers the adopted controls appropriate to manage the risks and consequences of an unplanned discharge of NWBM/base oil or WBM to a broadly acceptable level.

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 23 Woodside will manage its drilling activities to prevent material unplanned liquid release to the marine environment, limiting adverse impacts to less than slight[117].	C 6.1 Contract vessels complying with Marine Orders for safe vessel operations: Marine Order 91 (Oil) Marine Order 95 (Pollution prevention – garbage) Marine Order 96 (Pollution prevention – sewage).	PS 6.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Orders 91, 95 and 96).	MC 6.1.1 Environmental and MARPOL inspection records demonstrate vessels are compliant with standard maritime safety procedures (Marine Orders 91, 95 and 96).
	C 23.1 Marine riser's telescopic joint to be: comprised of a minimum of two packers (one hydraulic and one pneumatic) pressure tested in accordance with manufacturer's recommendations.	PS 23.1 MODU's joint packer designed and maintained to reduce hydrocarbons discharged to the environment.	MC 23.1.1 Environmental inspection records demonstrate that MODU's joint packer is compliant.
	C 5.1 Chemical Selection and Assessment Environment Guideline: Where Gold/Silver/E/D OCNS rating (and no OCNS substitution or product warning), chemicals are selected, no further control required. If chemicals with a different OCNS rating, sub-warning or non-OCNS rated chemicals are required, chemicals will be assessed in accordance with the guideline prior to use.	PS 5.1 All chemicals intended or likely to be discharged to the marine environment will be assessed and approved prior to use in accordance with the Chemical Selection and Assessment Environment Guideline (described in Section 3.9) to ensure the impacts associated with use are ALARP and acceptable.	MC 5.1.1 Chemical assessment register demonstrates the chemical selection, assessment and approval process for selected chemicals is followed. See Section 6.9.5
	C 22.2 Contractor procedure for managing project fluids transfers onto, around and off the MODU, which requires: emergency shutdown systems for stopping losses of containment (e.g. burst hoses) break-away dry-break couplings for oil-based mud hoses	PS 22.2 Compliance with Contractor procedures to limit accidental loss to the marine environment.	MC 22.2.1 Records demonstrate drilling fluid transfers are performed in accordance with the applicable contractor procedures.

[117] Defined in Section 2.6.3

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	transfer hoses to have flotation devised to allow detection of a leak the valve line-up will be checked prior to commencing mud transfers constant monitoring of the transfer process direct radio communications completed PTW and JSA showing contractor procedures are implemented recording and verification of volumes moved to identify any losses mud pit dump valves locked closed when not in use for mud transfers and operated under a PTW.		
	C 13.5 Raising incident reports within event reporting system for unplanned releases. Refer Section 6.8.5	PS 13.5 Incident reports raised for unplanned releases. Recordable Incidents notified for material unplanned liquid releases to sea, of: 80 L or more of hydrocarbons, or 1000 L or more of environmentally hazardous chemical118, in any 48 hour period. Refer Section 6.8.5	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed. Refer Section 6.8.5
	C 23.3 Check for the functionality of: additional SCE (augers and cuttings dryers) mud tanks mud tank room transfer hoses NWBM base fluid transfer lines NWBM base fluid transfer station base fluid storage.	PS 23.3 Prevent the unacceptable use or discharge of NWBM/ base oil.	MC 23.3.1 Environmental inspection records demonstrate the presence and functionality of the specified equipment
	For oil spill response outcomes, standards and measurement criteria refer to Appendix H.		

[118] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

6.9.7 Unplanned Discharges: Hazardous and Non-hazardous Waste Management

Context		
Operational Details – Section 3.5 Xena-03 Drilling and Tie-back Activities – Section 3.11	Physical Environment – Section 4.4 Protected Species – Section 4.6	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Incorrect disposal or accidental discharge of non-hazardous and hazardous waste to the marine environment.		x	x			x		A	E	2	M	LCS GP	Broadly Acceptable	EPO 24a EPO 24b

Description of Source of Risk

Non-hazardous and Hazardous Waste

Normal operations on the facility, the MODU and support vessels generate a variety of hazardous and non-hazardous wastes. These materials could potentially impact the marine environment, if incorrectly disposed of, lost overboard or discharged in significant quantities.

Non-hazardous wastes include domestic and industrial wastes such as paper and cardboard, aluminium cans, bottles, polystyrene, organics and scrap steel. Hazardous wastes include recovered solvents, excess or spent chemicals, oil contaminated materials (e.g. sorbents, filters and rags), batteries and used lubricating oils and potentially material containing NORMs. Sand and sludges may be periodically generated during process and vessel maintenance. Many waste streams are only generated on the riser platform and support vessels during deployment of personnel to the facility for IMMR activities.

All waste materials not suitable for discharge to the environment, including hazardous wastes (i.e. liquid and solid wastes), generated during the Petroleum Activities Program are transported to shore for disposal or recycling by Woodside's licenced waste contractor.

Material generated onshore from pigging of the export pipeline has been tested in accordance with the relevant procedures and determined not to be classified as NORM therefore NORMs not expected to be encountered.

Consequence Assessment

The potential impacts of hazardous or non-hazardous solid waste / equipment accidentally discharged to the marine environment include contamination of the environment as well as secondary impacts relating to potential contact of marine fauna with wastes. This could result in entanglement or ingestion and lead to injury and death of individual animals. The temporary or permanent loss of waste materials into the marine environment is not likely to have a significant environmental impact, based on the location of the PAA, the types, size and frequency of wastes that could occur, and species present.

Water and Sediment Quality

Hazardous solid wastes such as paint cans, oily rags, etc., can cause localised contamination of the water and sediment through a release of toxins and chemicals. Given likely small volumes of any unplanned solid waste

discharge, and the occasional nature of the event, these would result in temporary and highly localised changes to the water quality.

In the unlikely event of an object being dropped into the marine environment, potential environmental effects would be limited to slight 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 slight but permanent.

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

The unplanned discharge of solid wastes can result in mortality to fauna, either through contamination or physical injury depending on the nature of the waste. Marine fauna, including fish, seabirds and shorebirds, marine mammals and marine reptiles may be impacted through ingestion or entanglement of waste or through exposure to toxic chemicals. Ingestion or entanglement of marine fauna has the potential for physical harm which may limit feeding/foraging behaviours and thus can result in mortalities. Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris was listed as a key threatening process under the EPBC Act in August 2003 (DoEE, 2018). The Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE, 2018) identifies EPBC Act-listed species for which there are scientifically documented adverse impacts resulting from marine debris. Marine turtles and seabirds in particular may be at risk from plastics which may cause entanglement or be mistaken for food (e.g. DoEE, 2018; Commonwealth of Australia, 2017) and ingested causing damage to internal tissues and potentially preventing feeding activities. In the worst instance this could have a lethal affect to an individual. Marine debris has been identified as threat in the Recovery Plan for Marine Turtles in Australia (2017–2027).

Impacts to species including fish, birds, marine mammals and marine reptiles from the unplanned discharge of solid waste is unlikely given low occurrence of unplanned discharges. Significant impacts are unlikely to occur at an individual level and will not occur at a population level, nor result in the decrease of the quality of the habitat such that the extent of these species is likely to decline.

The temporary or permanent loss of waste materials into the marine environment is not likely to have a significant environmental impact, based on the nature and scale of activities that may generate wastes, the types, size and frequency of wastes that could occur.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
MODU, installation and support vessels complying with Marine Orders for safe vessel operations, Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014.	F: Yes. CS: Minimal cost. Standard practice.	Implementation of Marine Order 94 reduces the likelihood of a harmful substance being released to the environment. Implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Controls based on legislative requirements – must be adopted.	Yes C 24.1

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
MODU, installation and support vessels complying with Marine Order for safe vessel operations, Marine Order 95 (Pollution prevention – garbage).	F: Yes. CS: Minimal cost. Standard practice.	Implementation of Marine Order 95 reduces the likelihood of a harmful substance being released to the environment. Implementation is standard practice for commercial vessels as applicable to vessel size, type and class.	Controls based on legislative requirements – must be adopted.	Yes C 24.2
Good Practice				
Storing, handling and transporting wastes in accordance with the Waste Management Plan for Offshore Facilities	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of a release of waste to the environment by providing guidance on storage, handling and transport of waste streams.	Benefit outweighs cost sacrifice.	Yes C 24.3
If safe and practicable to do so, using MODU, vessels, ROV or crane to attempt recovery of material[119] environmentally hazardous or non-hazardous solid object/waste container lost overboard.	F: Yes. CS: Minimal cost. Standard practice.	Potentially reduces consequence by recovering object/waste container from the environment.	Benefit outweighs cost sacrifice.	Yes C 24.4
Incident reports are raised for unplanned releases within event reporting system.	F: Yes. CS: Minimal cost. Standard practice.	Good practice that operators identify, report and learn from unplanned release events. Supports compliance with regulatory reporting requirements.	Control based on Woodside standard and regulatory requirements.	Yes C 13.5

[119] For the purposes of this control/performance standard “material” is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of >F.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Implement the Woodside Waste Management Plan, which requires: dedicated space for waste segregation bins and skips provided on the MODU records of all waste to be disposed, treated or recycled waste streams handled and managed according to their hazard and recyclability class all non-putrescible waste (excludes all food, greywater or sewage waste) to be transported from the MODU and disposed of onshore.	F: Yes. CS: Minimal cost. Standard practice.	Controls outlined in the management plan will Reduce the likelihood of an unplanned release. The consequence is unchanged.	Benefit outweighs cost sacrifice.	Yes C 24.5
Installation Vessel Waste Management Plan, which requires: dedicated waste segregation bins records of all waste to be disposed, treated or recycled waste streams shall 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 24.6
Professional Judgement - Elimination				
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, Woodside considers the adopted controls appropriate to manage the impacts and risks of accidental discharge of non-hazardous and hazardous wastes. 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 consequence assessment has determined that, given the adopted controls, the accidental discharge of non-hazardous waste and hazardous waste represents a low risk rating and is unlikely to result in a consequence greater than localised impacts to water quality, marine sediment and marine species with no lasting effects. Woodside, across its operations (including this facility), has a well-established waste management culture which underpins a strong performance and limits the potential for accidental releases to the marine environment. Opportunities to reduce waste management impacts and risks are employed through standard practices such as job planning, implementation of Waste Management Plans and job hazard analysis practices. The adopted controls are considered good oil-field practice/industry best practice and meet requirements of Australian Marine Orders. 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 accidental discharge of non hazardous and hazardous waste to a level that is broadly acceptable.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 24a Woodside will manage its activities to prevent material loss of solid hazardous and non-hazardous waste from occurring.[120]	C 24.1 Support vessels complying with Marine Orders for safe vessel operations, Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014.	PS 24.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Order 94).	MC 24.1.1 Marine verification records demonstrate compliance with standard maritime safety procedure (Marine Order 94).
	C 24.2 MODU/ support vessels complying with Marine Order for safe vessel operations, Marine Order 95 (Pollution prevention – garbage).	PS 24.2 Vessels contracted whose practices comply with Marine Order as applicable to vessel size, type and class (Marine Order 94).	MC 24.2.1 Marine verification records demonstrate compliance with standard maritime safety procedure (Marine Order 94).
	C 24.3 Storing, handling and transporting wastes in accordance with the Waste Management Plan for Offshore Facilities	PS 24.3 Implementation of Waste Management Plan for Offshore Facilities, including: • waste segregation and storage • records of all waste to be disposed, treated or recycled shall be maintained, and shall include (though not limited to) quantity of waste, waste type and disposal/recycle location • waste streams shall be appropriately handled, tested, monitored and	MC 24.3.1 Records demonstrate implementation of Waste Management Plan for Offshore Facilities.

[120] Risk considers both likelihood and consequence as set out in Woodside's risk management process outlined in section 2.6.3. Material releases are defined in PS 13.5. For the purposes of this control/performance standard, 'material' is defined as unplanned releases of waste events with an environmental consequence greater than a minor impact (e.g. localized with No lasting effect).

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		managed according to their hazard and recyclability class.	
	C 24.4 If safe and practicable to do so, using MODU, vessels, ROV or crane to attempt recovery of material[121] environmentally hazardous or non-hazardous solid object/waste container lost overboard.	PS 24.4 Material[124] solid waste/equipment dropped to the marine environment will be recovered where safe and practicable to do so. Where retrieval is no practicable and/or safe, material items (property) that are lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title.	MC 24.4.1 Incident records detail the recovery attempt consideration and status of material environmentally hazardous or non hazardous solid waste object/container lost to the marine environment.
		PS 24.7 Incident reports raised for unplanned loss of solid waste/equipment and recordable incidents notified for material[124] unplanned loss, regardless of whether the item/s are recovered.	
	Mitigation – Emergency and Hydrocarbon Spill Response.	Refer to Section 7 discussion around the ALARP assessment of controls related to hydrocarbon spill response	

EPOs, EPSs and MC for Xena-03 Drilling and Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 24b Woodside will manage its Tieback activities to prevent unplanned material discharge of hazardous and/or non-hazardous waste, limiting impact to the marine environment to less than slight[122].	C 13.5 Raising incident reports within event reporting system for unplanned releases. Refer Section 6.8.5	PS 13.5 Incident reports raised for unplanned releases. Recordable Incidents notified for material unplanned liquid releases to sea, of: • 80 L or more of hydrocarbons, or • 1000 L or more of environmentally	MC 13.5.1 Records demonstrate incident reports raised for unplanned releases, and applicable Recordable Incident notifications completed. Refer Section 6.8.5

[121] For the purposes of this control/performance standard, "material" is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of > F.

[122] Defined in Section 2.6.3

EPOs, EPSs and MC for Xena-03 Drilling and Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
		hazardous chemical[123], in any 48 hour period. Refer Section 6.8.5	
	C 24.1 MODU/ support vessels complying with Marine Orders for safe vessel operations, Marine Order 94 (Marine pollution prevention – packaged harmful substances) 2014.	PS 24.1 Vessels contracted whose practices comply with Marine Orders as applicable to vessel size, type and class (Marine Order 94).	MC 24.1.1 Marine verification records demonstrate compliance with standard maritime safety procedure (Marine Order 94).
	C 24.2 MODU/ support vessels complying with Marine Order for safe vessel operations, Marine Order 95 (Pollution prevention – garbage).	PS 24.2 Vessels contracted whose practices comply with Marine Order as applicable to vessel size, type and class (Marine Order 94).	MC 24.2.1 Marine verification records demonstrate compliance with standard maritime safety procedure (Marine Order 94).
	C 24.4 If safe and practicable to do so, using MODU, vessels, ROV or crane to attempt recovery of material[124] environmentally hazardous or non-hazardous solid object/waste container lost overboard.	PS 24.4 Material[124] solid waste/equipment dropped to the marine environment will be recovered where safe and practicable to do so. Where retrieval is no practicable and/or safe, material items (property) that are lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title.	MC 24.4.1 Incident records detail the recovery attempt consideration and status of material environmentally hazardous or non hazardous solid waste object/container lost to the marine environment.
		PS 24.7 Incident reports raised for unplanned loss of solid waste/equipment and recordable incidents notified for material[124] unplanned loss, regardless of whether the item/s are recovered.	
	C 24.5	PS 24.5	MC 24.5.1

[123] Chemicals that are not on the CEFAS OCNS Ranked List of Notified Chemicals or CEFAS OCNS listed chemicals which have a CEFAS OCNS substitution warning, a OCNS product warning or are OCNS Hazard Quotient white, blue, orange, purple, A, B or C.

[124] For the purposes of this control/performance standard, “material” is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of > no lasting effect (see Section 2.6.3).

EPOs, EPSs and MC for Xena-03 Drilling and Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	Implement the Woodside Waste Management Plan, which requires: dedicated space for waste segregation bins and skips provided on the MODU records of all waste to be disposed, treated or recycled waste streams handled and managed according to their hazard and recyclability class all non-putrescible waste (excludes all food, greywater or sewage waste) to be transported from the MODU and disposed of onshore.	Hazardous and non-hazardous waste will be managed in accordance with the Waste Management Plan.	Records demonstrate implementation of Waste Management Plan.
	C 24.6 Installation Vessel Waste Management Plan, which requires: dedicated waste segregation bins records of all waste to be disposed, treated or recycled waste streams shall be handled and managed according to their hazard and recyclability class. implementation of waste management procedures which provide for safe handling and transportation, segregation and storage and appropriate classification of all waste generated.	PS 24.6 Hazardous and non-hazardous waste will be managed in accordance with the Installation Vessel Waste Management Plan.	MC 24.6.1 Records demonstrate compliance against Installation Vessel Waste Management Plan.

6.9.8 Physical Presence: Seabed Disturbance from Dropped Objects or Loss of Station Keeping Leading to Anchor Drag

Context		
Support Vessel Operations – Section 3.8 Vessel-based Activities for the Xena-03 Tie-back– Section 3.12 Holding Station: Mooring Installation and Anchor Hold Testing/Soil Analysis – Section 3.12.5	Physical Environment – Section 4.4 Habitats and Biological Communities– Section 4.5	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	Risk Rating	ALARP Tools	Acceptability	Outcome
Dropped objects resulting in the disturbance of benthic habitat	x			x		x	A	D	1	L	GP PJ	Broadly Acceptable	EPO 25
Loss of station keeping of the MODU leading to anchor drag and the disturbance of benthic habitat	x			x		x							

Description of Source of Risk

The primary cause for unplanned seabed disturbance during the PAP is through dropped objects from the riser platform and support vessel operations or from installation of the Xena-03 mooring system, the MODU, subsea installation and support vessels. Additional unplanned disturbance to the seabed may occur from a loss of station keeping and subsequent anchor drag during MODU operations if a moored MODU is used. An assessment of the risks of loss of control of suspended loads from the platform, and waste/objects lost to sea is presented in Section 6.8.9 and 6.9.7 and is not considered further here.

Dropped Objects

There is the potential for objects to be dropped overboard from the riser platform and support vessel operations or from installation of the Xena-03 mooring system, the MODU, installation and support vessels to the marine environment. Objects that have been dropped during previous offshore activities include small numbers of personal protective gear (e.g. glasses, gloves, hard hats), small tools (e.g. spanners) hardware fixtures (e.g. riser hose clamp) and drill equipment (e.g. drill pipe); however, there is also potential for larger equipment to also be dropped during the activity, particularly during recovery of infrastructure from the seabed. The spatial extent in which dropped objects can occur is restricted to the PAA.

Anchor Drag

The Xena-03 well may be drilled using a moored or hybrid MODU. If a moored MODU is used for drilling the Xena-03 well, it will be secured on station by an 8 to 12 point pre-laid mooring system deployed to the seabed, as dictated by the mooring analysis. High energy weather events such as cyclones, occurring while the MODU is on station, can lead to excessive loads on the mooring lines, resulting in failure (either anchor(s) dragging or mooring lines parting). A failure of mooring integrity may lead to the mooring lines and anchors attached to the MODU being trailed across the seabed. If mooring failure is sufficient, the MODU may move off station, increasing the likelihood of anchor drag

across the seafloor. A hybrid MODU that uses DP in conjunction with a pre-laid mooring system to hold station, may be used to conduct the drilling. In this scenario, there may be an opportunity to disconnect the RAR (See Section 3.12), which would allow the rig to avoid the cyclone and for the anchor drag risk to be reduced.

For a moored MODU, personnel on-board are typically evacuated during cyclones. Woodside implements a risk-based assessment process to aid in decision-making for cyclone evacuations, with the well suspended prior to MODU evacuation. Support vessels also demobilise from the PAA during the passage of a cyclone. While the MODU is temporarily abandoned, the position of the MODU is monitored remotely for any deviation. Support vessels and MODU personnel return to the Xena-03 Operational Area as soon as safe to do so after a cyclone evacuation. Operational experience indicates cyclone evacuations typically last for seven days.

Industry statistics from the North Sea show that a single mooring line failure for MODUs is the most common failure mechanism (33 × 10-4 per line per year), followed by a double mooring line failure (11 × 10-4 per line per year) (Petroleumstilsynet, 2014). Note that single and double mooring line failures do not typically result in the loss of station keeping. If partial or complete mooring failures are sufficient to result in a loss of station keeping, industry experience indicates that MODUs may drift considerable distances from their initial position (Offshore: Risk & Technology Consulting Inc., 2002). Partial mooring failures leading to a loss of station keeping resulted in smaller MODU displacements, due to the remaining anchors dragging along the seabed when compared to complete mooring failures; complete mooring failures resulted in a freely drifting MODU (Offshore: Risk & Technology Consulting Inc., 2002). NOPSEMA has recorded four cases of anchor drag due to loss of MODU holding station during cyclone activity between 2004 and 2015 (NOPSEMA 2015). Seabed disturbance area size from anchor drag will depend on the extent of the drag.

Consequence Assessment

Potential impacts to environmental values

In the unlikely event of an object being dropped into the marine environment or failed mooring, potential environmental effects would be limited to minor 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 minor but permanent.

KEFs and cultural heritage

The temporary or permanent loss of dropped objects into the marine environment and mooring failure is likely to result in a minor impact only, as the benthic communities associated with the Pluto Facility and Xena-03 Operational Areas are of low sensitivity and are broadly represented throughout the NWMR. As described in Section 4.7, the Ancient Coastline at 125 m overlaps with the Pluto Facility Operational area, and the Continental Slope Demersal Fish Communities KEF overlaps the Pluto Facility and Xena-03 Operational Areas. Benthic communities in the Operational Areas are representative of the deep water soft sediment habitats reported in the wider region, and is likely to consist of soft sediment seabed habitat, characterised by sparse, widely represented epifauna and infauna (Woodside, 2004; Brewer et al., 2007).

Given the nature and scale of risks and consequences from dropped objects and mooring failure, slight impacts are expected to seabed sensitivities within the Pluto Facility and Xena-03 Operational Areas. Further, considering the types, size, scale and frequency of dropped objects that could occur, it is unlikely that a dropped object would have a significant impact on any benthic community.

The operational areas overlap a small proportion of the KEFs. Any unplanned seabed disturbance within the KEFs would be minor and relatively small compared to the size of the KEFs. Given the location of the MODU, and likely anchor placement locations outside of the KEFs, impacts from anchor drag are likely to be further reduced. On this basis, the risk to the KEFs from unplanned seabed disturbance during Facility Operations and Xena-03 Tie-back Activities is low and would result in consequences no greater than minor, short-term impacts.

Epifauna and Infauna

As a result of a change in water quality and change in habitat, injury or mortality to marine fauna resulting from an increase in turbidity may occur. Given a change to water quality is unlikely, the only receptors that would potentially be at risk of unplanned seabed disturbance are bottom dwelling species including epifauna and infauna. Benthic communities, including epifauna and infauna may be impacted by the dropped objects, or the drag of anchors on the seabed. If not recovered, dropped objects may result in the permanent loss of a small area under the object. Over time, these hard substrates are expected to be colonised by sessile benthic biota (e.g. sponges, gorgonians, etc.), which is consistent with other small areas of hard substrate throughout the region.

If anchor drag occurs, habitat impact will span the extent of the drag area, leading to a localised change in communities; however, substantial adverse effect is not anticipated, given the sparse marine life that are well represented elsewhere in the region.

Given generally sparse benthic communities in the operational areas, no threatened or migratory benthic species or ecological communities were identified, and those epifauna and infauna communities observed are likely to be well

represented elsewhere in the region, impacts are expected to be restricted to a localised proportion of epifauna and infauna communities.

On this basis, the risk to epifauna and infauna from unplanned seabed disturbance during Xena-03 Tie-back activities is low and would result in consequences no greater than minor, short-term impacts.

Summary of Potential Impacts to environmental values(s)

Given the adopted controls, the predicted small footprint of a dropped object and the highly unlikely nature of anchor drag, it is considered that unplanned seabed disturbance will result in Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems), physical or biological attributes, and cultural heritage, with an overall risk rating of Moderate.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[125]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
No additional controls identified				
Good Practice				
The MODU/installation vessel work procedures for lifts, bulk transfers and cargo loading, which require: The security of loads shall be checked prior to commencing lifts. Loads shall be covered if there is a risk of loss of loose materials. Lifting operations shall be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state.	F: Yes. CS: Minimal cost. Standard practice.	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 25.1
MODU, installation vessel and support vessel inductions include control measures for 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 25.2
Specifications and requirements for station keeping equipment (mooring systems), require that: systems are tested and inspected in accordance with API RP 2I	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of mooring failure leading to uncontrolled anchor drag. Should mooring failure occur, no significant reduction in consequence could occur.	Benefit outweighs cost sacrifice.	Yes C 25.3

[125] *Qualitative measure*

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[125]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
systems have sufficient capability such that a failure of any single component will not cause progressive failure of the remaining anchoring arrangement.				
Project-specific Mooring Design Analysis.	F: Yes. CS: Minimal cost. Standard practice.	By ensuring that a mooring analysis report is undertaken, the likelihood of mooring failure occurring is reduced. Although no reduction in consequence would occur, the overall risk is reduced.	Benefit outweighs cost sacrifice.	Yes C 2.8
Mooring system is tested to recommended tension as per API RP 2SK.	F: Yes. CS: Minimal cost. Standard practice	Reduces the likelihood of anchor drag leading to seabed disturbance.	Benefit outweighs cost sacrifice.	Yes C 25.4
AMSA/AHS/potentially affected relevant persons (as identified in Section 5 will be notified in the event significant equipment is unable to be recovered. Notification will allow for stakeholder to raise Notice to Mariners if necessary.	F: Yes. CS: Minimal cost. Standard practice.	Occurs after a dropped object event and therefore no change to the likelihood. Will ensure relevant persons are aware of dropped object locations to be avoided when necessary.	Benefit outweighs cost sacrifice.	Yes C 25.5
Professional Judgement – Eliminate				
No additional controls identified				
Professional Judgement – Substitute				
No additional controls identified				
Professional Judgement – Engineered Solution				
If safe and practicable to do so, using MODU, vessels, ROV or crane to attempt recovery of material[126] environmentally hazardous or non-hazardous solid object/waste container lost overboard.	F: Yes. CS: Minimal cost. Standard practice.	Potentially reduces consequence by recovering equipment from the environment.	Benefit outweighs cost/sacrifice.	Yes C 24.4
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 unplanned seabed				

[126] For the purposes of this control/performance standard, "material" is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of > F.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)9F[125]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
disturbance. 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 disturbance to seabed from dropped objects from the Pluto Facility Operations and the Xena-03 Tie-back Activities including a loss of station keeping of the MODU represents a moderate current risk rating and is unlikely to result in a risk consequence greater than Minor. The adopted controls are considered industry good practice.
The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of seabed disturbance from dropped objects / anchor drag to an acceptable level.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 25a No incidents of dropped objects or anchor/chain hold drag to the marine environment inside the PAA greater than a consequence level	C 25.5 AMSA/AHS/potentially affected relevant persons (as identified in Section 5 will be notified in the event significant equipment is unable to be recovered. Notification will allow for stakeholder to raise Notice to Mariners if necessary.	PS 25.10 Notification to AMSA/ AHS/ potentially affected relevant persons to prevent activities interfering with other marine users.	MC 25.10.1 Consultation records demonstrate that AMSA/ AHS/ potentially affected relevant persons have been notified in the event of a significant equipment loss.

of Minor[127] during the Petroleum Activities Program.	C 25.7 If safe and practicable to do so, vessel, ROV, or crane will be used to attempt recovery of solid object/waste lost overboard.	PS 25.7 PS Material* solid waste/equipment dropped to the marine environment will be recovered where safe and practicable to do so. Where retrieval is no practicable and/or safe, material* items (property) that are lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title.	MC 25.7.1 Records detail the recovery attempt consideration and status of any hazardous waste lost to the marine environment.
		Incident reports raised for unplanned loss of solid waste/equipment and recordable incidents notified for material* unplanned loss, regardless of whether the item/s are recovered.	

[127] *Defined as "Minor, short-term impact (1-2 years)", as in Section 2.6.3*

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 25b Woodside will manage its Tieback activities to prevent unplanned material dropped/dragged objects, limiting adverse impacts to the marine environment to less than slight[128].	C 25.1 The MODU/installation vessel work procedures for lifts, bulk transfers and cargo loading, which require: the security of loads shall be checked prior to commencing lifts loads shall be covered if there is a risk of loss of loose materials. Lifting operations shall be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state. C 25.2 MODU, installation vessel and support vessel inductions include control measures for dropped object prevention.	PS 25.1 All lifts conducted in accordance with applicable MODU/installation vessel work procedures to limit potential for dropped objects. PS 25.2 To ensure awareness of requirements for dropped object prevention.	MC 25.1.1 Records show lifts conducted in accordance with the applicable MODU/installation vessel work procedures. MC 25.2.1 Records show dropped object prevention training is provided to the MODU/ installation vessel.
	C 25.3 Specification and requirements for station keeping equipment (mooring systems), require that: systems are tested and inspected in accordance with API RP 21 systems have sufficient capability such that a failure of any single component will not cause progressive failure of the remaining anchoring arrangement.	PS 25.3 MODU mooring system tested and in place to ensure no complete mooring failure.	MC 25.3.1 Records demonstrate mooring system tests and inspection.
	C 2.8 Project specific MODU Mooring Design Analysis.	PS 2.8 Seabed disturbance from MODU mooring limited to that required to ensure adequate MODU station holding capacity.	MC 2.8.1 Records demonstrate Mooring Design Analysis approved and implemented during anchor deployment.
	C 25.4 Mooring system is tested to recommended tension as per API RP 2SK	PS 25.4 Monitoring compliant with ISO 19901-7:2013	MC 25.4.1 Records confirm mooring system is tested to recommended tension as per API RP 2SK.

[128] Defined in Section 2.6.3

	C 24.4 If safe and practicable to do so, using MODU, vessels, ROV or crane to attempt recovery of material[129] environmentally hazardous or non-hazardous solid object/waste container lost overboard.	PS 24.4 Material solid waste/equipment dropped to the marine environment will be recovered where safe and practicable to do so. Where retrieval is no practicable and/or safe, material* items (property) that are lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title.	MC 24.4.1 Incident records detail the recovery attempt consideration and status of material environmentally hazardous or non hazardous solid waste object/container lost to the marine environment.
		Incident reports raised for unplanned loss of solid waste/equipment and recordable incidents notified for material* unplanned loss, regardless of whether the item/s are recovered.	

[129] For the purposes of this control/performance standard, "material" is defined as unplanned releases of environmentally hazardous or non-hazardous solid object/waste events with an environmental consequence of > F.

6.9.9 Physical Presence: Interactions with Marine Fauna

Context		
Facility Operations– Section 3.7 Xena-03 Drilling and Tie-back Activities – Section 3.11	Protected Species – Section 4.6	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Physical presence of the Pluto Facility, MODU, ASV, installation and support vessels resulting in collision with marine fauna.						x		A	E	1	L	LCS PJ	Broadly Acceptable	EPO 26

Description of Source of Risk

Activities associated with the Petroleum Activities Program will require vessels IMMR activities, support operations and supply/transport as well as for tie-back activities. The type and number of vessels in the PAA at any one time, and the duration of presence, will differ depending on the activities being undertaken.

Vessels operating in and around the PAA may present a potential hazard to cetaceans and other protected marine fauna such as whale sharks and marine reptiles. Vessel movements can result in collisions between the vessel (hull and propellers) and marine fauna, potentially resulting in superficial injury, serious injury that may affect life functions (e.g. movement and reproduction) and mortality. The 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 marine fauna potentially present and their behaviours.

Consequence Assessment

Marine mammals, reptiles and sharks

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. According to the data of Vanderlaan and Taggart (2007), it is estimated that the risk is less than 10% at a speed of four knots. Vessel–whale collisions at this speed are uncommon and, based on reported data contained in the US NOAA database (Jensen and Silber 2004), there only two known instances of collisions when the vessel was travelling at less than six knots. Both of these were from whale watching vessels that were deliberately placed among whales.

Support vessels undertaking the Petroleum Activities Program within the PAA are likely to be travelling less than eight knots (and will often be stationary). Therefore, the risk of a vessel collision with protected species resulting in death is inherently low. No known key aggregation areas (resting, breeding or feeding) are located within or immediately adjacent to the PAA.

The PAA overlaps two recognised BIAs for cetaceans; the pygmy blue whale migration and distribution BIA and the humpback whale migration BIA (the humpback whale is considered to be at risk due to relatively slow movement and proportion of time spent at or near the sea surface) (refer to Section 4.6.3). Both humpback whales and pygmy blue

whales are only expected to be present during their seasonal migrations. Refer to Table 4-14 for information on migration timing.

Whale sharks are at risk from vessel strikes when feeding at the surface. Whale sharks may traverse offshore NWS waters including the PAA during their migrations to and from Ningaloo Reef, and a BIA for foraging whale sharks overlaps the PAA. However, given the main aggregation area for whale sharks is approximately 340 km off the coast of Ningaloo (designated as a foraging BIA with high density prey) (Section 0), it is expected that whale shark presence within the PAA would not comprise significant numbers, and their presence would be transitory and of a short duration. There are no constraints preventing whale sharks from moving away from vessels to avoid injury (e.g. shallow water or shorelines).

Vessel strikes have also been identified as a threat to marine turtles; however, no explicit management actions are listed in relevant conservation advices or recovery plans (Table 4 3). The typical response from turtles on the surface to the presence of vessels is to dive (a potential "startle" response), which decreases the risk of collisions (Hazel et al., 2007). As with cetaceans, the risk of collisions between turtles and vessels increases with vessel speed (Hazel et al. 2007). Given the low speeds of vessels undertaking the Petroleum Activities Program, along with the expected low numbers of turtles within the Xena-03 and Facility Operational Areas, interactions between vessels and turtles are considered to be highly unlikely.

The facility section of the PAA overlaps a flatback internesting buffer BIA which extends for 40 km around a nesting BIA at the Montebello Islands and Dampier Archipelago during their summer nesting period. Given the water depth around the facility (between approximately 85 and 960 m) and absence of potential nesting or significant foraging habitat for turtles (i.e. no emergent islands, reef habitat or shallow shoals/banks) the Facility Operational Area is unlikely to represent important habitat for marine turtles.

The Export Pipeline Operational Area also overlaps the aforementioned flatback turtle internesting buffer BIA, as well as internesting BIAs for green, hawksbill and loggerhead turtles. The BIAs for flatback, green and hawksbill turtles have also been designated as habitat critical to the survival of the species in the Recovery plan for marine turtles in Australia 2017–2027 (Commonwealth of Australia, 2017); however, these areas are likely to hold the same significance as the existing BIAs with slightly differing spatial areas. The export pipeline lies in water depths of 40 to 85 m. No potential nesting or significant foraging habitat for turtles (i.e. no emergent islands, reef habitat or shallow shoals/banks) overlap the Export Pipeline Operational Area.

Given there are significant nesting sites along the mainland coast and islands in proximity to the Export Pipeline Operational Area, turtles are likely to transit this area. Individuals may also infrequently forage in some areas of the export pipeline (i.e. flatback turtles), although not in significant numbers given the lack of suitable habitat and distance from emergent land. As vessels are likely to only operate within the PAA infrequently during IMMR activities and when the facility is crewed, interactions with vessels during the Petroleum Activities Program are highly unlikely. Given vessels will be moving at low speeds while in the PAA, turtles are likely to avoid collisions with vessels by diving or swimming away from the area. It is not deemed credible that vessel movement associated with the Petroleum Activities Program could have a significant impact on marine fauna populations given (1) the low presence of transiting individuals, (2) avoidance behaviour commonly displayed by marine fauna, and (3) low operating speed of the activity support vessels (generally less than eight knots or stationary, unless operating in an emergency). Activities are considered unlikely to result in a consequence greater than slight, short-term disruption to individuals or a small proportion of the population, and no impact on critical habitat or fauna activity.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[130]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Implementing EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans to reduce the likelihood of collision with whales and dolphins.	F: Yes. CS: Minimal cost. Standard practice.	Reductions in speed around protected cetaceans reduce the likelihood of collision.	Controls based on legislative requirements – must be adopted.	Yes C 4.1

[130] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[130]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Good Practice				
Variation of the timing of the Petroleum Activities Program to avoid whale migration periods.	F: No. Timing of activities is linked to MODU schedule. Timing of all activities is currently not determined, and due to MODU availability and operational requirements, undertaking activities during migration seasons may not be able to be avoided. CS: Not considered,	Not considered, control not feasible	Not considered, control not feasible.	No
Professional Judgement - Elimination				
Not using vessels.	F: No. No alternative to the use of vessels during the Petroleum Activities Program was identified. Given vessels must be used to undertake the Petroleum Activities Program, there is no feasible means to eliminate the source of risk. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, 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, Woodside considers the adopted controls appropriate to manage the risk of interactions with 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 consequence assessment has determined that, given the adopted controls, interaction with marine fauna represents a low risk rating that is unlikely to result in a consequence greater than slight, short-term disruption to individuals or a small proportion of the population, and no impact on critical habitat or activity. 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 Regulations 2000. The management of interactions with marine fauna is consistent with the objectives of approved conservation advice and recovery plans for marine fauna, including cetaceans and whale sharks, where human interference has been identified as a threat. 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 vessel collision with marine fauna to a level that is broadly acceptable.

EPOs, EPSs and MC for Pluto Facility Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 26a No vessel strikes with protected marine fauna (whales, whale sharks, turtles) during the Petroleum Activities Program.	C 4.1 EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, which include the following measures131: vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale; 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, activity support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots; and vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	PS 4.1 Vessels will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to manage the risk of fauna collision.	MC 4.1.1 Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans and Woodside Marine Charterers Instructions. MC 4.1.2 Records demonstrate reporting cetacean ship strike incidents to DCCEEW.

[131] For safety reasons, the specified distances requirements are not applied for a vessel holding station or with limited manoeuvrability (e.g. loading, back-loading, close standby cover for overside working and emergency situations).

EPOs, EPSs and MC for Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 26b No vessel strikes with protected marine fauna (whales, whale sharks, turtles) from Tie-back activities.	C 4.1 EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans, which include the following measures132: vessels will not travel greater than 6 knots within 300 m of a cetacean or turtle (caution zone) and not approach closer than 100 m from a whale; 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, activity support vessels will immediately withdraw from the caution zone at a constant speed of less than 6 knots; and vessels will not travel greater than 8 knots within 250 m of a whale shark and not allow the vessel to approach closer than 30 m of a whale shark.	PS 4.1 Vessels will comply with the EPBC Regulations 2000 – Part 8 Division 8.1 (Regulation 8.05 and 8.06) Interacting with cetaceans to manage the risk of fauna collision.	MC 4.1.1 Records demonstrate no breaches with EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans and Woodside Marine Charterers Instructions. MC 4.1.2 Records demonstrate reporting cetacean ship strike incidents to DCCEEW.

[132] For safety reasons, the specified distances requirements are not applied for a vessel holding station or with limited manoeuvrability (e.g. loading, back-loading, close standby cover for overside working and emergency situations).

6.9.10 Physical Presence: Introduction of Invasive Marine Species

Context		
Facility Operations Section 3.4 Xena-03 Drilling and Tie-back Activities Section 3.11	Regional Context – Section 4.2 Habitats and Biological Communities – Section 4.5 Protected Species – Section 4.6 Protected Places – Section 4.8 Socio-economic Environment – Section 4.9	Consultation – Section 5

Impacts and Risks Evaluation Summary

Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***						
	Soil and Groundwater	Marine Sediment	Water Quality	Air Quality (incl Odour)	Ecosystems / Habitat	Species	Socio-economic	Decision Type	Consequence / Impact	Likelihood	Risk Rating	ALARP Tool	Acceptability	Outcome
Invasive species in vessel ballast tanks or on vessels/ submersible equipment.					x	x	x	A	E	1	L	LCS GP PJ	Broadly Acceptable	EPO 28

Description of Source of Risk

During the Petroleum Activities Program, vessels will be transiting to and from the PAA, potentially including traffic mobilising from beyond Australian waters. Vessels include those servicing and supporting Pluto operations (Section 3.8) as well as the MODU, ASV, IMMR vessel, installation vessels or general support vessels (Section 3.12). Vessels may be sourced from the local area (Dampier, Port Hedland, etc.) or from further afield, depending on the type of vessel required and availability. In addition, infrequent import of materials (e.g. spares) from international suppliers may be required. Vessels arriving from international waters typically call into Dampier, where quarantine clearance including ballast log reviews is conducted in accordance with Biosecurity Act 2015.

All vessels are inherently subject to some level of marine fouling. Organisms attach to the vessel hull, particularly in areas where organisms can find a good surface (e.g. seams, strainers and unpainted surfaces) or where turbulence is lowest (e.g. niches, sea chests, etc.). Organisms can also be drawn into ballast tanks during on-boarding of ballast water as cargo is unloaded or to balance vessels under load. Biofouling organisms can become established in an area through the release of propagules (e.g. eggs or larvae), or by attaching to substrate after becoming detached from the host vessel.

Non-indigenous Marine Species (NIMS) have been introduced into a region beyond their natural biogeographic range and have the ability to survive, reproduce and establish founder populations. Not all NIMS introduced into an area thrive or cause demonstrable impacts. Indeed, the majority of NIMS around the world are relatively benign and few have spread widely beyond sheltered ports and harbours. Only a subset of NIMS that become abundant and impact on social/cultural, human health, economic and/or environmental values can be considered Invasive Marine Species (IMS).

During the Petroleum Activities Program, vessel activities that have the potential to lead to the introduction of IMS are:

- discharge of ballast water from vessels
- vessel interactions with the facility
- cross contamination between vessels (e.g., when vessels need to be alongside each other)

Consequence Assessment

IMS have historically been introduced and translocated around Australia by a variety of human means including biofouling and ballast water. Species of concern are those that:

- are not native to the region;
- are likely to survive and establish in the region; and
- are able to spread by human mediated or natural means.

Species of concern vary from one region to another, depending on various environmental factors such as water temperature, salinity, nutrient levels and habitat type. These factors dictate their survival and invasive capabilities.

Introducing IMS into the local marine environment may alter the ecosystem, as IMS have characteristics that make them superior (in a survival and/or reproductive sense) to indigenous species. They may prey upon local species (which had previously not been subject to this kind of predation and therefore not have evolved protective measures against the attack), they may outcompete indigenous species for food, space or light and can also interbreed with local species, creating hybrids such that the endemic species is lost.

IMS have also proven economically damaging to areas where they have been introduced and established. Such impacts include direct damage to assets (fouling of vessel hulls and infrastructure) and depletion of commercially harvested marine life (e.g. shellfish stocks). IMS have proven particularly difficult to eradicate from areas, once established. If the introduction is captured early, eradication may be effective but is likely to be expensive, disruptive and, depending on the method of eradication, harmful to other local marine life.

Despite the potential high consequence of the establishment of a marine pest within a high value environment as a result of introduction, unlike coastal or sheltered nearshore waters, the deep offshore open waters of the PAA are not conducive to the settlement and establishment of IMS (Geiling 2016), due to the lack of light or suitable habitat to sustain growth or survival. Table 6-44 provides an assessment of the IMS impacts and risks associated with the Petroleum Activity Program.

Epifauna and Infauna

Epifauna and infauna are susceptible to impacts from IMS due to the risk of changes to the ecosystem dynamics such as competition for resources and predation.

Two KEFs also overlap the PAA; the Ancient Coastline at 125 m KEF and Continental Slope Demersal Fish Communities KEF.

Discrete areas of hard substrate hosting sessile filter feeding communities such as sponges and gorgonians may be associated within the Ancient Coastline at the 125 m Depth Contour KEF, of which 9.1 km2 overlaps the PAA. However, no areas of hard substrate characteristic of this KEF have been identified within the PAA (Jacobs 2014).

Filter feeder communities within the PAA are present on the subsea infrastructure and Pluto platform, which provides hard substrate for attachment (Jacobs, 2014).

Vessels have the potential to introduce IMS into the PAA, however, the deep offshore open waters of the PAA (70 - 130 m) are not conducive to the settlement and establishment of IMS. Furthermore, the PAA are away from shorelines and/or critical habitat. The likelihood of IMS being introduced and establishing viable populations within the PAA or immediate surrounds is considered unlikely, with the potential settlement on subsea infrastructure not expected. Accordingly, impact to epifauna/infauna in the PAA is not considered credible. Receptor sensitivity for epifauna and infauna is low, leading to a Slight (E) risk consequence.

Industry, Shipping, Defence

The establishment of IMS has the potential to cause changes to the functions, interests or activities of other users through indirect impact such as changes to fisheries target species resulting in economic and social implications, or due to compromised reputation to the oil and gas industry.

Given the low likelihood of IMS translocation to, and colonisation of environments within the PAA, project activities will not result in establishment of IMS, and as such not adversely affect other marine user activities in the region.

Based on the impact evaluation, the magnitude of potential impacts of a change to the functions, interests or activities of other users is slight. Receptor sensitivity for industry, shipping and defence is medium, leading to a Slight (E) risk consequence. The likelihood of the risk event occurring is Remote, therefore the risk is assessed as Low.

Summary of Potential Impacts to Environment Values

In support of Woodside's assessment of the impacts and risks of IMS introduction associated with the Petroleum Activities Program, a risk and impact evaluation of the different aspects of marine pest translocation associated with the activity was conducted.

Given the adopted controls, the overall risk rating for unplanned introduction of invasive marine species is Low based on a Slight consequence (short-term impact (<1 year) on species, habitat (but not affecting ecosystem function), physical or biological attribute, or to a community or area/item of cultural significance community), and a highly unlikely likelihood.

Table 6-44: Assessment of the impacts and risks of IMS introduction associated with the Petroleum Activity Program

IMS Introduction Aspect	Credibility of Introduction	Consequence of Introduction	Likelihood
Transfer of IMS from infected vessel to PAA and establishment on the seafloor or subsea infrastructure.	Not Credible The deep offshore open waters of the PAA away from shorelines and/or critical habitat, more than 12 nm from a shore and in waters 40 - 85 m deep, are not conducive to the settlement and establishment of IMS.		
Transfer of IMS from infected vessel to and subsequent establishment on the Pluto Platform.	Credible There is potential for the transfer of marine pests to occur.	If IMS were to establish this would potentially result in fouling of intakes (depending on the pest introduced) and would likely result in the quarantine of the Pluto facility until eradication could occur (through cleaning and treatment of infected areas), which would be costly to undertake. Minor (D) – Reputation and Brand Such introduction would be expected to have Minor (D) impact to Woodside's reputation and brand, and close scrutiny of asset level operations or future proposals. Slight (E) – Environment Environmental consequence of introduction of IMS to the Pluto platform is considered Slight (E), localised and would relate to habitat directly on the facility.	Highly Unlikely (1) Interactions between the Pluto facility and support vessels is limited during the petroleum activity program, with a 500 m safety exclusion zone being adhered too. Spread of marine pests via ballast water or spawning in these open ocean environments is considered Highly Unlikely (1).
Introduced to PAA and establishment on a project vessel.	Credible There is potential for the transfer of marine pests between project vessels within the PAA.	Environment – Not Credible The translocation of IMS from a colonised MODU or project vessel to shallower environments via natural dispersion is not considered credible given the distances of the PAA from nearshore environments (i.e. greater than 12 nm/50 m water depth). There is therefore no credible environmental	Remote (0) Interactions between project vessel will be limited during the Petroleum Activities Program, with minimum 500 m safety exclusion zones being adhered to around the MODU and installation vessel, and interactions limited short periods of time alongside (i.e. during backloading, bunkering activities).

		risk and the assessment is limited to Woodside's reputation. Reputation – E If IMS were to establish on a project vessel (i.e. MODU, installation vessel, activity project vessels) this could potentially impact the vessel operationally through the fouling of intakes, result in translocation of an IMS into the PAA and, depending on the species, potentially transfer of an IMS to other project vessels, which would likely result in the quarantine of the vessel until eradication could occur (through cleaning and treatment of infected areas), which would be costly to perform. Such introduction would be expected to have slight impact to Woodside's reputation, particularly with Woodside's contractors, and would likely have a reputational impact on future proposals.	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 these open ocean environments is also considered remote.
Transfer of IMS from infected vessel to and subsequent establishment on riser platform, then transfer of IMS to a secondary vessel from the facility.	Not Credible Risk is considered so remote that it is not credible for the purposes of the Petroleum Activity Program. The transfer of a marine pest from an infected activity vessel to the facility is considered highly unlikely given the offshore open ocean environment. For a marine pest to then establish into a mature spawning population on the facility and then transfer to another support vessel is not considered credible (i.e. beyond the Woodside risk matrix). The facility is located in an offshore, open ocean, deep environment. Support vessels only spend short periods of time alongside the riser platform (i.e. during		

	backloading or bunkering activities). There is also no direct contact (i.e. they are not tied up alongside) during these activities. It is also noted that Woodside has been conducting marine vessel movements between the facility and WA ports (such as Dampier) for a long period of time, and no IMS has been detected in these ports (Department of Fisheries 2017).		

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
On arrival in Australia all vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements	F: Yes. CS: Minimal cost. Standard practice.	Reduction in the likelihood that ballast water will host IMS.	Controls based on legislative requirements under the Biosecurity Act 2015 – must be adopted.	Yes C 28.1
Internationally sourced project vessels will manage their biosecurity risk associated with biofouling as specified in the Australian Biofouling Management Requirements.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of transfer of marine pests between vessels within the PAA. No change in consequence would occur.	Controls based on legislative requirements under the Biosecurity Act 2015 – must be adopted.	Yes C 28.2
Good Practice				
Woodside's IMS risk assessment process[133] will be applied to the MODU, and all vessels and relevant immersible equipment undertaking the Petroleum Activities Program. Assessment will consider these risk factors: • For MODU and project vessels:	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 PAA is reduced. No change	Benefits outweigh cost/sacrifice.	Yes C 28.3

[133] Qualitative measure
45 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)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• vessel/MODU/ type • recent IMS inspection and cleaning history, including for internal niches • out-of-water period before mobilisation • age and suitability of antifouling coating at mobilisation date • internal treatment systems and history • origin and proposed area of operation • number of stationary/slow speed periods >7 days • region of stationary or slow periods • type of activity – contact with seafloor. • For immersible equipment: • region of deployment since last thorough clean, particularly coastal locations • duration of deployments • duration of time out of water since last deployment • transport conditions during mobilisation • post-retrieval maintenance regime.		in consequence would occur.		

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
• 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.				
Diver based monitoring of the riser platform for IMS.	F: Potentially. Diver based surveys are technically feasible for the facility but are not approved under the in-force Safety Case. CS: Significant. IMS inspections of in-water assets typically require vessel logistics and diver-based inspection teams to reliably detect IMS. This is a costly, time-consuming process that would likely require facility simultaneous operational constraints, and invariably introduces a series of significant safety risks in a hazardous offshore environment. Monetary cost of IMS survey for facility-sized infrastructure would be comparable to safe diver campaign arrangements in the order of $200,000/day plus mob/demob costs. Costs of ROV to support survey are in the order of $150,000/day plus	Riser platform monitoring does not prevent the potential for translocation (i.e. only as a mitigation measure). Detection may facilitate subsequent development of options to manage IMS. Subsequent success may be limited due to structure complexity and hazardous environment.	Disproportionate. Interactions between the facility and support/subsea vessels posing IMS translocation risk is limited, and the vessels involved will have been managed through the implementation of Woodside's Invasive Marine Species Management Plan (IMSMP) (C 13.2), a verified process which provides Woodside confidence in the verification of EPO 13. Consequently, any additional benefit gained through the implementation of this control is considered disproportionate, given material execution safety risks and controls already adopted (and noting already incurred cost through implementation of IMSMP (i.e. inspections and cleaning where risk warrants)), and the unlikely likelihood of a translocation event.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
	mob/demob costs (based on subsea ROV hire costs). Health and safety exposure includes those of personnel while conducting diver-based surveys - four days of two to three people (based on subsea ROV surveys of similar size), as well as offshore vessel and facility simultaneous operations hazards.			
Professional Judgement - Elimination				
Not using MODU and project vessels.	F: No. No alternative to the use of vessels during the Petroleum Activities Program was identified, given vessels must be used to undertake the Petroleum Activities Program. There is no feasible means to eliminate the source of risk. CS: Not assessed, control not feasible.	Not assessed, control not feasible.	Not assessed, control not feasible.	No
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
Professional Judgement – Substitute				
Sourcing 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	Sourcing vessels from within Australian will reduce the likelihood of IMS from outside Australian waters, however, it does not	Disproportionate. Sourcing vessels from Australian waters may result in a reduction in the likelihood of IMS introduction to the PAA; however, the potential cost of	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
	vessel, as well as the ability of the local vessels to perform the required tasks. For example, there are limited installation vessels based in Australian waters. While the project will attempt to source project vessels locally it is not always possible. Availability cannot always be guaranteed when considered competing Oil and Gas activities in the region. In addition, sourcing Australian based vessels only will cause increases in cost due to pressures of vessel availability. CS: Significant cost and schedule impacts due to restrictions of vessel hire opportunities.	reduce the likelihood of introduction of species native to Australia but alien to the PAA and NWMR, or of IMS that have established elsewhere in Australia. The consequence is unchanged.	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.	
Inspecting all vessels for IMS.	F: Yes. Approach to inspect vessels is feasible. CS: Significant cost and schedule impacts. Thorough inspections require vessels to be removed from the sea (e.g. slipped or dry docked) and examined by an IMS expert. This process incurs significant financial and schedule sacrifices. Timely vessel-based support is integral to the safe and efficient operation of the facility and subsea infrastructure.	Reduction in the likelihood that a vessel will host IMS.	Disproportionate. The cost/sacrifice is grossly disproportionate to the benefit gained.	No
Professional Judgement – Engineered Solution				
None identified.				
ALARP Statement:				

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the impacts and risks of IMS introduction and establishment. 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, introduction of IMS represent a moderate risk rating that has a remote likelihood to result in an environmental consequence greater than major long-term impact on marine communities within the PAA. 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 Australian legislative requirements, including the Biosecurity Act 2015. 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 invasive marine species to an acceptable level.				

EPOs, EPSs and MC for Pluto Operations and Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 28 No introduction of IMS into the PAA as a result of the Petroleum Activities Program.	C 28.1 All vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements.	PS 28.1 Compliance with 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 the introduction of IMS.	MC 28.1.1 Ballast water exchange records maintained by vessels which verify compliance against Ballast Water Management requirements.
	C 28.2 Internationally sourced project vessels will manage their biosecurity risk associated with biofouling as specified in the Australian Biofouling Management Requirements.	PS 28.2 Compliance with Australian Biofouling Management Requirements.	MC 28.2.1 Records of implementation of biofouling management measure and pre-arrival reporting.
	C 28.3 Woodside's IMS risk assessment process[134] will be applied to all vessels and relevant immersible equipment undertaking the Petroleum Activities	PS 28.3 Before entering the PAA, all vessels and relevant immersible equipment are determined to be low risk of introducing IMS of concern and maintain this low risk status to mobilisation.	MC 28.3.1 Records of IMS Vessel Risk Assessments maintained for all vessels and relevant immersible equipment, as required by the management plan.

[140] 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).

EPOs, EPSs and MC for Pluto Operations and Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	Program. Assessment will consider these risk factors: For all vessels: • vessel/MODU/ type • recent IMS inspection and cleaning history, including for internal niches • out-of-water period before mobilisation • age and suitability of antifouling coating at mobilisation date • internal treatment systems and history • origin and proposed area of operation • number of stationary/slow speed periods >7 days • region of stationary or slow periods • type of activity – contact with seafloor. • For immersible equipment: • region of deployment since last thorough clean, particularly coastal locations • duration of deployments • duration of time out of water since last deployment • transport conditions during mobilisation • post-retrieval maintenance regime. • Based on the outcomes of each IMS risk		MC 28.3.2 Records maintained of management measures which have been implemented where identified through the IMS Vessel Risk Assessment process.

EPOs, EPSs and MC for Pluto Operations and Xena-03 Tie-back Activities			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
	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.		

6.9.11 Physical Presence (Unplanned): Interaction with Live Infrastructure

Context

Relevant Activities	***Existing Environment***	***Consultation***
Project vessels – Section 3.12 Subsea installation Activities – 3.12 Drilling Activities – 3.11.1	Socio-economic Environment – Section 4.10	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 live infrastructure from dropped objects						X	A	E	1	L	LCS GP	Broadly Acceptable	EPO 29
Interaction with live infrastructure from anchor drag						X							

Description of Source of Impact

There is existing live subsea infrastructure in the PAA, which includes components of the Woodside Julimar Brunello Production Pipeline, Chevron Wheatstone Pipeline, Santos Reindeer Offshore Gas Supply Pipeline and Woodside Scarborough Export Pipeline. During the PAP, activities may be conducted that present a risk of dropped objects or anchor drag over the nearby live infrastructure.

Dropped Objects

There is the potential for objects to be dropped overboard from the MODU and project vessels to the marine environment. Objects that have been dropped during previous offshore activities include small numbers of personal protective gear (e.g. glasses, gloves, hard hats), small tools (e.g. spanners), hardware fixtures (e.g. riser hose clamp) and drill equipment (e.g. drill pipe). However, there is potential for larger equipment to be dropped during the activity, particularly during recovery of infrastructure from the seabed. The spatial extent in which dropped objects can occur is restricted to the PAA.

Anchor Drag

A moored/ hybrid MODU may be used for drilling the wells, secured on station by an 8 to 12-point mooring system deployed to the seabed, as dictated by the mooring analysis. High energy weather events such as cyclones, occurring while the MODU is on station, can lead to excessive loads on the mooring lines, resulting in failure (either anchor(s) dragging or mooring lines parting). A failure of mooring integrity may lead to the mooring lines and anchors attached to the MODU being trailed across the seabed and over live infrastructure.

For a moored MODU, personnel on-board are typically evacuated during cyclones. Woodside implements a risk-based assessment process to aid in decision making for cyclone evacuations, with the well suspended prior to MODU evacuation. Support vessels also demobilise from the PAA during the passage of a cyclone. While the MODU is temporarily abandoned, the position of the MODU is monitored remotely for any deviation. Support vessels and MODU personnel return to the PAA as soon as safe to do so after a cyclone evacuation. Operational experience indicates cyclone evacuations typically last for seven days.

Industry statistics from the North Sea show that a single mooring line failure for MODUs is the most common failure mechanism (33 × 10-4 per line per year), followed by a double mooring line failure (11 × 10-4 per line per year) (Petroleumstilsynet, 2014). Note that single and double mooring line failures do not typically result in the loss of station keeping. If partial or complete mooring failures are sufficient to result in a loss of station keeping, industry experience indicates that MODUs may drift considerable distances from their initial position (Offshore: Risk & Technology Consulting Inc., 2002). Partial mooring failures leading to a loss of station keeping resulted in smaller MODU displacements, due to the remaining anchors dragging along the seabed when compared to complete mooring failures; complete mooring failures resulted in a freely drifting MODU (Offshore: Risk & Technology Consulting Inc., 2002).

NOPSEMA has recorded four cases of anchor drag due to loss of MODU holding station during cyclone activity between 2004 and 2015 (NOPSEMA 2015).

Impact Assessment

Potential impacts to environmental values

Interactions with other marine users

In the unlikely event of an object being dropped on, or anchors dragging over, live infrastructure there is potential impacts to the infrastructure and the Operators of that infrastructure.

If interactions with live infrastructure were to occur, Woodside would notify the relevant operations team in accordance with the SIMOPS plan. This would trigger responses from the Operator to assess and respond to any damage caused in accordance with the relevant operations EP for the live infrastructure. Under Regulation 56 of the Environment Regulations, a titleholder may refer NOPSEMA to information previously given to NOPSEMA for another purpose under the OPGGS Act, the Environment Regulations or any other regulations made under the Act, to comply with a requirement on the titleholder under the Environment Regulations to give NOPSEMA information or include information in a document. In accordance with Regulation 56, NOPSEMA is referred to the relevant operations EPs submitted by the Operators of the live infrastructure, and accepted by NOPSEMA, for the detail of the Operators' assessment and response in such a scenario. Potential impacts therefore include time and costs associated with inspecting the infrastructure and time and costs associated with any associated repair, which are expected to be slight and short-term in nature.

Potential subsequent loss of containment

In the unlikely event of an object being dropped on, or anchors dragging over, live infrastructure, and in the further unlikely event of a severe interaction with the infrastructure, there is a possibility that live infrastructure could be ruptured releasing hydrocarbons into the marine environment in such a scenario. In accordance with Regulation 56, NOPSEMA is referred to the relevant operations EPs submitted by the Operators of the live infrastructure, and accepted by NOPSEMA, for the detail of potential impacts, receptors and the extent of the environment that may be affected in such a scenario, being:

Julimar Operations EP (NOPSEMA Doc A771970, https://docs.nopsema.gov.au/A771970)

Wheatstone Project Start-up and Operations EP (NOPSEMA Doc: A853704, https://docs.nopsema.gov.au/A853704)

Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations (NOPSEMA Doc: A738138, https://docs.nopsema.gov.au/A738138)

Scarborough Seabed Intervention and Trunkline Installation (NOPSEMA Doc. A1027151, https://docs.nopsema.gov.au/A1027151)

As detailed in this Section above and below, this EP addresses the risks and impacts (interaction with live infrastructure) that arise from the activities under this EP (interaction from dropped objects and interaction from anchor drag). This EP also contains controls to prevent such an event from occurring that are within the operational control of this EP. As detailed in this Section, the operational control, maintenance and incident response associated with the live infrastructure and/or loss of containment from the live infrastructure is not within the operational control of this EP. As detailed below, the risks and impacts of the activities under this EP are managed to ALARP and an acceptable level by implementing the SIMOPS plan and notifying the relevant Operators in the instance of an interaction with live infrastructure to allow the relevant Operator's detailed response strategies under the relevant operations EPs to be triggered, if required. In the event of a loss of containment caused by an interaction with live infrastructure Woodside will follow direction from the relevant Operator and will respond as per the relevant Operator's requirements. In accordance with Regulation 56, NOPSEMA is referred to the relevant operations EPs submitted by the Operators of the live infrastructure, and accepted by NOPSEMA, for the detail of the operational control, maintenance and incident response associated with the live infrastructure and/or loss of containment from the live infrastructure.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[135]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Good Practice				
The MODU/PIV work procedures for lifts, bulk transfers and cargo loading, which require: The security of loads shall be checked prior to commencing lifts. Loads shall be covered if there is a risk of loss of loose materials. Lifting operations shall be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of an object being dropped during lifts, bulk transfers and cardo loading.	Benefits outweigh cost/sacrifice.	Yes C 25.1
Specifications and requirements for station keeping equipment (mooring systems), require that: systems are tested and inspected in accordance with API RP 21 systems have sufficient capability such that a failure of any single component will not cause progressive failure of the remaining anchoring arrangement.	F: Yes. CS: Minimal cost. Standard practice.	Reduces the likelihood of mooring failure leading to uncontrolled anchor drag.	Benefit outweighs cost sacrifice.	Yes C 25.2
Project-specific Mooring Design Analysis.	F: Yes. CS: Minimal cost. Standard practice.	By ensuring that a mooring analysis report is undertaken, the likelihood of mooring failure occurring is reduced. The mooring design analysis report specifically considers proximity to live infrastructure and manages potential impacts on that infrastructure accordingly.	Benefit outweighs cost sacrifice.	Yes C 4.3
Mooring system is tested to recommended tension as per API RP 2SK.	F: Yes. CS: Minimal cost. Standard practice	Reduces the likelihood of anchor drag.	Benefit outweighs cost sacrifice.	Yes C 25.3

[135] Qualitative measure

Professional Judgement – Eliminate				
No additional controls identified				
Professional Judgement – Substitute				
No additional controls identified				
Professional Judgement – Engineered Solution				
MODU tracking equipment operational when the MODU unmanned.	F: Yes. CS: Minimal cost. Standard practice.	Although no reduction in consequence would occur, the overall risk is reduced as the location of the MODU would be known at all times and the appropriate response could be deployed in the event of a loss of station keeping.	Benefit outweighs cost sacrifice.	Yes C 25.4
SIMOPS Plan in place when MODU working in vicinity of other facilities, vessels or live infrastructure i.e. during xmas tree installation. SIMOPS Plan will contain information on: Minimum separation distances Communications MODU / vessels / activities involved in SIMOPS Exclusion zone entry and exit processes ROV operations Helicopter operations Key roles, responsibilities and emergency contacts PTW arrangements Incident reporting and investigation Management of Change	F: Yes. CS: Minimal cost. Standard practice.	SIMOPS Plan contains detail such as communications requirements, exclusion zones and entry/exit requirements and roles and responsibilities – which can help reduce likelihood of interactions with live infrastructure, it also contains notification protocols in the event of an interaction with live infrastructure. The SIMOPS plan also requires notification in the event of an incident or interaction with infrastructure thus triggering response strategies in the relevant operations EPs. The detailed response is in the Ops EP and the implementation of that would be triggered by the SIMOPS plan and Woodside will support the response according to the other Operator's requests.	Benefits outweigh cost/sacrifice. Control is also Standard Practice.	Yes C 1.10

ALARP Statement

Woodside considers the adopted controls appropriate to manage the risks of a significant dropped object or anchor drag interacting with live infrastructure within the PAA. As no reasonable additional/alternative controls were identified that would further reduce the risks and consequences without disproportionate sacrifice, the risks and consequences are considered ALARP.

Demonstration of Acceptability

Acceptability Statement

The impact assessment has determined that interaction with live infrastructure from dropped objects or a loss of station keeping of the MODU represents a low current risk rating and is unlikely to result in a risk consequence greater than slight. The adopted controls are considered industry good practice.

The potential risks and consequences are considered broadly acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the risks of seabed disturbance from dropped objects / anchor drag to an acceptable level.

Environmental Performance Outcomes, Standards and Measurement Criteria

Outcomes	*Controls*	*Standards*	*Measurement Criteria*
EPO 29 No interactions with live infrastructure resulting in loss of hydrocarbons to the marine environment during the PAP	C 1.10	PS 1.10	MC 1.10.1
	C 4.3	PS 4.3	MC 4.3.1
	C 25.1 The MODU/PIV work procedures for lifts, bulk transfers and cargo loading, which require: The security of loads shall be checked prior to commencing lifts. Loads shall be covered if there is a risk of loss of loose materials. Lifting operations shall be conducted using the PTW and JSA systems to manage the specific risks of that lift, including consideration of weather and sea state.	PS 25.1 All lifts conducted in accordance with applicable MODU/ installation vessel work procedures to limit potential for dropped objects.	MC 25.1.1 Records show lifts conducted in accordance with the applicable MODU/ installation vessel work procedures.
	C 25.2 Specifications and requirements for station keeping equipment (mooring systems), require that: systems are tested and inspected in accordance with API RP 21 systems have sufficient capability such that a failure of any single component will not cause progressive failure of the remaining anchoring arrangement.	PS 25.2 MODU mooring system tested and in place to ensure no complete mooring failure.	MC 25.2.1 Records demonstrate mooring system tests and inspection.
	C 25.3 Mooring system is tested to recommended tension as per API RP 2SK.	PS 25.3 Monitoring compliant with ISO 19901-7:2013	MC 25.3.1 Records confirm mooring system is tested to recommended tension as per API RP 2SK.
	C 25.4 MODU tracking equipment operational when the MODU unmanned.	PS 25.4 Tracking of the MODU is possible when the MODU is unmanned.	MC 25.4.1 Records show the moored MODU has functional tracking equipment for instances when MODU is unmanned.

6.10 Recovery Plan and Threat Abatement Plan Assessment

This section describes the assessment that Woodside has undertaken to demonstrate that the Petroleum Activities Program is not inconsistent with any relevant recovery plans or threat abatement plans. For the purposes of this assessment, the relevant Part 13 statutory instruments (recovery plans and threat abatement plans) are:

- Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017).
- Conservation Management Plan for the Blue Whale 2015–2025 (Commonwealth of Australia, 2015a).
- National Recovery Plan for the Southern Right Whale (DCCEEW, 2024b)
- Recovery Plan for the Grey Nurse Shark (Carcharias taurus) 2014 (Commonwealth of Australia, 2014).

Sawfishes and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015b).

Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (Commonwealth of Australia, 2018).

Table 6-46 lists the objectives and (where relevant) the action areas of these plans, and also describes whether these objectives/action areas are applicable to government, the Titleholder, and/or the Petroleum Activities Program. For those objectives/action areas applicable to the Petroleum Activities Program, the relevant actions of each plan have been identified, and an evaluation has been conducted as to whether impacts and risks resulting from the activity are not inconsistent with that action.

The assessment of potential impacts and risks to pygmy blue whales from underwater noise emissions has taken into account the definitions of terminology in the CMP, as described in the DAWE and NOPSEMA guidance released in September 2021. Similarly, the assessment against relevant actions in the CMP in Table 6-47 has been undertaken in the context of the definitions included in the guidance note.

Table 6-45: Identification of Applicability of Recovery Plan and Threat Abatement Plan Objectives and Action Areas

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
Marine Turtle Recovery Plan			
Long-term Recovery Objective: Minimise anthropogenic threats to allow for the conservation status of marine turtles to improve so they can be removed from the EPBC Act threatened species list	Y	Y	Y
Interim Recovery Objectives			
Current levels of legal and management protection for marine turtle species are maintained or improved, both domestically and throughout the migratory range of Australia's marine turtles	Y		
The management of marine turtles is supported	Y		
Anthropogenic threats are demonstrably minimised	Y	Y	Y
Trends in nesting numbers at index beaches and population demographics at important foraging grounds are described	Y	Y	
Action Areas			
A. Assessing and addressing threats			
A1. Maintain and improve efficacy of legal and management protection	Y		
A2. Adaptatively 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		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
B. Enabling and measuring recovery			
B1. Determine trends in index beaches	Y	Y	
B2. Understand population demographics at key foraging grounds	Y		
B3. Address information gaps to better facilitate the recovery of marine turtle stocks	Y	Y	Y
Blue Whale Conservation Management Plan			
Long-term recovery objective: Minimise anthropogenic threats to allow for their conservation status to improve so that they can be removed from the EPBC Act threatened species list	Y	Y	Y
Interim Recovery Objectives			
The conservation status of blue whale populations is assessed using efficient and robust methodology	Y		
The spatial and temporal distribution, identification of biologically important areas, and population structure of blue whales in Australian waters is described	Y	Y	Y
Current levels of legal and management protection for blue whales are maintained or improved and an appropriate adaptive management regime is in place	Y		
Anthropogenic threats are demonstrably minimised	Y	Y	Y
Action Areas			
A. Assessing and addressing threats			
A.1: Maintain and improve existing legal and management protection	Y		
A.2: Assessing and addressing anthropogenic noise	Y	Y	Y
A.3: Understanding impacts of climate variability and change	Y		
A.4: Minimising vessel collisions	Y	Y	Y
B. Enabling and Measuring Recovery			
B.1: Measuring and monitoring population recovery	Y		
B.2: Investigating population structure	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
B.3: Describing spatial and temporal distribution and defining biologically important habitat	Y	Y	Y
Southern Right Whale Recovery Plan			
Long-term vision: increase population to a level that the conservation status has improved and the species no longer qualifies for listing as threatened under any of the EPBC Act listing criteria.	Y	Y	Y
Interim Recovery Objectives			
• Current levels of Commonwealth and State legislative and management protection for southern right whales are implemented, maintained, or improved, so threats continue to be managed and reduced over the life of the plan	Y		
• Anthropogenic threats are managed consistent with ecologically sustainable principles to facilitate recovery of southern right whales	Y	Y	Y
• Population dynamics, including demographics, distribution, residency, and coastal movement across the species range are monitored and quantified using robust, standardised, best-practice methodology to assess population recovery	Y		
• The population structure in Australian waters is clearly characterised to evaluate the degree to which the western and eastern populations are separate populations and inform the degree of connectivity with other southern right whale populations	Y		
• Capability of First Nation Australians, research, citizen science, and general community groups is improved to assist in addressing recovery actions of southern right whales in Australia.	Y		
Action Areas			
Assess and address key threats			
A1: Maintain, implement and improve efficacy of current legislative and management protection for southern right whales.	Y		
A2: Address habitat degradation impacts from coastal and offshore marine infrastructure developments within the species' range.	Y	Y	Y
A3: Understand impacts of climate variability and anthropogenic climate change on the species biology and population recovery.	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
A4: Manage and mitigate the threat of entanglements from commercial active or discarded fishing gear throughout the species' range in Australian waters.	Y		
A5: Assess, manage, and mitigate impacts from anthropogenic underwater noise.	Y	Y	Y
A6: Manage, minimise and mitigate the threat of vessel strike.	Y	Y	Y
Measure recovery			
B1: Measure and monitor population demographic and recovery	Y		
B2: Characterise population structure	Y		
B3: Determine migratory paths and offshore distribution	Y		
B4: Improve capability of First Nation Australians, research, citizen science, and general community groups to assist management of southern right whales	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			
Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters	Y		
Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range	Y		
Where practicable, minimise the impact of shark control activities on the grey nurse shark	Y		

EPBC Act Part 13 Statutory Instrument	Applicable to:		
	Government	***Titleholder***	***Petroleum Activities Program***
Investigate and manage the impact of ecotourism on the grey nurse shark	Y		
Manage the impact of aquarium collection on the grey nurse shark	Y		
Improve understanding of the threat of pollution and disease to the grey nurse shark	Y	Y	Y
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	
Continue to develop and implement research programs to support the conservation of the grey nurse shark	Y	Y	
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			
Reduce and, where possible, eliminate adverse impacts of commercial fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate adverse impacts of recreational fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate adverse impacts of Indigenous fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate the impact of illegal, unregulated and unreported fishing on sawfish and river shark species	Y		
Reduce and, where possible, eliminate adverse impacts of habitat degradation and modification on sawfish and river shark species	Y	Y	Y
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***
Reduce and, where possible, eliminate any adverse impacts of collection for public aquaria on sawfish and river shark species	Y		
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		
Develop research programs to assist conservation of sawfish and river shark species	Y	Y	
Improve community understanding and awareness in relation to sawfish and river shark conservation and management	Y		
Marine Debris Threat Abatement Plan			
Objectives			
Contribute to long-term prevention of the incidence of marine debris	Y	Y	
Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations	Y	Y	Y
Remove existing marine debris	Y		
Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris, and assess the effectiveness of management arrangements for reducing marine debris	Y		
Increase public understanding of the causes and impacts of harmful marine debris, including microplastic and hazardous chemical contaminants, to bring about behaviour change	Y		

Table 6-46: Assessment against relevant actions of the Marine Turtle Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
Marine Turtle Recovery Plan	Action Area A3: Reduce the impacts from marine debris	Action: Support the implementation of the Marine Debris Threat Abatement Plan (TAP) Priority actions at stock level: G-NWS – Understand the threat posed to this stock by marine debris LH-WA – Determine the extent to which marine debris is impacting loggerhead turtles F-Pil – no relevant actions	Not inconsistent assessment: The assessment of the accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to marine turtles. Controls have been implemented to reduce the likelihood of accidental release of solid wastes for the duration of the petroleum activities program.	EPO 24 C 24.1 PS 24.1
	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	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.	Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in Sections 6.8 and 6.9

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
	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 important behaviours of nesting adults and emerging/dispersing hatchlings can continue	Not inconsistent assessment: The assessment of light emissions has considered the potential impacts to marine turtles. Internesting, mating, foraging or migrating turtles are not impacted by light from offshore vessels. Based on the frequency and nature of IMMR activities, the impacts to adult turtles moving through the PAA from vessel lighting are expected to be localised and temporary with no lasting effect.	EPO 12 C 12.1, 12.2, C 10.8 PS 12.1, 12.2, 10.8
	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 Program1.	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	Not inconsistent assessment: The assessment of acoustic emissions has considered the potential impacts to marine turtles. Noise related to the Petroleum Activities Program is not expected to result in behavioural response, injury or mortality of individuals, or any other lasting effect.	EPO 4 C 4.1 PS 4.1

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

Table 6-47: 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	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 pygmy blue whale. There are no known or possible foraging areas for pygmy blue whales within or adjacent to the PAA. If the Petroleum Activities Program within the PAA overlaps with an individual northbound or southbound migration, they may deviate slightly from the migratory route, but will continue on their migration.	EPO 4 C 4.1 PS 4.1
	Action Area A.4: Minimising vessel collisions	Action 3: Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented	Not inconsistent assessment: The assessment of vessel collision with marine fauna has considered the potential risks to pygmy blue whales. If the Petroleum Activities Program within the PAA overlaps with an individual northbound or southbound migration, they may deviate slightly from the migratory route, but will continue on their migration. Vessel collisions with pygmy blue whales are highly unlikely to occur, given the low operating speed of support vessels.	EPO 26 C 4.1 PS 4.1
	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).	N/A
Assessment Summary The Blue Whale Conservation Management Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

Table 6-48: Assessment against relevant actions of the Southern Right Whale Recovery Plan

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
National Recovery Plan for the Southern Right Whale	A2: Address habitat degradation impacts from coastal and offshore marine infrastructure developments within the species' range.	Action 1 Coastal and offshore development actions are assessed according to principles of ecological sustainable development to ensure the risk of injury, auditory impairment and/or disturbance to southern right whales is maintained. Action 3 Current information on species' occurrence, particularly in HCTS, BIAs, and historic high use areas, are used to inform planning, assessment, and decision-making on marine infrastructure development actions.	Not inconsistent assessment: This EP assesses the potential impacts of the petroleum activity do not result in the risk of injury, auditory impairment and/or disturbance to southern right whales, particularly within the HCTS and BIAs that are located over 250 km from the Operational Areas.	N/A
	A5: Assess, manage, and mitigate impacts from anthropogenic underwater noise.	Action 2: Actions within and adjacent to southern right whale BIAs and HCTS should demonstrate that it does not prevent any southern right whale from utilising the area or cause auditory impairment. Action 3: Actions within and adjacent to southern right whale BIAs and HCTS should demonstrate that the risk of behavioural disturbance is minimised. Action 4: Ensure environmental assessments associated with underwater noise generating activities include consideration of national policy (e.g., EPBC Act Policy Statement 2.1) and guidelines related to managing anthropogenic underwater noise and implement appropriate mitigation measures to reduce risks to southern right whales to the lowest possible level. Action 5: Quantify risks of anthropogenic underwater noise to southern right whales, including studies aimed to measure physiological effects, behavioural disturbance, and changes to acoustic communication (e.g., masking of vocalisations) to whales.	Not inconsistent assessment: The assessment of acoustic emissions has considered the potential impacts to southern right whales. The nearest BIAs and HCTS for the southern right whale being over 250 km from the Operational Areas therefore it is not expected that noise from the petroleum activity program will impact the southern right whales.	N/A

Part 13 Statutory Instrument	Relevant Action Areas/Objectives	Relevant Actions	Evaluation	EPO, Controls and PS
	A6: Manage, minimise and mitigate the threat of vessel strike.	Action 1: Assess risk of vessel strike to southern right whales in BIAs Action 3: Ensure environmental impact assessments and associated plans consider and quantify the risk of vessel strike and associated potential cumulative risks in BIAs and HCTS/.	Not inconsistent assessment: The assessment of vessel collision with marine fauna has considered the potential risks to southern right whales. The nearest BIAs and HCTS for the southern right whale being over 250 km from the Operational Areas therefore it is not expected that there is a risk of vessel strike.	N/A
Assessment Summary The National Recovery Plan for the Southern Right Whale 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 6-49: 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	Not inconsistent assessment: This EP includes an assessment of the impacts from accidental release of solid wastes as well as planned discharges of drilling waste on marine species.	N/A
			Not inconsistent assessment: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to grey nurse sharks. Spill risk strategies and response program include management measures, as identified and required.	Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in Section 6.8 and 6.9.
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 6-50: 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	Not inconsistent assessment: The assessment of accidental release of chemicals / hydrocarbons has considered the potential risks to sawfish and river shark. Spill risk strategies and response program include management measures, as identified and required.	Detailed oil spill preparedness and response performance outcomes, standards and measurement criteria for the Petroleum Activities Program are present in Appendix H.
	Objective 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	Action 6a: Assess the impacts of marine debris including ghost nets, fishing gear and plastics on sawfish and river shark species	Not inconsistent assessment: The assessment of the accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to sawfish. Controls have been implemented to reduce the likelihood of accidental release of solid wastes for the duration of the petroleum activities program.	N/A
Assessment Summary The Sawfish and River Shark Recovery Plan has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

Table 6-51: 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	Not inconsistent assessment: The assessment of the accidental release of solid hazardous and non-hazardous wastes has considered the potential risks to the marine environment. Controls have been implemented to reduce the likelihood of accidental release of solid wastes for the duration of the petroleum activities program.	N/A
Assessment Summary The Marine Debris TAP has been considered during the assessment of impacts and risks, and the Petroleum Activities Program is not considered to be inconsistent with the relevant actions of this plan.				

6.11 First Nations Cultural Features and Heritage Values Assessment

As described in Section 4.9 the identification of cultural features and heritage values of the environment as well as the social, economic and cultural features important to First Nation's people is integral to understanding the environment and any potential impacts and risks to the environment.

In line with Woodside's First Nations Communities Policy (December 2023), Woodside seeks to avoid damage or disturbance to cultural heritage (including intangible heritage) and, if avoidance is not possible, minimise and mitigate the impacts, in consultation with First Nation communities and Traditional Custodians. Mitigation can include any measure or control aimed at ensuring the viability of the intangible cultural heritage and its intergenerational transmission. This can include reducing impacts and risks to environmental features that are associated with intangible cultural heritage (UNESCO 2003; ICOMOS 2013).

It is important to note that not all topics raised by First Nations groups / individuals through consultation are considered values for the purpose of the cultural features and heritage values impact assessment below. A number of topics were raised in the context of a general interest in environmental management and ecosystem health (i.e., natural environment interest), where the group/individual was seeking further information about potential impacts and risks from the Petroleum Activities Program on a receptor. As these interests relate to the maintenance of the natural environment, these are adequately addressed through impact and risk assessments and not further assessed below.

Aspect	Cultural Features and Heritage Values
Description of Source Impact/ Risk	***Physical presence of vessels*** The Petroleum Activities Program involves operation of the Pluto Facility and the drilling and tie-back of one new production well (Xena-03). The MODU will be present within the Operational Area for ~60 days to drill the Xena-03 well. When underway, activities will be 24 hours per day, seven days per week. Subsea installation vessels will be used to install and cold commission the flowlines and subsea infrastructure following the completion of drilling the new well. This is expected to take ~ 3 weeks. Temporary exclusion zones will be established around the MODU. ***Acoustic emissions from vessels*** MODUs, installation vessels and support vessels (including ASV and AHVs) undertaking the Petroleum Activities Program will generate noise both in the air and underwater. During drilling operations, the MODU will produce low-intensity continuous sound. In addition, the Petroleum Activities Program will be supported by DP capable vessels. These noises will contribute to and can 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 1 µPa (RMS SPL) under windy conditions. ***Unplanned hydrocarbon release from loss of well containment (basis of EMBA)*** For each source of risk, the credible worst-case scenario in conjunction with impact thresholds is used to determine the spatial extent of the EMBA. The worst-case unplanned event is considered to be an unplanned hydrocarbon release. The stochastic modelling approach to determining the EMBA involves numerous simulations covering a range of metocean conditions representing currents and winds that typically prevail over the course of a year. The EMBA is generated from a composite of outcomes of each simulation and therefore covers a larger area than the area that could be affected during any one single spill event. In the event of a spill, the area that would be affected would be much smaller than the EMBA. The EMBA is driven by the distribution of entrained hydrocarbon above ecological thresholds and hence although Islands such as Barrow and Montebello Islands, and mainland coastlines are within the EMBA, these are not expected to be affected unless there is shoreline contact above thresholds. Whilst the EMBA is driven by predictions of entrained hydrocarbons, the scenario associated with the most significant consequence involves shoreline contact, which is predicted from the scenario of subsea equipment loss of containment.

<table>
<tr><th>Aspect</th><th colspan="4">Cultural Features and Heritage Values</th></tr>
<tr><td></td><td colspan="4">Refer to Section 6.8.5 and 6.8.6 for more details.</td></tr>
<tr><td>Receptor sensitivity</td><td colspan="4">Cultural features and heritage values: High value
Marine mammals: High value species
Marine reptiles: High value species
Fish: High value species</td></tr>
<tr><td rowspan="5">Planned Activities</td><td colspan="4">The potential environmental impact to species that have a cultural feature or heritage value have been summarised below to provide the context of a potential impact significance level to those species to understand any cumulative impact on the cultural feature or heritage value.</td></tr>
<tr><td>Aspect</td><td colspan="3">Impact Significance Level</td></tr>
<tr><td>Environmental impact assessment to marine species</td><td>Marine mammals</td><td>Marine reptiles</td><td>Fish</td></tr>
<tr><td>6.6.7 Routine Light Emissions: External Lighting on Project Vessels</td><td>N/A</td><td>Slight (E)</td><td>N/A</td></tr>
<tr><td>6.6.3 Routine Acoustic Emissions – Generation of Noise from Project Vessels and Positioning Equipment</td><td>No Lasting (F)</td><td>No Lasting (F)</td><td>No Lasting (F)</td></tr>
<tr><td></td><td>6.6.5 Routine and Non-Routine Discharges: (Utility Systems)</td><td>No Lasting (F)</td><td>No Lasting (F)</td><td>No Lasting (F)</td></tr>
<tr><td rowspan="15">Unplanned Activities</td><td colspan="4">The potential environmental risks to species considered to have cultural value to Traditional Owners have been summarised below and attributed a risk rating to understand cumulative impacts on them as a cultural feature or heritage value.</td></tr>
<tr><td>Aspect</td><td colspan="3">Risk Rating</td></tr>
<tr><td>Environmental risk assessment to marine species</td><td>Marine mammals</td><td>Marine reptiles</td><td>Fish</td></tr>
<tr><td>6.7.1 Unplanned Discharge: Release of Hydrocarbons or Chemicals during transfer, storage, and use</td><td>Moderate</td><td>Moderate</td><td>Moderate</td></tr>
<tr><td>6.7.2 Unplanned Discharge: Hazardous and Non-hazardous Waste Management</td><td>Moderate</td><td>Moderate</td><td>Moderate</td></tr>
<tr><td>6.7.3 Physical Presence: Interaction with Marine Fauna</td><td>Low</td><td>Low</td><td>Low</td></tr>
<tr><td>6.8.3 Unplanned Hydrocarbon Release: Loss of well containment</td><td>Moderate</td><td>Moderate</td><td>Moderate</td></tr>
<tr><td>6.8.4 Unplanned Hydrocarbon Release: Subsea flowline and Riser Loss of Containment</td><td>High</td><td>High</td><td>High</td></tr>
<tr><td>6.8.5 Unplanned Hydrocarbon Release: Topside Loss of Containment</td><td>High</td><td>High</td><td>High</td></tr>
<tr><td>6.8.6 Unplanned Hydrocarbon Release: Offloading Equipment Loss of Containment</td><td>Moderate</td><td>Moderate</td><td>Moderate</td></tr>
<tr><td>6.8.7 Unplanned Hydrocarbon Release: Cargo Tank Loss of Containment</td><td>Moderate</td><td>Moderate</td><td>Moderate</td></tr>
<tr><td>6.8.8 Unplanned Hydrocarbon Release: Loss of Structural Integrity</td><td>High</td><td>High</td><td>High</td></tr>
<tr><td>6.8.9 Unplanned Hydrocarbon Release: Loss of Marine Vessel Separation</td><td>High</td><td>High</td><td>High</td></tr>
<tr><td>6.8.10 Unplanned Discharge: Loss of suspended Load</td><td>Moderate</td><td>Moderate</td><td>Moderate</td></tr>
</table>

Aspect	Cultural Features and Heritage Values
Impact and Risk Assessment	The PAP has the potential to impact cultural features and heritage values through the following ways: ***Intangible Cultural Heritage*** Songlines: Songlines can become lost, fragmented, or broken when there is a loss of Country or forced removal from Country (Neale and Kelly, 2020:30). Physical sites that have been identified as comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. It is noted that oil and gas infrastructure exists in many areas of the North West Shelf, and that songlines are still acknowledged and recognised. It is inferred that if there were to be any impacts to surviving songlines these would be significantly more likely to be described as qualitative (i.e. "weaken" a songline) rather than binary or absolute (i.e. destroy a songline). Creation/dreaming sites; sacred sites; ancestral beings: Activities that physically alter landscape features may be assumed to potentially impact values of creation/dreaming sites, sacred sites or ancestral beings. Cultural obligations to care for Country: Environmental impacts may be assumed to impact rights and obligations to care for Sea Country. Exclusion of Traditional Custodians from Sea Country (e.g. by restricting access) or decision-making processes (e.g. by not conducting ongoing consultation) are other potential sources of impact. Knowledge of Country/customary law and transfer of knowledge: Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population. Therefore, the transmission of these skills is expected to be impacted where there are impacts at the species/population level. Limitations on access to sites or disruption/relocation of First Nations communities may have implications for the preservation of First Nations knowledge. Connection to Country: Where people are displaced or disrupted (e.g. during colonisation) or where there is a loss of technical skills or environmental knowledge this may damage connection to Country (McDonald and Phillips, 2021). Access to Country: Impacts to access to Country may be classified as temporary (e.g. where exclusion zones exist around activities for safety reasons) or permanent (e.g. where infrastructure obstructs access or navigation). Impacts to access to Country can only occur in areas that were traditionally accessed by Traditional Custodians. This is anticipated to be focussed on areas adjacent to the coast. Restrictions on Access to Country: Access to the operational area has not been identified as a cultural issue, however some areas within the EMBA may not be culturally appropriate to access. Impacts to this value may occur where spill response access areas that are not appropriate, or in ways that are not consistent with traditional law. Kinship systems and totemic species: It is assumed that marine species may have kinship/totemic relationships to Traditional Custodians, but it is understood that these relationships do not prohibit people outside of that "skin group" from hunting or eating that same species (Juluwarlu, 2004). It is therefore inferred that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals. Resource collection: Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, marine species (as resources) will be impacted where there is an impact at the species/population level. ***Marine Ecosystems and Species:*** Marine ecosystems may hold both cultural and environmental value with cultural and environmental values intrinsically linked (DCCEEW, 2023; MAC, 2021 as cited in Woodside, 2023a). It necessarily follows that an impact to marine ecosystems has the potential to impact cultural features where the impact is detectable within Sea Country—the seascape which Traditional Custodians view, interact with or hold knowledge of. ***Coastal landforms*** Coastal landforms may have cultural values either through association with intangible values described above (e.g. as features of a songline, physical manifestations of ancestor beings etc.) or as archaeologically prospective locations (e.g. water sources with increased habitation/use, dunes used for burials etc.)

Aspect	Cultural Features and Heritage Values
	Intangible Values ***Songlines*** Management of intangible cultural heritage can include reducing impacts and risks to tangible features that are associated with intangible cultural heritage (UNESCO, 2003; ICOMOS, 2013). Impacts to marine plants, animals and other cultural features associated with songlines might impact the intergenerational transmission of knowledge of songlines when individuals can no longer witness or interact with the cultural features tied to songlines on Country. Therefore, managing songlines may require environmental controls to minimise potential impact to marine fauna at a population level, including migratory routes. Refer to species specific assessment below for further information. Physical features comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. Songlines can become lost, fragmented, or broken when there is a loss of Country or impact to culturally important physical features (Neale and Kelly, 2020:30). No specific details of songlines within the EMBA have been provided by relevant persons during consultation for this Activity, and no landforms typical of songlines (e.g. rocks, mountains, rivers, caves and hills (Higgins 2021:724)) are anticipated to be impacted by the Activity. ***Creation/Dreaming Sites; Sacred Sites; Ancestral Beings*** Woodside has undertaken all reasonable steps to identify creation and dreaming sites, sacred sites, and places associated with ancestral beings within the EMBA. No such sites have been identified. A review of relevant literature has been undertaken which has identified creation, dreaming and ancestral narratives related to the sea more broadly without confirming where (if anywhere) these overlap the EMBA. These references are of a general nature, and do not identify any features or values requiring specific protection or management from the proposed activities. In the literature reviewed, sea serpents or water serpents are common in Aboriginal creation narratives, and several references were identified. The majority of these refer to serpents residing within inland rivers or pools outside of the EMBA (Barber and Jackson, 2011, Hayes v Western Australia [2008] FCA 1487, Juluwarlu, 2004; Water Corporation, 2019). In some versions, the serpent originates from the sea or coast and creates the rivers as it heads inland. Areas of the current coastline and past coastlines at various points along the Ancient Landscape—where the Serpent would have emerged onto the land—are within the EMBA. Areas of the broader ocean where the serpent may have originally lived are not specified. Barber and Jackson (2011) also recount a story where a freshwater serpent pushes a sea serpent back into the ocean where it presumably continues to reside. This does not provide the specificity required to determine the location of sea serpents within the sea, and it is possible that the ocean as a whole (out to and beyond other continents) should be viewed generally as housing the sea serpent(s). Consultation with Traditional Custodians and ethnographic surveys have not identified impacts on sea serpents from the PAP. However, by analogy to other water serpent narratives across Australia, possible impact pathways may include interruption of its path by blocking or reducing flows of water, damaging sacred sites such as thalu or rock art sites or depleting water sources. No impacts to water flows (either tidal movement or ocean currents) or depletion of water sources are anticipated from this PAP. ***Cultural Obligations to Care for Country*** Caring for Country collectively refers to the cultural obligations of individuals and groups, as well as rituals and ceremonies required for the physical and spiritual health of the environment. Lack of access to coastally located cultural sites that carry songlines or remain ceremonially important can impact First Nations people's livelihoods and impact their ability to carry out cultural obligations on Country. ***Knowledge of Country/Customary Law and Transfer of Knowledge*** Cultural knowledge about Sea Country/customary law and the intergenerational transmission of knowledge are important values identified through consultation, assessments and the literature review. Transfer of knowledge includes continuing traditional practices to pass on practical skills. Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population—for example traditional fishing methods require the survival of traditional fish resources. Therefore, ensuring the transmission of cultural knowledge may require environmental controls protecting species and migratory pathways at a population level. Refer to species specific assessment below for further information.

Aspect	Cultural Features and Heritage Values
	Connection to Country Connection to Country describes the multi-faceted relationship between First Nations people and the landscape, which is envisioned as having personhood and spirit. No impacts to connection to country are anticipated as a result of exclusion or displacement of Aboriginal communities. Access to Country is discussed below. ***Access to Country*** Access to Country, including Sea Country, is necessary for the continuation of other values including caring for Country and the transfer of traditional knowledge. Access is also a value in its own right, as a continuation of traditional Sea Country access and use. Access to areas within the Operational Area may be limited where exclusion zones are established around vessels for safety purposes. Further the exclusion zones around drilling activities are temporary and presence of subsea infrastructure are not anticipated to affect navigation, particularly given the water depth. Access to Country within the EMBA is also not expected to be affected in the highly unlikely event of an unplanned hydrocarbon release. However relevant cultural authorities will be engaged in the event of a spill that may affect them. ***Restrictions on Access to Country*** No information was received which suggested any part of the Operational Area cannot be accessed in a culturally appropriate way. However, some areas of the EMBA may be subject to cultural restrictions on access or may be culturally dangerous to access in any respect. Access to these areas would only be required in response to an unplanned impact. Kinship Systems and Totemic Species Individuals may have kinship to specific species (Smyth, 2008; Juluwarlu, 2004) and/or a responsibility to care for species (Muller, 2008). These relationships are understood to impose obligations on Traditional Custodians. It is understood that these obligations do not impose restrictions on other people generally, but it is considered that impacts to species at a population level may inhibit Traditional Custodians with kinship relationships' ability to perform their obligations where this results in reduced or displaced populations. It is therefore considered that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals. As such, impacts to individual marine fauna is not expected to impact on the totemic or kinship cultural connection. Refer to species specific assessment below for further information. ***Resource Collection*** A number of marine species are identified through consultation and literature as important resources, particularly as food sources. In addition to their immediate value as sustenance, the gathering and preparation of these resources are informed by cultural knowledge, and an inability to use these resources may result in a loss of ability to transfer that knowledge to future generations. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these communities may be impacted where there is an impact at the species/population level. Refer to species specific assessment below for further information. Relevant cultural authorities will be engaged in the event of a spill that may affect them. **Marine Species** ***Marine Mammals*** There are increase ceremonies/rituals for species of animals and plants, important to First Nations, to enhance or maintain populations. Thalu are places where these increase ceremonies are performed. All mentions of active ceremonial sites were confined to onshore locations, though the values may extend offshore where, for example, the thalu relates to marine species populations. As thalu ceremonies are performed to maintain and increase populations of marine species, it is considered that management applies at the species/population level and not to individuals—for example the thalu site on Murujuga which "brings in whales to beach" will continue to serve its purpose so long as whales continue to migrate through Mermaid Sound. Related intangible cultural heritage may include the transmission of cultural knowledge about whales and whale behaviour, including birthing areas, whale communication and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn, 2021). First Nations groups have expressed interest about whale migratory routes and studies. Inter-generational transmission of cultural knowledge (including songlines) relating to marine mammals may be impacted where changes to population or behaviour at a population level results in reduced sightings (e.g. through

Aspect	Cultural Features and Heritage Values
	population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO, 2003). As described in the relevant environmental impact and risk assessment, potential impacts to whales are limited to behavioural disturbance to transient individuals, which are not considered to be ecologically significant at a population level, and hence not expected to impact the value of marine mammals, including the transmission of cultural knowledge. The Operational Area does overlap the BIAs for Migration for the Pygmy Blue Whale and Humpback Whale. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained. ***Marine Reptiles*** Turtles and their eggs have been identified through consultation and existing literature as an important resource, particularly as food sources. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level. Intangible cultural heritage may also include the transmission of cultural knowledge about marine reptiles, such as nesting areas, hunting areas and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn, 2021). First Nations groups have expressed an interest regarding turtle monitoring programs and migration patterns. Activities that impact turtle populations and their marine environment may have an indirect impact on some Aboriginal communities as this can limit access to cultural sites or deplete hunting areas that would threaten local food security (Delisle et al., 2018:251). Inter-generational transmission of cultural knowledge (including Songlines) relating to marine reptiles may be impacted where changes results in reduced sightings (e.g. through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO, 2003). As described in the relevant environmental impact and risk section, potential impacts to marine reptiles are predicted to be at an individual level, which are not considered to be ecologically significant at a population level. Impacts will not occur to significant proportions of the populations of the species, nor result in a decrease of the quality of the habitat such that the extent of these species is likely to decline. Further, the Operational Area and EMBA do overlap marine turtle BIAs. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained. ***Fish*** Fish have been identified through consultation and existing literature as an important resource, particularly as food sources. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level. During consultation, fish were identified as important agents in the management of the broader ecosystem in Mermaid Sound, and generally to marine environments. Inter-generational transmission of cultural knowledge relating to fish may be impacted where changes to population/behaviour results in reduced sightings (e.g. through population decline). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO, 2003). Intangible cultural heritage associated with fish, including inter-generational knowledge regarding fishing techniques and migratory patterns, can be managed by reducing impacts to fish in nearshore marine environments to which this cultural knowledge is intrinsically connected. As described in the relevant environmental impact and risk sections, it is expected that fish, sharks and rays may demonstrate avoidance or attraction behaviour however, potential impacts are not considered to be ecologically significant at a population level. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained. ***Benthic habitats (coral, seagrass)*** Through consultation, First Nations groups identified benthic habitats as valuable for their ecological values, including corals attracting fish and seagrass providing shelters for fauna, as well as an important habitat for dugongs. Additionally, coral is valued by MAC for its aesthetic values. As described in the relevant environmental impact assessments, the potential impacts from the PAP on benthic habitats is assessed to be no lasting effect.

Aspect	Cultural Features and Heritage Values
	In terms of risk, a change in habitat may occur due to a change in water or sediment quality following an unplanned hydrocarbon release. Given hydrocarbon characteristics, rapid weathering, short-term exposure, as well as the response strategies planned to be deployed, an unplanned release is not expected to result in a level of exposure to coral and seagrass that would cause an adverse impact on marine ecosystem functioning or integrity results. As such, cultural values and intangible cultural heritage associated with benthic habitats are expected to be maintained. ***Shoreline Habitats (coastal vegetation, mangroves)*** Through consultation, First Nations groups identified shoreline habitats as valuable for their ecological values, including coastal vegetation such as mangroves which provide shelter to marine invertebrates, which are identified resources, and potential nursery for turtles. Literature also notes that mangroves are also valued for the flora and fauna they are associated with and support (Commonwealth of Australia 2002) and Smyth (2007) reports that mangrove seeds are used as a resource by Ngarda-Ngarli. There is no overlap between the Operational Area and shoreline habitats, and no planned impacts to shoreline habitats from the PAP. In terms of risk, a change in habitat may occur due to a change in water or sediment quality following an unplanned hydrocarbon release. Given hydrocarbon characteristics, rapid weathering, as well as the response strategies planned to be deployed, an unplanned release is not expected to have a substantial adverse impact on marine ecosystem functioning or integrity. As such, cultural values and intangible cultural heritage associated with shoreline habitats are expected to be maintained. ***Coastal Landforms*** There is no overlap between the Operational Area and coastal landforms, and no planned impacts to coastal landforms from the PAP. For coastal landforms beyond the Operational Area, the EMBA is driven by an unplanned hydrocarbon release. There is no anticipated impact pathway from the presence of marine diesel on the physical existence of coastal landforms such as hills, waterways or dune systems. Access to Country within the EMBA is also not expected to be affected in the highly unlikely event of an unplanned hydrocarbon release. However relevant cultural authorities will be engaged in the event of a spill that may affect them. As such, cultural values and intangible cultural heritage associated with shoreline habitats are expected to be maintained. **Conclusion** The impact and risk assessment has determined that the planned activities are unlikely to result in an impact greater than negligible[136] (F) and unplanned activities are assessed to have a residual risk rating of moderate (or lower). Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process..
Impact and Risk Assessment	The Petroleum Activities Program has the potential impact cultural features and heritage values through the following ways: **Archaeological heritage:** Places that are identified in the literature for their value as archaeological sites can be assumed to be impacted where there is an impact to the archaeological or scientific values of its tangible elements. This could include damage or disturbance of archaeological material or to the archaeological context. **Intangible cultural heritage:** Songlines: Songlines can become lost, fragmented, or broken when there is a loss of Country or forced removal from Country (Neale and Kelly 2020:30). Physical sites that have been identified as comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. It is noted that oil and gas infrastructure exists in many areas of the North West Shelf, and that songlines are still acknowledged and recognised. It is inferred that if there were to be any impacts to surviving songlines these would be significantly more likely to be described as qualitative (i.e. “weaken” a songline) rather than binary or absolute (i.e. destroy a songline).

[136] Noting that as the receptor sensitivity is high, the impact significance level is Slight (E).

	Creation/dreaming sites; sacred sites; ancestral beings: Activities that physically alter landscape features may be assumed to potentially impact values of creation/dreaming sites, sacred sites or ancestral beings. Ceremonial sites: Activities that prevent the performance of ceremony at these sites will directly impact its values. Cultural obligations to care for Country: Environmental impacts may be assumed to impact rights and obligations to care for Sea Country. Exclusion of Traditional Custodians from Sea Country (e.g., by restricting access) or decision-making processes (e.g., by not conducting ongoing consultation) are other potential sources of impact. Knowledge of Country/customary law and transfer of knowledge: Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population. Therefore, the transmission of these skills is expected to be impacted where there are impacts at the species/population level. Limitations on access to sites or disruption/relocation of First Nations communities may have implications for the preservation of First Nations knowledge. Cultural Safety refers to respecting local Lore and culturally significant areas to protect individuals from cultural harm. There are many cultural implications for those (Aboriginal and non-Aboriginal) who do not follow cultural advice or access Country in culturally inappropriate ways. Connection to Country: Where people are displaced or disrupted (e.g., during colonisation) or where there is a loss of technical skills or environmental knowledge this may damage connection to Country (McDonald and Phillips, 2021). Access to Country: Impacts to access to Country may be classified as temporary (e.g. where exclusion zones exist around activities for safety reasons) or permanent (e.g. where infrastructure obstructs access or navigation). Impacts to access to Country can only occur in areas that were traditionally accessed by Traditional Custodians. As described in Section 4.9 this is anticipated to be focussed on areas adjacent to the coast. Kinship systems and totemic species: It is assumed that marine species may have kinship/totemic relationships to Traditional Custodians, but it is understood that these relationships do not prohibit people outside of that “skin group” from hunting or eating that same species (Juluwarlu 2004). It is therefore inferred that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals. Resource collection: Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, marine species (as resources) will be impacted where there is an impact at the species/population level. **Marine ecosystems and species** Marine ecosystems may hold both cultural and environmental value (see Section 4.9), with cultural and environmental values intrinsically linked (DCCEEW 2023, MAC 2021 as cited in Woodside 2023a). It necessarily follows that an impact to marine ecosystems has the potential to impact cultural features where the impact is detectable within sea country—the seascape which Traditional Custodians view, interact with or hold knowledge of. **Archaeological Heritage** ***Onshore / intertidal archaeological sites*** No coastal areas or islands exist within the Operational Area. A review of the of DPLH’s Aboriginal Heritage Inquiry System identified 55 Registered Aboriginal Sites and Other Heritage Places in the EMBA. These were mainly comprised of sites at Barrow Island, the Ningaloo coast, the Pilbara and then north to the Kimberly. These locations do exist within the EMBA boundary, however given the EMBA is driven by an unplanned hydrocarbon spill there is no anticipated impact pathway from this activity to onshore archaeological sites above highest astronomical tide (HAT). Archaeological sites may exist in intertidal landscapes within the EMBA and may be exposed to hydrocarbon from an unplanned spill, however there is no anticipated impact pathway from the presence of hydrocarbons on archaeological values, as this is not expected to impact the fabric or context of sites on an exposed shoreline site. Impacts to the heritage value of fish traps from hydrocarbons in an unplanned spill may occur indirectly through impacts to fish. However, it is expected that continued use of fish traps beyond their archaeological value will be preserved where fish species and distribution are maintained at a population level. With regard to fish, refer to species specific assessment below for further information. ***Submerged archaeological sites*** No submerged archaeological sites have been identified beyond terrestrial or intertidal areas, with the exception of two sites at Murujuga in Cape Bruguieres channel and Flying Foam Passage

	(Benjamin et al. 2020; Benjamin et al 2023), which are outside of the EMBA. Nevertheless, there is the potential for submerged archaeological sites on the Ancient Landscape. Submerged archaeological sites (locations undefined) may exist on the Ancient Landscape within the broader EMBA. However, given the EMBA is driven by an unplanned hydrocarbon spill, it is not expected to impact the seabed or archaeological material on or within it. Therefore, there is no anticipated impact pathway to submerged archaeological sites in the broader EMBA from the Petroleum Activities Program. ***Rivers, waterholes, tidal channels and seeps*** Oceanographic studies indicate that both the open ocean and coastal zone off Western Australia are well-mixed and saline. Submerged former water sources (e.g. river beds) may exist within the EMBA which are archaeologically prospective or culturally significant. The EMBA is driven by an unplanned hydrocarbon spill, which is not expected to impact the seabed or features on it. As such, there is no anticipated impact pathway from this activity to submerged water sources in the broader EMBA. In the highly unlikely and unmitigated worst case, unplanned hydrocarbons may contact shorelines and receptors such as mangroves, and shoreline habitats. These habitats may contain brackish or fresh water due to runoff from land. Given hydrocarbon characteristics and rapid weathering, an unplanned release is expected to have no lasting effect on any freshwater sources along the shoreline. **General Intangible values** ***Songlines*** Management of intangible cultural heritage can include reducing impacts and risks to environmental features that are associated with intangible cultural heritage (UNESCO 2003; ICOMOS 2013). Impacts to marine plants, animals and other cultural features associated with songlines might impact the intergenerational transmission of knowledge of songlines when individuals can no longer witness or interact with the cultural features tied to songlines on Country. Therefore, managing songlines may require environmental controls protecting species at a population level, including migratory routes. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section 6.7 and 6.8, respectively. Energy lines have also been raised during consultation. Energy lines are understood by Woodside to be the same as songlines. Physical features comprising a component of a songline are important to protect to prevent the fragmenting or breaking apart of songlines and loss of sacred cultural knowledge. Songlines can become lost, fragmented, or broken when there is a loss of Country or impact to culturally important physical features (Neale and Kelly 2020:30). No specific details of songlines within the EMBA have been provided by relevant persons during consultation for this Activity, and no landforms typical of songlines (e.g. mountains, rivers, caves and hills (Higgins 2021)) are anticipated to be impacted by the Activity. In publicly available literature, Murujuga is acknowledged as a starting point for songlines, including the flying fox songline (MAC 2023a). Precise location of this songline, and features of this songline that might be impacted, are not clearly articulated in the reviewed sources, but it is stated that “the sea is a source of creation for flying foxes” (DEC 2013). Although this does not provide the specificity required to determine the location of the flying fox songline or associated sites. Consultation with MAC and other Traditional custodians has not identified the flying fox songline as overlapping the EMBA, and flying foxes do not occur within the EMBA. Kearney et al (2023) notes a connection between the Kangaroo songline and a pair of submerged waterholes identified through seabed mapping by the Deep History of Sea Country project, which later found submerged artefacts in Flying Foam passage. Noted that due to the water depth it is not expected that active or former freshwater sources that may connect to the Kangaroo or other songlines would be within the Operational Area. Consultation with MAC and other Traditional custodians has not identified these songlines as overlapping the EMBA, and these species do not occur within the EMBA. In publicly available literature, Murujuga is acknowledged as the starting point for the seven sisters songline (Bainger 2021). Precise location of this songline, and features of this songline that might be impacted, are not clearly articulated in the reviewed sources. Consultation with MAC and other Traditional custodians has not identified the seven sisters songline as overlapping the EMBA. While the presence of songlines are generally raised in the literature across several relevant communities, no specific details have been identified. The literature review has also identified culturally important features, which are known to be commonly associated with songlines (e.g. marine species and landforms; Section 4.8), and these have been separately assessed. Further assessment of intangible values and marine species are provided below, in addition to the impact and risk assessment in Section 6.7 and 6.8, respectively.

	Creation/dreaming sites; sacred sites; ancestral beings Woodside has undertaken all reasonable steps to identify creation and dreaming sites, and places associated with ancestral beings within the EMBA. No such sites have been identified. A review of relevant literature has been undertaken which has identified creation, dreaming and ancestral narratives related to the sea more broadly without confirming where (if anywhere) these overlap the EMBA. These references are of a general nature, and do not identify any features or values requiring specific protection or management from the proposed activities. Sea serpents or water serpents are common in Aboriginal creation narratives, and several references were identified in the reviewed literature. The majority of these refer to serpents residing within inland rivers or pools outside of the EMBA (Barber and Jackson 2011, Dury v Western Australia [2018] FCA 1849, Hayes v Western Australia [2008] FCA 1487, Juluwarlu 2004, Kalbarri Visitor Centre 2023, Water Corporation 2019, Zaunmayr 2016, Department of Parks and Wildlife 2014, Yu 1999, DBCA 2020). In some versions, the serpent originates from the sea or coast and creates the rivers as it heads inland. Barber and Jackson (2011) also recount a story where a freshwater serpent pushes a sea serpent back into the ocean where it presumably continues to reside. This does not provide the specificity required to determine the location of sea serpents within the sea, and it is possible that the ocean as a whole (out to and beyond other continents) should be viewed generally as housing the sea serpent(s). Consultation with Traditional Custodians have not identified activities of this Petroleum Activities Program as having an impact on sea serpents. However, by analogy to other water serpent narratives across Australia, possible impact pathways may include interruption of its path by blocking or reducing flows of water, damaging sacred sites such as thalu or rock art sites or depleting water sources. While there is potential for shoreline accumulation of hydrocarbons within the EMBA, relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. No impacts to water flows (either tidal movement or ocean currents) or depletion of water sources are anticipated from this Petroleum Activities Program. Features of the landscape with the potential for connection to creation/dreaming stories and ancestral beings are likely within the EMBA on the Ancient Landscape. However, there are no anticipated impact pathways to submerged landscape features within the broader EMBA from the Petroleum Activities Program. ***Ceremonial sites*** All mentions of active ceremonial sites were confined to onshore locations and no direct impacts to onshore ceremonial sites are anticipated from the Petroleum Activities Program. However, indirect impacts may occur where ceremonies cannot be performed due to limitations on access, loss of knowledge or impacts to the environment, which are further described below. ***Cultural obligations to care for Country*** Caring for Country collectively refers to the cultural obligations of individuals and groups, as well as rituals and ceremonies required for the physical and spiritual health of the environment. Lack of access to coastally located cultural sites that carry songlines or remain ceremonially important can impact First Nations people's livelihoods and impact their ability to carry out cultural obligations on Country. While there is potential for shoreline accumulation of hydrocarbons within the EMBA, relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. ***Knowledge of Country/ customary law and transfer of knowledge*** Cultural knowledge about Sea Country/customary law and the intergenerational transmission of knowledge are important values identified through consultation, assessments and the literature review. Transfer of knowledge includes continuing traditional practices to pass on practical skills. Direct impact to communities practicing these skills will inherently occur when relevant aspects of the environment disappear, are displaced or suffer a reduction in population—for example traditional fishing methods require the survival of traditional fish resources. Therefore, ensuring the transmission of cultural knowledge may require environmental controls protecting species and migratory pathways at a population level. Refer to species specific assessment below for further information, in addition to the impact and risk assessment in Section 6.7 and 6.8 respectively. ***Connection to Country*** Connection to Country describes the multi-faceted relationship between First Nations people and the landscape, which is envisioned as having personhood and spirit. Connection to Country may be damaged where people are displaced or disrupted (e.g. during colonisation) or where there is a loss of technical skills or environmental knowledge (McDonald and Phillips, 2021). No impacts of this nature are considered to arise from this Petroleum Activities Program. Access to Country is discussed below.

	Access to Country Access to Country, including Sea Country, is necessary for the continuation of other values including caring for Country and the transfer of traditional knowledge. Access is also a value in its own right, as a continuation of traditional Sea Country access and use. Access to areas within the Operational Area may be limited where exclusion zones are established around vessels for safety purposes. However due to the location offshore this is not expected to impact on Access to Country. Access to Country within the EMBA would be limited to temporary exclusion in areas where there are hydrocarbons present, including shoreline accumulation. However relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. ***Cultural Safety*** Cultural Safety refers to respecting local Lore and culturally significant areas to protect individuals from cultural harm. There are many cultural implications for those (Aboriginal and non-Aboriginal) who do not follow cultural advice or access Country in culturally inappropriate ways. Cultural safety may include observing gender restricted areas, respecting significant places and restricted areas as well as following the advice from those with cultural authority. Therefore, relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. ***Kinship systems and totemic species*** Individuals may have kinship to specific species (Smyth 2008, Juluwarlu 2004) and/or a responsibility to care for species (Muller 2008). These relationships are understood to impose obligations on Traditional Custodians. It is understood that these obligations do not impose restrictions on other people generally, but it is considered that impacts to species at a population level may inhibit Traditional Custodians with kinship relationships' ability to perform their obligations where this results in reduced or displaced populations. It is therefore considered that the management of totemic or kinship species applies at the species/population level and not to individual plants and animals. As such, impacts to individual marine fauna is not expected to impact on the totemic or kinship cultural connection. Totemic species identified during consultation include whales, fish, stingrays and octopuses. In the highly unlikely event of a hydrocarbon spill relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. ***Resource collection*** A suite of marine species have been identified through consultation and literature as important resources, particularly as food sources. For example, Sea Country resources of noted relevance to Thalanyji people which may be present in the vicinity of the Montebello Islands include dugongs, majun (marine turtles), turtle eggs, fish and shellfish. Other resource species include marine mammals, fish, molluscs including bivalves, gastropods and cephalopods and seabirds, sea urchins and mangrove seeds. In addition to their immediate value as sustenance, the gathering and preparation of these resources are informed by cultural knowledge, and an inability to use these resources may result in a loss of ability to transfer that knowledge to future generations. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these communities may be impacted where there is an impact at the species/population level. As assessed Section 6.7, impacts from planned activities on the marine environment, including resources important to First Nations people, is expected to be limited to negligible or slight and therefore impacts that result in population effects (e.g., population decline, changes in migration routes, etc) are not expected. Impacts to potential resources within the EMBA, in the highly unlikely event of hydrocarbon spill, are described and risk assessed in Section 6.8 and are not expected to result in species / population level impacts. There may be potential impacts to resource collection along the coastlines where there is shoreline accumulation of hydrocarbons. Given hydrocarbon characteristic and rapid weathering an unplanned release is not expected to have a substantial adverse impact resulting in population level changes. Therefore, impacts to resource collection would be limited to temporary exclusion in areas where there are hydrocarbons present, including shoreline accumulation. Further relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. **Marine Ecosystems and Species** ***Marine mammals (whale, dolphins, dugongs)*** There are increase ceremonies / rituals for species of animals and plants important to First Nations, to enhance or maintain populations. Thalu are places where these increase ceremonies are performed. All mentions of active ceremonial sites in the reviewed literature were confined to

	onshore locations, though the values may extend offshore where, for example, the thalu relates to marine species populations. As thalu ceremonies are performed to maintain and increase populations of marine species, it is inferred that management applies at the species/population level and not to individuals. Reviewed literature (Deloitte 2020) also includes information that is marked as information that cannot be copied, reproduced or used without consent. The values described in the literature are environmental in nature, apply to marine mammal behaviours at a population level and are managed through existing environmental controls in Sections 6.7, 6.8 and 6.9. Related intangible cultural heritage may include the transmission of cultural knowledge about whales and whale behaviour, including birthing areas, whale communication and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn 2021). Whale symbology expressed through stories, music, and dance can reflect a group's connections with the sea, as well as marine fauna, which then comprise a group's cultural values (Ardler 2021; Bursill et al. 2007; Cressey 1998). Whales also speak to a broader connection that exists between First Nation people and their surrounding environment. Beyond mythology and symbolism, whales can be connected with various economic and social functions associated with everyday life. Cultural knowledge of whales, whale migration, behaviour and the related marine environment may all be important in ensuring the continuation of these socio-economic functions and other related activities that remain valuable to First Nations people (Fijn 2021). No impacts to communities' ability to perform or transmit stories, music or dance are anticipated from the Petroleum Activities Program. Where timing or performance is linked to sighting or engaging with these species, impacts may occur where numbers or migration behaviours are impacted at a population level. First Nations groups have expressed interest about whale migratory routes and studies. Inter-generational transmission of cultural knowledge (including songlines) relating to marine mammals may be impacted where changes to population or behaviour at a population level results in reduced sightings (e.g. through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003). As described in the relevant environmental impact and risk assessments in Sections 6.7, 6.8 and 6.9, respectively, potential impacts to cetaceans from planned activities are limited to behavioural impact, which may include temporary and localised deviations from migratory pathways for cetaceans. However, no permanent impacts preventing cetaceans from entering or occupying the areas have been identified. These impacts and risks are not considered to be ecologically significant at a population level, and hence are not expected to impact the value of marine mammals, including the transmission of cultural knowledge. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained. Marine reptiles (turtles, sea snakes, crocodiles) Turtles and crocodiles have been identified through consultation and existing literature as an important resource, particularly as food sources. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level. Intangible cultural heritage may also include the transmission of cultural knowledge about marine reptiles, such as nesting areas, hunting areas and migratory patterns. Cultural knowledge may also be conveyed through stories, such as the turtle being trapped in the sea as a result of its greed for berries as recounted by Capewell (2020). Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn 2021). First Nations groups have expressed an interest regarding turtle monitoring programs and migration patterns. Activities that impact turtle / crocodile populations and their marine environment may have an indirect impact on some Aboriginal communities as this can limit access to cultural sites or deplete hunting areas that would threaten local food security (Delisle et al. 2018:251). Inter-generational transmission of cultural knowledge (including songlines) relating to marine reptiles may be impacted where changes to population or behaviour results in reduced sightings (e.g. through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003). As described in the relevant environmental impact and risk assessments in Sections 6.7, 6.8 and 6.9, potential impacts to marine reptiles from planned activities are likely to be restricted to temporary behavioural changes, which are not considered to be ecologically significant at a population level, and hence not expected to impact the value of marine reptiles, including the

	transmission of cultural knowledge or use as a resource. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained. ***Fish and Cephalopods*** Fish and squid have been identified through consultation and existing literature as an important resource, particularly as food sources. Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore these species (as resources) will be impacted where there is an impact at the species/population level. Through consultation, fish were identified as important agents in the management of the broader ecosystem. It may be assumed that inter-generational transmission of cultural knowledge relating to fish may be impacted where changes to population or behaviour results in reduced sightings (e.g. through population decline). In additional MIAC (2019) identified whale sharks as a culturally important species associated with stories which describe them as guardians of the sea. This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003). Intangible cultural heritage associated with fish and whale sharks, including inter-generational knowledge regarding fishing techniques and migratory patterns, can be managed by reducing impacts to fish in nearshore marine environments to which this cultural knowledge is intrinsically connected. The octopus is an important totem to Ngarla People and features in the creation story of Solitary Island. There are increase ceremonies / rituals for species of squid and octopus to enhance or maintain populations. Thalu are places where these increase ceremonies are performed. All mentions of active ceremonial sites in the reviewed literature were confined to onshore locations, though the values may extend offshore where, for example, the thalu relates to marine species populations. As thalu ceremonies are preformed to maintain and increase populations of marine species, it is inferred that management applies at the species/population level and not to individuals. As described in the relevant environmental impact and risk assessments in Sections 6.7, 6.8 and 6.9, respectively, the potential impacts from planned activities on fish[137] are considered to be localised and with slight, short-term (<1-year) impact potential on species (or lower), but not affecting ecosystem function, physical or biological attributes. Impact potential is not considered to be ecologically significant at a population level. As such, cultural values and intangible cultural heritage associated with these species are expected to be maintained. ***Seabirds*** Seabirds, specifically shags, have been identified through literature as a culturally significant species (Malgana Land and Sea Management et al. 2021), as well as a resource (seabird eggs; Smyth 2007). Direct impact to communities using these resources will inherently occur when the resource disappears, is displaced or suffers a reduction in population. Therefore, these species (as resources) will be impacted where there is an impact at the species/population level. Intangible cultural heritage may also include the transmission of cultural knowledge about seabirds, such as nesting areas, hunting areas and migratory patterns. Such cultural knowledge may be associated with various cultural functions and activities that support the social and economic life of a community (Fijn 2021) Inter-generational transmission of cultural knowledge relating to seabirds may be impacted where changes to population or behaviour results in reduced sightings (e.g. through population decline, changes to migration routes or changes to migration seasonality). This transfer of knowledge may be integral to managing a group's intangible cultural heritage (UNESCO 2003). As described in the relevant environmental impact assessments in Section 6.7, the potential impacts from the Petroleum Activities Program on seabirds is limited to slight. The potential for temporary behavioural disturbance localised around vessels from light is not expected to result in a substantial adverse effect on species' population, and light emissions will not seriously disrupt the lifecycle of an ecologically significant proportion any migratory bird species. In terms of risk, as described in Section 6.8 and 6.9 a change in marine fauna behaviour or injury/mortality to seabirds and migratory shorebirds may occur due to a change in water or sediment quality following an unplanned hydrocarbon release. Given hydrocarbon characteristics, expected rapid weathering to below impact thresholds, and the mobile transient nature of individuals, unplanned hydrocarbon releases are not expected to substantially modify important habitat for migratory species. As such,

[137] Squid and octopus are considered to be impacted through similar impact pathways as fish, and hence the conclusion represented here are considered appropriate for cephalopods.

	cultural values and intangible cultural heritage associated with these species are expected to be maintained. ***Benthic habitats (coral, seagrass)*** Through consultation, First Nations groups identified benthic habitats as valuable for their ecological values, including corals attracting fish and seagrass providing shelters for fauna, as well as an important habitat for dugongs. There is no overlap between the Operational Area and coral / seagrass habitats as water depth is more than 170 m, and no planned impacts to coral / seagrass habitats from the Petroleum Activities Program. In terms of risk, as described in Section 6.8 and 6.9, a change in habitat may occur following an unplanned hydrocarbon release. Given hydrocarbon characteristics, rapid weathering, short-term exposure, as well as the response strategies planned to be deployed, an unplanned release may result in localised impacts coral and seagrass habitats. As such, cultural values and intangible cultural heritage associated with benthic habitats are expected to be maintained. ***Shoreline Habitats (mangroves / salt marshes)*** Through consultation, First Nations groups identified shoreline habitats as valuable for their ecological values, including mangroves for providing shelter to marine invertebrates, which are identified resources, and potential nursery for turtles. Literature also notes that mangroves are also valued for the flora and fauna they are associated with and support (Commonwealth of Australia 2002) and Smyth (2007) reports that mangrove seeds are used as a resource by Ngarda-Ngarli. There is no overlap between the Operational Area and mangrove / salt marsh habitat, and no planned impacts to mangroves from the Petroleum Activities Program. In terms of risk, as described in Section 6.8 and 6.9, a change in habitat may occur due to a change in water or sediment quality following an unplanned hydrocarbon release. Given hydrocarbon characteristics, rapid weathering, as well as the response strategies planned to be deployed an unplanned release may result in localised impacts coral and seagrass habitats. As such, cultural values and intangible cultural heritage associated with shoreline habitats are expected to be maintained. ***Marine Park / coastal reserves*** A number of marine parks (e.g. Barrow Island Marine Park, Montebello Islands Marine Park, Ningaloo Marine Park) are jointly managed with First Nation groups. The groups are responsible for sharing management decisions and also for sharing in the overall responsibility of making sure the marine park fulfils its purpose. There is no overlap between the Operational Area and any marine parks. In terms of risk, as described in Section 6.8 and 6.9, shoreline accumulation may occur in some of these marine parks. The relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. ***Nearshore islands*** Nearshore islands (including Rosemary Island and Solitary Island) have been raised in consultation as of interest, for cultural values and for their ecological benefit. There is no overlap between the Operational Area and any islands. ***Solitary Island is outside the EMBA.*** In terms of risk, as described in Section 6.8 and 6.9, shoreline accumulation may occur on some islands. The relevant cultural authorities will be engaged in the event of a spill that may affect them, as specified in Appendix I. ***Murujuga*** Cultural features and heritage values associated with Murujuga petroglyphs are outlined in **Section 4.9.5** and consideration of potential for indirect impact from atmospheric emissions associated with onshore processing of Pluto gas presented in **Section** 6.7.11 **Conclusion** The impact and risk assessment for cultural features and heritage values has determined that the planned activities are unlikely to result in an impact greater than negligible (F) and unplanned activities are assessed to have a residual risk rating of High (or lower).

Demonstration of ALARP				
As marine ecosystems may hold both cultural and environmental value (see Section 4.9.1), with cultural and environmental values intrinsically linked, in addition to the specific controls for cultural features and heritage values, the controls and performance standards in section 6.7 and 6.8 will reduce impacts to cultural features and heritage values, including marine species and habitats.				
Control considered	***Feasibility (F) & Cost/ Sacrifice (Cs)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Adopted***
Apply a 'living heritage[138]' management approach. Woodside seeks advice and incorporates Traditional Custodian cultural knowledges across our activities. Cultural safety considerations are factored for our workforce and the Traditional Custodian community.	F: Yes CS: Minimal	Implementation of the 'living heritage' approach pays acknowledgement and respect to Traditional Custodian communities. It supports the transfer of cultural knowledges and is an effective strategy to manage intangible cultural values.	Benefits outweigh cost/ sacrifice.	Yes C 29.1
Project inductions to all relevant marine crew, prior to the individual commencing the activity, will include information on cultural features and heritage values, including tangible and intangible cultural heritage.	F: Yes CS: Minimal	Ensures workforce is suitably aware of cultural features and heritage values in the area they are operating.	Benefits outweigh cost/ sacrifice.	Yes C 29.2
Should it be identified that relevant cultural authorities may be affected in the unlikely event of a spill, Woodside will engage with those parties as appropriate and in alignment with the FSP.	F: Yes CS: Minimal	Engaging with relevant cultural authorities that may be impacted by a spill will allow the Traditional Custodians to identify areas of concern.	Benefits outweigh cost/sacrifice	Yes Adopted
ALARP Statement				
On the basis of the impact and risk assessment outcomes and use of the relevant tools appropriate to the decision type (i.e. Decision Type A, Section 2.6.1), Woodside considers the adopted controls appropriate to manage the potential impacts and risks to cultural features and heritage values. As no reasonable additional/alternative controls were identified that would further reduce the impacts without grossly disproportionate sacrifice, the impacts are considered ALARP.				
Acceptability Statement				
The impact and risk assessment has determined that, given the adopted controls, planned activities are unlikely to result in an impact greater than negligible and unplanned activities are assessed to have a residual risk rating of moderate (or lower).				

[138] Living heritage supports community and individual identity. Intangible cultural heritage is 'living heritage' that is inherited from ancestors and passed on to their descendants. It is comprised of many influences, including oral traditions, art, social practices, rituals and ceremonies, cultural knowledge and practices. It is transmitted from generation to generation, and evolves in response to the environment. Woodside applies a 'living heritage' approach to its cultural heritage management. This includes ensuring that Traditional Custodians are given voice to identify interests, transmit information and express concerns. Woodside works with Traditional Custodians to support and follow appropriate cultural protocols, including calling to Country, conducting smoking ceremonies (in areas where this custom is appropriate) and undertaking cultural awareness. Woodside will collaborate and provide relevant information it holds to groups such as Heritage Management Committees where they are established.

The Petroleum Activities Program and the EMBA are not expected to have a significant impact (e.g. changes in population levels) on MNES including marine fauna with a First Nations connection with, or traditional use in nearshore areas as defined in Section 4.8. While the EMBA may overlap the Ancient Landscape no impacts are predicted as hydrocarbons are expected to remain within the upper water column.

Woodside has engaged with Traditional Custodians adjacent to the EMBA to understand the cultural features and heritage values that may occur and potential impacts from the activity. In the event of an unplanned loss of hydrocarbons Woodside has committed to engaging with relevant cultural authorities that may be affected (Appendix I).

Further opportunities to reduce the impacts have been investigated above. The potential impacts and risks are considered acceptable if the adopted controls are implemented. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks to cultural features and heritage values to a level that is acceptable, if ALARP.

Key Environmental Performance Outcomes, Standards and Measurement Criteria related to Cultural Features and Heritage Values[139]

Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 29 No impact to cultural features and heritage values greater than a consequence level of F from the Petroleum Activities Program	C 29.1 Apply a 'living heritage' management approach. Woodside seeks advice and incorporates Traditional Custodian cultural knowledge across our activities. Cultural safety considerations are factored for our workforce and the Traditional Custodian community.	PS 29.2.1 Woodside will continue to give voice to Traditional Custodians to identify interests, transmit information and express concern	MC 29.2.1 Records demonstrate Change Management and Management of Knowledge processes have been followed where new controls or management measures identified
		PS 29.1.2 Woodside will assess and where deemed practicable will implement appropriate cultural protocols where requested by Traditional Custodians	MC 29.1.2 Records demonstrate Woodside implemented cultural protocols as requested
	C 29.2 Project inductions to all relevant marine crew, prior to the individual commencing the activity, will include information on cultural features and heritage values, including tangible and intangible cultural heritage.	C 29.2.1 All relevant marine crew have completed Project inductions that include information on cultural values, including tangible and intangible cultural heritage for awareness	MC 29.2.1 Records demonstrate all relevant marine crew have completed inductions that include cultural material

[139] As marine ecosystems may hold both cultural and environmental value (see Section 4.9.1), with cultural and environmental values intrinsically linked, in addition to the specific controls for cultural features and heritage values, the controls and performance standards in section 6.6 and 6.7 will reduce impacts to cultural features and heritage values including marine species and habitats.

EPOs, EPSs and MC for the Pluto Operations			
Environmental Performance Outcomes	***Controls***	***Environmental Performance Standards***	***Measurement Criteria***
EPO 30 No adverse impact to Underwater Cultural Heritage without a permit.	C 30.1 Review of existing survey data by a suitably qualified maritime archaeologist to inform areas for laydown and/or installation of equipment to avoid or where not possible, minimise physical impacts to cultural heritage areas or prospective areas, where water depths <130m.	PS 30.1 Existing survey data reviewed by a suitably qualified maritime archaeologist to inform areas for laydown and/or installation of equipment.	MC 30.1.1 Records demonstrate review of existing survey data completed prior to laydown and/or installation of equipment.
	C 30.2 Unexpected finds of potential Underwater Cultural Heritage sites/ features, including First Nations UCH are managed in accordance with an Unexpected Finds Procedure set out in b.	PS 30.2 In the event that an Underwater Cultural Heritage site or feature is identified, implement an Unexpected Finds Procedure set out in Section 7.6.	PS 30.2.1 In the event that an Underwater Cultural Heritage site or feature is identified, implement an Unexpected Finds Procedure set out in Section 7.6.
	C 30.3 Report any potential UCH finds to relevant stakeholders and authorities in accordance with the Unexpected Finds Procedure, Underwater Cultural Heritage Act 2018 and the ATSIHP Act.	PS 30.3 Report any finds of potential UCH in accordance with the Unexpected Finds Procedure (b) including to the Australasian Underwater Cultural Heritage Database.	MC 30.3.1 Records of potential UCH finds reported to relevant authorities and stakeholders.
	C 30.4 Relevant vessel crew and ROV operators will be advised in an induction of the potential to encounter UCH, and of their requirement to follow the Unexpected Finds Procedure.	PS 30.4 Relevant vessel crew (including ROV operators) are made aware of the requirements of the Unexpected Finds Procedure through an induction.	MC 30.4.1 Records demonstrate vessel crew are made aware of potential to encounter UCH.

7. IMPLEMENTATION STRATEGY

7.1 Overview

Regulation 22 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 EPSs 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 1.8).

7.2 Systems, Practice and Procedures

All operational activities are planned and performed in accordance with relevant legislation and internal environment standards and procedures identified in this EP (Section 6).

Processes are implemented to verify controls to manage environmental impacts and risks to:

- a level that is ALARP and acceptable
- meet EPOs
- comply with EPSs defined in this EP.

The systems, practices and procedures that are implemented are listed in the EPSs contained in this EP. Document names and reference numbers may be subject to change during the statutory duration of this EP and is managed through a Change Register and update process. Further information regarding some of the key systems, practices and procedures relevant to implementation of this EP is provided below.

7.2.1 WMS Operate Processes

Under the WMS Operate Activity (see Section 1.8 for an overview of the WMS), there are four overarching processes; those directly relevant to the implementation of this EP and environmental management during the Petroleum Activities Program are described below (Operate Plant Process and the Maintain Assets Process).

7.2.2 Operate Plant

The objective of the Operate Plant Process is for production to be carried out in a safe, efficient, reliable and economic manner, and that all required process variables are within allowable limits. This is so that the potential for unplanned (accident/incident) events that may impact the environment are minimised.

The Operate Plant Process develops key activities to support ongoing production activities so that the facility is operated within the Basis of Design. The process also identifies required production routines, routine execution, recording of data gathered and formulation of remedial activities. The Operate Plant Process includes the Integrated Safe System of Work (ISSoW) system (described below).

In addition, the Operating Practice MSPS (M02) is in place to assure operating practices are in place, such that:

- integrity critical operating procedures are available, accurate, up to date, understood and used.
- safe operating and technical integrity limits are defined, understood and the process is managed within these limits.

7.2.3 Integrated Safe System of Work

The ISSoW Procedure outlines the key activities required to achieve effective management of permit-controlled work on the facility. The ISSoW process is a management system for all work and is a key element in ensuring the safety of personnel, protection of the environment and technical integrity of the facility.

Work within the facility 500 m PSZ and operations within the vicinity of the connected flowlines is controlled in accordance with ISSoW.

The ISSoW system takes a risk-based approach to activities, thus tasks with higher levels of risk are subjected to greater scrutiny and control. The ISSoW system also allows for low risk routine tasks to be carried out with adequate but minimal administration. The prime objective of ISSoW is to ensure work other than normal operations is properly planned, risk assessed, controlled, coordinated and safely executed. It provides a methodical approach to identifying hazards, assessing risks, and creating and supporting permits to work and associated certificates.

In keeping with ALARP principles, this system is critical to ensuring the appropriate level of hazard identification and risk assessment is carried out for activities performed on the facility.

In addition, the Safe Work Control MSPS (M04) is in place to assure effective safe work control, permit to work and task risk management arrangements are in place and followed to control the risks arising from work activities.

7.2.4 Maintain Assets

The Maintain Assets Process aims to improve the reliability and availability of plant and equipment (which includes that required for safe operation) through well managed and planned execution of maintenance that promotes a proactive maintenance culture.

Maintenance, inspection and testing systems and procedures are in place to safeguard the integrity of the facility. The maintenance strategy for the facility is based on optimising safety, minimising environmental impact and maximising production. Maintenance practices used to establish well managed maintenances strategies, planned execution and improvement are described in the Maintenance of Assets Procedure.

A risk-based approach is used as the basis for establishing and prioritising inspection, maintenance and testing requirements at the facility. Equipment is assessed to establish equipment criticality with respect to the consequences and likelihood of equipment failure. This informs determination of appropriate maintenance and inspection activities. Maintenance activities are allocated risk rankings according to the criticality of equipment, so that high risk maintenance work orders are completed as a priority.

A computerised maintenance management system (CMMS) provides a database called SAP-PM that contains facility registers, equipment details, spare parts data and associated planned maintenance tasks. This system is used to plan, monitor and record maintenance activities. The system provides a variety of reports that enable monitoring and assessment of maintenance activities.

SCE Technical Performance Standards identify SCEs and associated assurance activities. These activities are identified in the CMMS and given the appropriate priority (Technical Integrity status). Refer to Sections 2.7.5 and 7.4 for more detail on SCE Technical Performance Standards and how they differ from EPSs required by the Environment Regulations. SCE Technical Performance Standards form a key component in the processes and systems implemented by Woodside to maintain safety and environment critical plant and equipment.

In addition, the Maintenance and Inspection MSPS (M03) is in place to assure that the necessary inspection and maintenance requirements are identified and carried out to maintain the integrity of SCEs and SCCs.

7.2.5 Process Safety Management

So that Woodside protects the safety, security and health of its employees, contractors, the environment and assets, Woodside has adopted the Energy Institute's Process Safety Management (PSM) framework within its Process Safety Management Procedure which sets out a disciplined framework for managing the integrity of systems and processes that handle hazardous substances over the production (and exploration) lifecycle. It deals with the prevention and control of events that have potential to release hazardous materials and energy.

PSM consists of four main focus areas. Each focus area contains a number of PSM requirements that define key aspects required so that PSM is integrated through the organisation. There are twenty PSM requirements. The focus areas and requirements are shown in Figure 7-1.

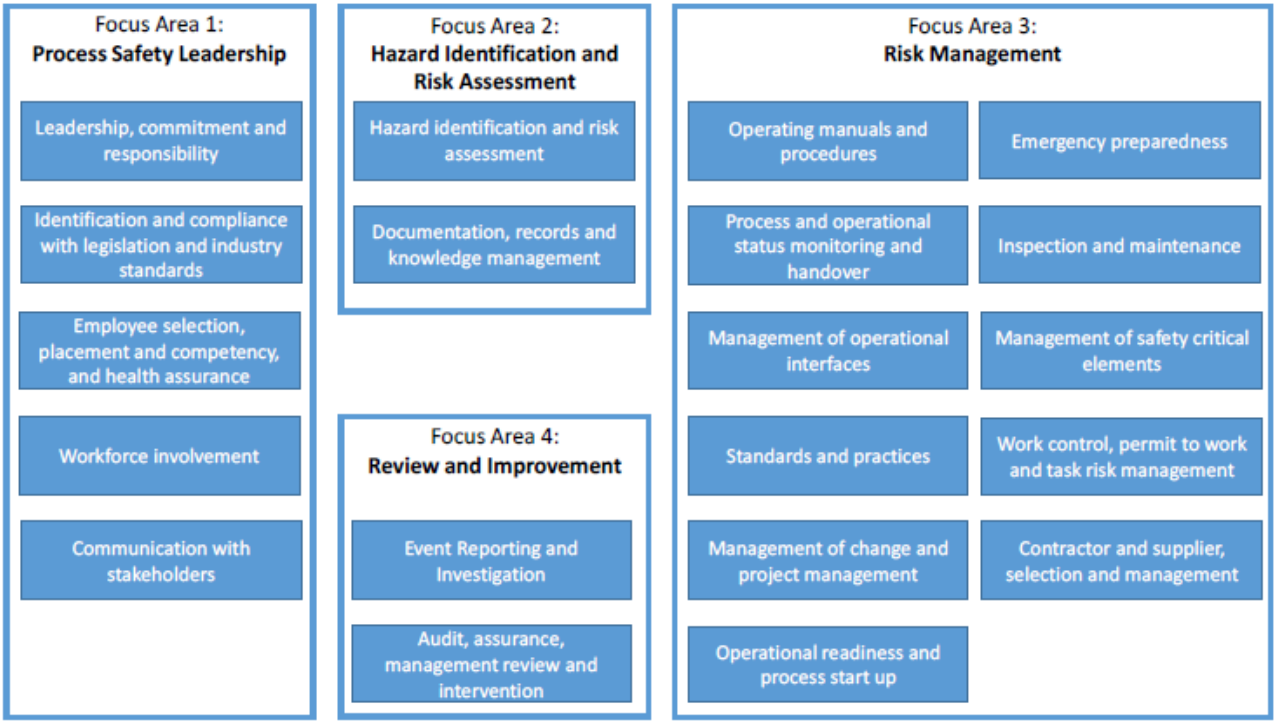


Figure 7-1: Process safety management focus area

7.2.6 Woodside Safety Culture Framework

Woodside's 'Our Safety Culture' framework (shown in Figure 7-2) promotes a strong HSE culture and is a key enabler for effective process safety management. This framework outlines the expected behaviours for everyone including supervisors and managers/executives, and is openly discussed as part of inductions, training and development.

Figure 7-2: Woodside 'Our Safety Culture' framework

7.2.7 Woodside Invasive Marine Species Risk Assessment Process

7.2.7.1 Objective and scope

To minimise the risk of introducing IMS as a result of the Petroleum Activities Program, all applicable vessels and immersible equipment will be subject to Woodside's IMS risk assessment process (unless exempt as outlined below).

The objective of the risk assessment process is to identify the level of threat a contracted vessel, or immersible equipment poses if no additional risk reduction management measures are implemented. This allows Woodside (and its contractors) to apply management options that are commensurate to the identified level of risk.

In context of the activities specified in Section 3, the IMS risk assessment process does not apply to the following:

- Vessels or immersible equipment that do not plan to enter the IMS Management Area (IMSMA)[140] or PAAs defined in environmental approvals.
- 'New build' vessels launched less than 14 days prior to mobilisation.
- Vessels or immersible equipment which have been inspected by a suitably qualified IMS inspector who has classified the vessels or immersible equipment as acceptably low risk no more than 14 days prior to mobilisation.
- Locally sourced vessels or immersible equipment from within the Pilbara locally sourced zone[141] . Vessels, or immersible equipment are defined as locally sourced when the same

[140] MSMA is based on current legal framework and includes all nearshore waters around Australia, extending from the lowest astronomical tide (LAT) mark to 12 nm from land (including Australian territorial islands). The IMSMA also includes all waters within 12 nm from the 50 metre depth contour outside of the 12 nm boundary (i.e. Submerged reefs and atolls).

[141] The Pilbara Zone includes Port, nearshore and offshore movements between Exmouth and Port Headland (excluding high environmental value areas, World Heritage Areas, Commonwealth Marine Reserve Sanctuary Zones and State Marine Management Areas and Marine Parks).

supply facilities/port have been used since their last IMS inspection, full hull clean in dry dock or application of antifouling coating (AFC[142]).

7.2.8 Risk assessment process

Woodside's IMS risk assessment process was developed with regard to the national biofouling management guidelines for the petroleum production and exploration industry and guidelines for the control and management of a ships' biofouling to minimise the transfer of invasive aquatic species (IMO Guidelines, 2011).

In order to effectively evaluate the potential for vessels and immersible equipment to introduce IMS, a risk assessment process has been developed to score and evaluate the risk posed by each Project vessel, or immersible equipment planning to undertake activities within the IMSMA / PAA. The risk assessment process considers a range of factors, as listed in Table 7-1 and Table 7-2.

The IMS risk assessments will be undertaken by a trained environment adviser who has completed relevant Woodside IMS training or by a qualified and experienced IMS inspector. A QA/QC process is implemented for all Woodside conducted IMS risk assessments where a secondary trained environment adviser verifies the assessment to minimise the risk of misapplication and errors within the risk assessment process.

Table 7-1: Key factors considered as a part of the risk assessment process for vessels

Factors	Details
Vessel type	The risk of IMS infection varies depending on the type of vessel undertaking the activity. A higher risk rating is applied for more complex, slow-moving vessels (e.g., dredges) in comparison to simple vessels (e.g., crew transfer vessel).
Recent IMS inspection and cleaning history, including for internal niches	In the case of biofouling on external hull niches, different risk ratings are applied dependant on whether out-of-water or in-water IMS inspections by qualified IMS inspectors and cleaning (if required) have been undertaken prior to contract commencement. If an IMS inspection (and clean if required) has not been undertaken in the past six months (from the time of contract commencement), the highest risk factor is applied. The risk factor then lessens for vessels as the time between inspection and mobilisation reduces.
Out-of-water period before mobilisation	A risk reduction factor can be applied for vessels that are hauled out and then mobilised as deck cargo or by road during mobilisation, therefore becoming air dried over an extended period. Risk reduction factor increases with exposure time out of water.
Age and suitability of AFC at mobilisation date	AFC manufacturers provide a range of coatings, each designed to avoid premature coating failure if it is correctly applied and matched to the vessel's normal speeds and activity profile (i.e., proportion of time spent stationary or below three knots), and its main operational region (i.e., tropical, sub-tropical temperate). If the AFC type is deemed to be unknown, unsuited or absent, the highest risk value is applied. If the AFC type is suitable the risk factor applied reduces with age since application.
Internal treatment systems	A risk reduction factor applied if the vessel has an internal biological fouling control system in place at the time of assessment, or evidence of manual dosing.
Vessel origin and proposed area of operation	Differing risk ratings are assigned in relation to the climatic relationship between the vessel's origin and the proposed climatic region of the proposed area of operation. Highest risk rating is applied to similar climatic regions.
Number of stationary/slow speed periods >7 days	A risk factor is calculated based on the number of 7 day periods that the vessel has operated at stationary or at low speed (less than three knots) in port or coastal waters which is any waters less than 50 metres deep outside 12 nautical miles from land or any

[142] Vessels and immersible equipment can still be classified as locally sourced even if the AFC application occurred in a different port provided the amount of time between AFC application and departure to the locally sourced area (i.e. period of time in waters <12nm/50m water depth) did not exceed consecutive 7 days or the period of time the vessel or immersible equipment has spent within the locally sourced zone exceeds 1 year (i.e. the risk of introducing a species from a different location has already passed).

Factors	Details
	waters within 12 nautical miles of land. The greater the number of periods the higher the risk factor applied.
Region of stationary or slow periods	A further multiplier is applied depending on the location of the stationary/slow speed periods. The highest risk rating applied if the stationary or slow speed periods occurred within ports or coastal waters of the same climatic region,
Type of activity – contact with seafloor.	The potential for the introduction of IMS varies on the planned vessel activity taking place. Those activities that come in contact with sediments and thus have the potential to accumulate and harbour IMS in areas such as hoppers (dredges) and spud cans (drilling rigs) are considered to have a greater risk of infection.

Table 7-2: Key factors considered as a part of the risk assessment process for immersible equipment

Factors	Details
Region of deployment since last thorough clean, particularly coastal locations	Climatic region of use since last overhaul, thorough cleaning or prolonged period out of water (>28 day). Highest risk rating is applied to similar climatic regions. Activities occurring in nearshore areas (less than 50 meters deep and/or within 12 nautical miles from land) are given the highest risk rating.
Duration of deployments	Maximum duration of deployment (maximum time in water) since last overhaul or thorough cleaning. The longer the period of immersion the higher the risk rating applied.
Duration of time out of water since last deployment	A further risk reduction factor can be applied for immersible equipment that has been out of the water for an extended period.
Transport conditions during mobilisation	If the equipment is stored in damp conditions then a high risk factor is applied, while if equipment is stored in dry and well ventilated (low humidity) conditions then a low risk factor is applied.
Post-retrieval maintenance regime.	A risk reduction factor is applied if the equipment/item of interest is routinely washed, cleaned, checked and/or dissembled between project sites. While a higher risk rating is applied where no routine cleaning occurs.

Following implementation of the risk assessment process, vessels and/or immersible equipment are classified as one of three risk categories, as defined below.

‘Low’– Low risk of introducing IMS of concern and hence no additional management required, or management options have been applied to reduce the risk.

‘Uncertain’– Risk of introducing IMS is not apparent and as such the precautionary approach is adopted, and additional management options may be required.

‘High’– High risk of introducing IMS means additional management options are required prior to this vessel mobilising to the PAA.

Following the allocation of a ‘low’ risk rating for a vessel or immersible equipment, the information provided by the vessel operator for the purposes of risk assessment must be confirmed prior to mobilisation. For vessels or equipment classified as posing an ‘uncertain’ or ‘high’ theoretical risk, a range of management options are presented to reduce this theoretical risk to acceptable levels and achieve a low risk status. These management options have been developed with the intention of reducing IMS risk to levels that are as low as reasonably practicable (i.e., ALARP). It is a flexible approach that allows for a range of management actions to be tailored for a specific vessel movement. These will be assessed on a case-by-case basis and may include, but not limited to, the following:

- Inspection (desktop, in-water or dry dock) by a suitably qualified and experienced IMS inspector to verify risk status. Where practicable, the inspection shall occur within seven days (but not more than 14 days) prior to final departure to the PAA.

- In-water or dry dock cleaning of the hull and other niche areas. This is typically applied where the risk assessment outcome is High risk driven by the age of the AFC on the vessel and its time spent in similar climatic region ports.
- Treatment of vessels internal seawater systems. This is typically applied in isolation for vessels with AFC applied to their hull within the last twelve months and where subsequent assessment through the process achieves a low risk rating.
- Limiting the duration that the vessel spends within the IMSMA to a maximum of 48 hours (cumulative entries). This is applicable for Uncertain risk vessels only.
- Reject the vessel.
- Project vessels and immersible equipment are required to be a low risk of introducing IMS prior to entering the PAA.

Risk Management

Risk management processes and practices are applied on an ongoing basis to design, production and maintenance activities at the Pluto facility to manage risks to personnel, assets and the environment.

Potential environmental consequences and impacts from the Pluto facility are risk assessed and controlled in accordance with the Woodside risk management processes described in Section 2 of this EP (Environmental Risk Management Methodology).

The results of the Pluto facility ENVID are described in Section 6 and in the facility Environmental Impacts and Risk Register. This register, in conjunction with the EP, provides a demonstration that environmental risks have been identified, and that appropriate controls are in place to manage those risks to a level that is acceptable and ALARP throughout the life of the facility.

A number of other risk management tools and techniques are used by the Pluto facility to manage environmental and other risks on a routine basis during operational, maintenance and inspection tasks. Examples include:

- the processes outlined in Section 2.2
- risk management tools including: ISSoW tools, e.g. Hazard Identification and Risk Assessments, Level 2 Risk Assessments, Operational Risk Assessments, the technical Management of Change (MoC) system (Section 7.3.2), and Step back 5 x 5
- integrity review studies, HAZIDs and Hazard Operability studies.

These tools, risk and integrity management practices are described further in the Pluto Facility Safety Case, WOMP, and the Control of Operational Risk Procedure.

In addition, other risk sub-processes and practices are also applied within Woodside on an ongoing basis to manage different types of risk. A summary of those relevant to the Petroleum Activities Program is provided below. Woodside's risk management processes (refer to Section 2.2.1), along with the supporting risk sub-processes and practices discussed in this section, so that the environmental impacts and risks of the activity continue to be identified and reduced to a level that is ALARP.

7.2.9 Management of Risks – Contracting and Procurement

Suppliers and contractors play a significant role in meeting the resource needs of Woodside's operations, including the facility operations. Effective management of environmental risks in contracts is achieved by setting clear expectations and managing environmental risks throughout the duration of the contract. Environmental risks in contracts are managed under the Contracting and Procurement Procedure supported by the Health, Safety and Environment in Contracting

Guideline. The guideline provides a risk-based approach to contractor selection and management and is aligned with 'HSE Management – Guidelines for Working Together in a Contract Environment' (International Association of Oil and Gas Producers, Report No. 423).

The Engineering Standard: Quality Requirements for Supply of Products and Services defines specific quality requirements for engineering contracts and purchase orders. The specified quality control requirements in the Standard are required to be complied with as applicable to the scope of supply.

7.2.10 Management of Risks – Subsea Activities

Subsea activities are managed in line with the Subsea and Pipelines Integrity Management Procedure which defines the practices and technical requirements that must be applied to deliver and safeguard integrity of the subsea equipment and pipelines during the facility lifecycle. It provides the relationship between the PSM Framework (including management of change) and Subsea and Pipelines Group services processes.

IMMR activities are managed under the Manage IMMR Work Procedure. Risk assessments are conducted as required under this procedure.

These requirements are supported by implementation of the Subsea Construction and Inspection, Maintenance and Repair Environment Screening Questionnaire tool. The screening questionnaire is used to understand the scope of the activity, potential environmental impact and if additional regulatory approvals are required. To achieve this, the questionnaire captures key project information such as seabed disturbance, chemical use and waste. This information is used by an environment focal point to determine if further assessment is required. For projects that have the potential for environmental impact, an assessment is undertaken against this EP and other Woodside environmental requirements. If determined by the Subsea and Pipeline Environment Screening Questionnaire process, an EP MoC review (as per Section 7.3.2) is undertaken to confirm if the level of environmental risk warrants revision and resubmission of an EP.

Key environmental requirements and regulatory commitments are communicated to project teams and incorporated into key project documentation where applicable and required (i.e. not addressed via existing Woodside practices).

7.2.11 Management of Risks – Major Projects

Major projects are required to follow the Appraise and Develop Management Procedure and the Investment Management Framework. This procedure defines the requirements to deliver a commercially valuable production facility or modify to an existing facility. The process workflow requires integration of work from various functions utilising their people and processes, including Environment, for example HSE philosophy and regulatory approval requirements.

These requirements are supported by implementation of the Brownfields Environment Screening Questionnaire tool. The screening tool is used to determine if a project has the potential for environmental impact or requires additional regulatory approvals. For projects that have the potential for environmental impact, an environmental focal point is assigned and the risks and impacts assessed against the facility EP and other Woodside environmental requirements.

Key environmental requirements and regulatory commitments are communicated to project teams and incorporated into key project documentation where applicable and required (i.e. not addressed via existing Woodside practices). Where it is identified that the project scope has the potential to result in modification or change to the facility description provided in the EP, or where potential new environmental risks or impacts or increases in an existing environmental risk or impact are identified, an EP MoC review (as per Section 7.3.2) is undertaken to confirm if the level of environmental risk warrants revision and resubmission of an EP.

7.2.12 Management of Risks – Well Integrity

Wells are managed throughout their lifecycle in line with the Well Lifecycle Management Procedure. This procedure provides the basis for ensuring well integrity in accordance with the Process Safety Management Procedure.

In addition, wells are required to have a regulator accepted WOMP to demonstrate that well integrity risks are managed to ALARP levels. Wells tied back to the facility are managed under a WOMP.

7.2.13 Management of Risks – Marine Services

Woodside's Marine Services Function provides a platform for the conduct of safe and efficient Marine Operations across Woodside through the Marine Services Management. A set of procedures that support vessel assurance and management (including HSE and quality [HSEQ] management) are in place to ensure marine operations are conducted in a safe and efficient manner, and in accordance with regulatory requirements.

Vessel masters are required to request clearance from the facility OIM or delegate prior to entering the 500 m PSZ.

7.2.14 Management of Risks – Emissions and Energy Management

Emissions generation and energy use is managed in line with the GHG Emissions and Energy Management Procedure which defines the minimum mandatory requirements to manage and deliver continuous improvement in energy efficiency and reduction in GHG emissions. The procedure supports the implementation of the Climate Policy and aligns with the requirements of Woodside's Environmental Performance Procedure. It supports the "operate out" component of limiting net emissions as part of Woodside's Climate Policy (Available: page 14 of the Climate Transition Action Plan (Woodside, 2024) available on the Woodside website).

Implementation of the GHG Emissions and Energy Management Procedure assists in meeting external expectations, such as Woodside's 2025 (-15%) and 2030 (-30%) emissions reductions targets and aspiration to be net zero by 2050. It also maintains consistency with the principles of current corporate initiatives, such as the Zero Routine Flaring Initiative for oil assets and the Methane Guiding Principles. These methane reduction commitments aim to improve methane emissions inventorisation, methane materiality assessments, evaluation, reduction implementation and increased transparency through reporting. The Woodside Flare Framework is an optional WMS tool that seeks to improve awareness of flaring-related issues and influence for reduced flaring.

The GHG Emissions and Energy Management Procedure links to the annual review of opportunities to improve energy performance through identification and evaluation as described in the Production Optimisation and Opportunity Management Procedure. It also requires measurement, analysis and communication of energy performance across the Operations Division and consideration of actual or potential impacts to energy efficiency in Woodside decision making, such as management of change, operational decisions, issue resolution options analysis and facility optimisation plans.

The Environmental Performance Procedure requires that assets measure, monitor or estimate direct air and GHG emissions, and designed such that emissions and energy intensities are minimised to ALARP. Further details including performance standards are defined in Section 6.7.10.

7.2.15 Production Optimisation and Opportunity Management

Woodside's Production and Opportunity Management Procedure outlines the process for identification, prioritisation and management of production opportunities that maximise production revenue or reduce emissions intensity across Woodside operated assets. Opportunities are identified throughout the year in various meetings, forums and teams. In addition, formal opportunity identification takes place through annual workshops, which complement the identification of

improvement opportunities. These opportunities are prioritised and managed according to the workflow shown in Figure 7-3.

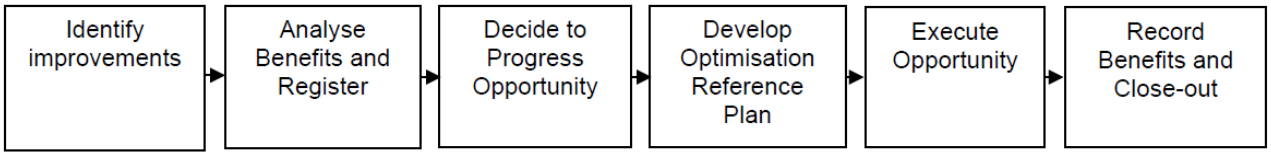


Figure 7-3 Opportunity Management Workflow

Production opportunities are evaluated and progressed, based on value and confidence of return, within the constraints of technical feasibility, cost and other factors. Implemented opportunities are validated and recorded before close out.

7.2.16 Flare Target Setting

In demonstrating the risks and impacts relating to flaring have been reduced to ALARP, flare targets for the facility are set annually. Targets are estimated based on operating experience and forecast activities, e.g. shutdowns. Consideration is also given to the flaring estimates contained within this EP.

The flare target is tracked against flare performance through the year. Where achieving a flare target is in question, an internal flare target deviation is developed, which requires an ALARP justification. A flare target deviation considers the EP flare estimate. If the estimate is likely to be exceeded, an EP MoC assessment (see Section 7.3.2) is undertaken to determine if a revision and resubmission is required.

7.2.17 Management of Risks – Indirect GHG Emissions Management

As stated in the Climate Policy, Woodside's objective is to thrive in this energy transition as a low cost, lower carbon energy provider. To support this policy Woodside undertakes the following measures:

- Set science-based[143] near, mid, and long-term net emissions reduction targets that are consistent with Paris-aligned[144] scenarios, covering equity scope 1 and 2 emissions, both operated and non-operated.[145]
- Develop and operate oil and gas projects in a manner that is consistent with these targets. This includes the deployment of lower-emission technologies (Design Out), supporting efficient operations (Operate Out) and use of robust offsets (Offset) as methods to reduce and offset greenhouse gas emissions.

[143] Woodside is using the draft Prototype IFRS Sustainability Disclosure Standard definition of "science-based" (published 2021) which states "targets are considered 'science-based' if they are in line with what the most recent climate science sets out is necessary to meet the goals of the Paris Agreement—limiting global warming to below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit warming to 1.5 degrees Celsius." See https://www.ifrs.org/content/dam/ifrs/groups/trwg/trwg-climate-related-disclosures-prototype.pdf.

[144] Woodside is using the draft Prototype IFRS Sustainability Disclosure Standard definition of "Paris-aligned scenarios" (published 2021) which states "scenarios consistent with limiting global warming to below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit warming to 1.5 degrees Celsius." See https://www.ifrs.org/content/dam/ifrs/groups/trwg/trwg-climate-related-disclosures-prototype.pdf.

[145] Equity emissions means the share of the total emissions arising from an activity that are attributable to Woodside in proportion to Woodside's ownership interest in the activity, irrespective of whether Woodside operates the activity. Operated emissions are the total emissions arising from an activity that Woodside operates, irrespective of Woodside's ownership interest.

- Invest in new energy products and lower carbon services to reduce customers' emissions (part of Woodside's Scope 3 emissions), including but not limited to hydrogen, ammonia and carbon capture, utilisation and storage.
- Publish transparent climate-related disclosures aligned to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) or other recognised global reporting standards.
- Align our advocacy to the principles of this Climate Policy.

These measures will be amalgamated into a cohesive program to monitor market developments related to the contribution of hydrocarbons in the energy transition and support suppliers and customers to reduce their GHG emissions. The program will be managed by Woodside's Climate & Sustainability Team and implementation will be in Q1 2024. The progress against each of the measures will be tracked and reported, as part of Woodside's climate-related disclosures.

7.2.17.1 Annual Review

The measures proposed will be Woodside Corporate initiatives targeting indirect emissions which are attributable to production from Woodside operated facilities as a whole. Via the annual review process and consideration of the controls, if they are deemed to be effective at a Corporate implementation level then it will also be deemed that specific impacts and risks at an Asset contribution level (i.e. proportion attributable to Pluto production) is also being managed appropriately.

The review process will also undertake an assessment of the Pluto attributable indirect GHG emissions and consider the EP indirect emission estimates (Table 6-25 in Section 6.7.10). This assessment will include both a review of the total CO_2e estimates and also the methods used to derive the estimates. If the estimate is exceeded, an EP management of change assessment (see Section 7.3.2) is undertaken to determine if a revision and resubmission is required.

7.2.18 Management of Human Factor Related Risks

The term 'human factors' is used to describe the consideration of people as part of complex systems. Woodside defines 'human factors' as follows: 'human factors uses what we know about people, organisation and work design to influence performance'.

As outlined in Section 6.8.10, human factors can contribute to MEEs, or result in failure or degradation of the controls in place to protect against MEEs. The WMS includes a number of procedures designed to manage human factors related risks and prevent incident causation.

7.3 Change Management

Woodside's Change Management Procedure describes Woodside's requirements for change management at Woodside owned or controlled operations/sites.

Change management is used where there is no existing approved business baseline, such as a process, procedure or accepted practice, or where conformance with an approved baseline is not possible or intended; for example, due to equipment fault or failure or a recently discovered issue which will take time to rectify. Change management is also used when the baseline is changed (e.g. the process is modified). It applies to management of temporary, permanent, planned or unplanned change encompassing one or more of the following:

- plant (equipment, plant, technology, facilities, operations or materials)
- projects (budget, schedule)
- people (organisation structure, performance, roles)

- process (WMS content, processes, procedures, standards, legislation, information).

Woodside's change management process hierarchy is depicted in Figure 7-4. The hierarchy has been developed with sub-processes to address the different types of change performed at Woodside.

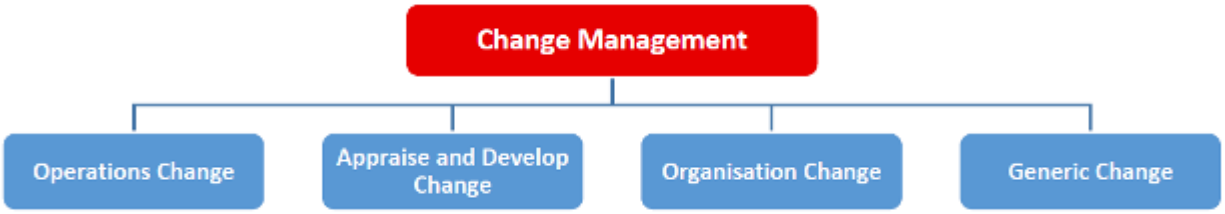


Figure 7-4: Change management hierarchy

To help manage the day-to-day operation of the facility, Woodside has developed a Golden Safety Rules Booklet, which provides a summary of mandatory requirements for safety in the workplace and includes guidance for managing changes that have a Health, Safety, Integrity and/or Environment impact.

7.3.1 Technical Change Management

Technical changes within the Operations Division are managed using the MoC – Assets Procedure. The objective of the procedure is to ensure HSE risks associated with both realised and potential changes, including any failure to meet the facility SCE Technical Performance Standards, are identified, assessed and reduced to ALARP (Section 7.4 provides further information on management of SCE Technical Performance Standards).

Assessed changes must be recommended, agreed and decided upon based on the assessed current level of risk, as defined by Woodside's Technical Decision Authority matrices.

The MoC requirements contained in the PSM Procedure and Management System Performance Standard M05 MoC are considered when conducting any changes with the potential to impact process safety.

The Engineering Management Procedure specifies key requirements of engineering related changes, and requires that engineering Technical Decisions are agreed, recommended and decided at the appropriate engineering authority level according to the risk. Change management and risk assessment include consideration of applicable legislation/regulation.

Change is also managed under management system requirements set out as part of major projects (Brownfields), wells integrity, subsea and pipelines integrity management and marine management system. Change management includes consideration of regulatory requirements, managed in accordance with the Regulatory Compliance Management Procedure.

In addition, the MoC MSPS (M05) is in place to assure process safety risks arising from change (temporary and permanent) are systematically identified, assessed and managed.

7.3.2 Environment Plan Management of Change and Revision

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 2.10) including: review of advances in technology at stages where new equipment may be selected such as vessel contracting; changes in understanding of the environment, DCCEEW EPBC Act listed threatened and migratory species status, Part 13 statutory instruments (recovery plans, threat abatement plans, conservation advice, wildlife conservation plans) and current requirements for AMPs (Section 4.8); and potential new

advice from external stakeholders (Section 5), will be managed in accordance with Regulation 38 and 39 of the Environment Regulations.

Risk will be assessed in accordance with the environmental risk management methodology (Section 2.8 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 38 and 39 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 38 or 39 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.

7.3.3 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 38 and 39 to determine if EP, including OPEP, resubmission is required (see Section 7.3.2). Matters arising with potential to influence minor or technical changes to the OPEP are tracked in MoC records, project records and incorporated during internal updates of the OPEP or revisions to the EP.

7.4 Management of Safety and Critical Element Technical Performance Standards and Management System Performance Standards

7.4.1 Management System Performance Standards (MSPS)

Woodside ensures safety critical management processes function as required through the application of MSPS. These standards are developed and owned at non-facility-specific level (i.e., pan-Woodside) and include assurance checks for the key requirements of the applicable management system.

Individual facilities demonstrate conformance against the MSPS through the conduct of reviews. Non-conformances against an MSPS are internally managed in accordance with the WMS.

7.4.2 SCE Technical Performance Standards

An SCE is defined by Woodside as a hardware barrier, the failure of which could cause or contribute substantially to, and the purpose of which is to prevent or limit the effect of a MAE/MEE, or Process Safety Event.

Woodside identifies/develops, implements, monitors/assures and verifies/optimises SCEs by applying SCE technical Performance Standards as described in the SCE Management Procedure. Key elements of the procedure are summarised in Table 7-3.

Table 7-3: Safety and Environment Critical Element Management Procedure Summary

Identify/Develop	Identify SCE – SCEs must be identified from the facilities PSRAs (e.g. Formal Safety Assessments) (Section 2.2). The identification of SCEs for which Performance Standards are required are part of the formal safety and environmental risk assessment processes. Woodside's Global Performance Standards (based on industry and Woodside Standards) should be used for preliminary selection of SCEs. Complete Engineering Design Studies – Engineering design studies must be completed to demonstrate that SCE Performance Criteria specified in the global Performance Standard and/or determined by PSRA will be met by the facility design, allowing for normal SCE degradation in operation. The studies must establish the testing and inspection tasks required to assess performance against the criteria. The scope and frequency of SCE Assurance Tasks are guided by the Global Performance Standard and may require designated Engineering Design Studies. Studies should include Reliability Centred Maintenance, Risk Based Inspection and Safety Instrumented Function studies to determine the Assurance Task scope and frequencies, RBI plans, and classification and implementation requirements for instrumented safeguarding. Develop Performance Standards – Facilities must develop Performance Standards for all SCEs by: selecting the applicable Global Performance Standard (including Assurance Tasks) considering facility specific requirements and applicable regulatory requirements adding the specific data from the facility Engineering Design Studies and PSRA to compile scope and frequency of SCE assurance activities.
Implement	Identify SCE in Asset Register – SCEs must be uniquely identified on the asset register and assigned Performance Standard flags. Develop Testing, Inspection and Maintenance Programs – SCE assurance tasks are developed into maintenance procedures. Implement Testing, Inspection and Maintenance Programs – SCE testing, inspection and maintenance requirements must be implemented in the CMMS (Section 7.2.4).
Maintain/Assure	Execute Testing, Inspection and Maintenance Programs – On completion of SCE assurance tasks, results must be recorded with all relevant detail, assessed for conformance with the Performance Criteria and any follow on correction work identified. Conduct Fitness for Service (FFS) Assessment – In some instances, an engineering FFS assessment may be required to determine whether equipment has failed its performance standard requirements, e.g. assessment of corrosion defects following inspection of piping. Detailed results of FFS assessment may be recorded out of CMMS. Response to SCE Failure – SCE failure (technical Performance Standard non-conformance) is a failure to achieve the given Performance Criteria. SCE failures must be managed in accordance with a structured review process. This process may require the application of the facility MOPO which provides prescriptive guidelines to be followed in the event of a reduction in the performance of an SCE, or managed in accordance with the Management of Change – Assets Procedure (Section 7.1.4). Internal Reporting – SCE failure/damage and SCE demands must be reported in accordance with the Health Safety and Environment Event Reporting and Investigation Procedure (Section 7.13.4). External Reporting – External notification obligations for SCE failure/damage must be understood (i.e. based on local regulatory requirements). External communications must be in accordance with the health safety and environment event reporting and investigation procedure (Section 7.13.5). Manage and Analyse Results – The results from assurance tasks must be accurately recorded to support data analysis. Analysis will enable appropriate action to be taken to minimise future failure recurrences, and enable assessment of overall system performance and reliability to verify SCE effectiveness in revealing failures and to allow predictive maintenance.

Verify/Optimise	Review SCE Performance – SCE performance reviews must be conducted to ensure requirements for maintaining SCE performance are being met. Manage Change – Any change to the Performance Standards must be conducted in accordance with the MoC Procedure (Section 7.3.2).

SCE Technical Performance Standards are a statement of the performance required of an SCE (e.g. functionality, availability, reliability, survivability), which is used as the basis for establishing agreed assurance tasks and managing the hazard. An assurance task is an activity to confirm that the SCE meets, or will meet, its SCE Performance Standard. Examples of assurance tasks include inspection routines, maintenance activities, test routines, instrumentation calibration and reliability monitoring.

These assurance tasks are identified in the CMMS, flagged against their associated technical Performance Standard, and given the appropriate priority. Management systems are in place to manage the completion of maintenance including that required for Technical Integrity assurance.

Events where the SCC/SCE have not met their specified performance criteria must be managed in accordance with a structured review process. This process may require the application of the facility Manual of Permitted Operation (MOPO) which provides prescriptive guidelines to be followed in the event of a reduction in the performance of an SCE in specific defined circumstances; or, if the MOPO does not cover the event, according to procedures for the assessment and management of operational risk.

Internal notification of SCC failures must be made in accordance with maintenance management workflows. Failures to meet a Facility Performance Standard occur where SCC events lead to the functional objectives (goal and/or key requirement statements) of the facility Performance Standard for the SCE not being met (i.e. lost or unavailable), taking into account any redundancy inherent within the SCE. These ‘damage to SCE’ events are reported in the Event Reporting Database as potential SCE Failure to Meet Facility Performance Standard Events.

These are internally reported as Hazard Events. Where ‘Failure to meet a Facility Performance Standard’ leads to a loss of hydrocarbon containment, or a release of energy, it is internally reported (and externally where relevant) as a Loss of Primary Containment or Environmental Spill event, depending on the nature of the release.

Additionally, confirmed “Failure to meet a Facility Performance Standard’’ events for the SCEs identified in the MEE bowties may equate to a breach of EPOs and/or EPSs. The review to identify such events for external reporting considers whether the hazard event is relevant to environmental SCE functional objectives (goal and/or key requirements) of the SCE Facility Performance Standard and whether the event poses a risk to achieving EPOs and EPSs. The WMS Regulator Event Reporting Guideline provides additional information regarding external SCE related reporting obligations.

There may also be planned changes/deviations from SCE Technical Performance Standards, these are managed via procedures for the assessment and management of operational risk, and endorsed in accordance with the engineering management procedures (described further within Section 7.3. This management process ensures risks (including environment) are managed so that the planned change/deviation does not result in unacceptable impact or risk, remains ALARP and regulatory requirements are met.

7.5 Woodside’s Decommissioning Framework

Decommissioning is a planned activity for the offshore oil and gas industry. Current best practice is for decommissioning to include:

- designing for decommissioning during the development phase of projects / facilities
- removing property, equipment and infrastructure, such as a facility or a pipeline, and plugging wells associated with a petroleum activities.
- assessing decommissioning options and opportunities during the operational life of the facility leading up to cessation of production
- selecting, developing and planning the selected decommissioning option
- executing decommissioning plans
- restoring the marine environment.

This is aligned with Section 572 (3) of the OPGGS Act, which requires titleholders to remove property from the title area when it is neither used, nor to be used, in connection with the operations. Planning for complete removal is generally the base case for offshore decommissioning operations. Section 572 (7) and section 270 (3) of the OPGGS Act provide scope for in situ decommissioning or other arrangements to be made where it can be demonstrated that the risks and impacts are ALARP and acceptable. If complete removal or other arrangements for decommissioning are planned, the proposed alternative presented in an EP must comply with all other Acts and legislation.

7.5.1 Decommissioning in Operations

Asset specific decommissioning plans are typically developed prior to cessation of production. Planning includes redundant infrastructure as well as structures coming to the end of production and decommissioning critical systems to enable, as a base case, removal.

7.5.2 Facility Decommissioning Planning

Decommissioning planning generally commences 2-10 years prior to Cessation of Production (CoP) (Figure 7-5). The timeframe selected for decommissioning planning depends on the complexity of the facility and infrastructure requiring decommissioning.

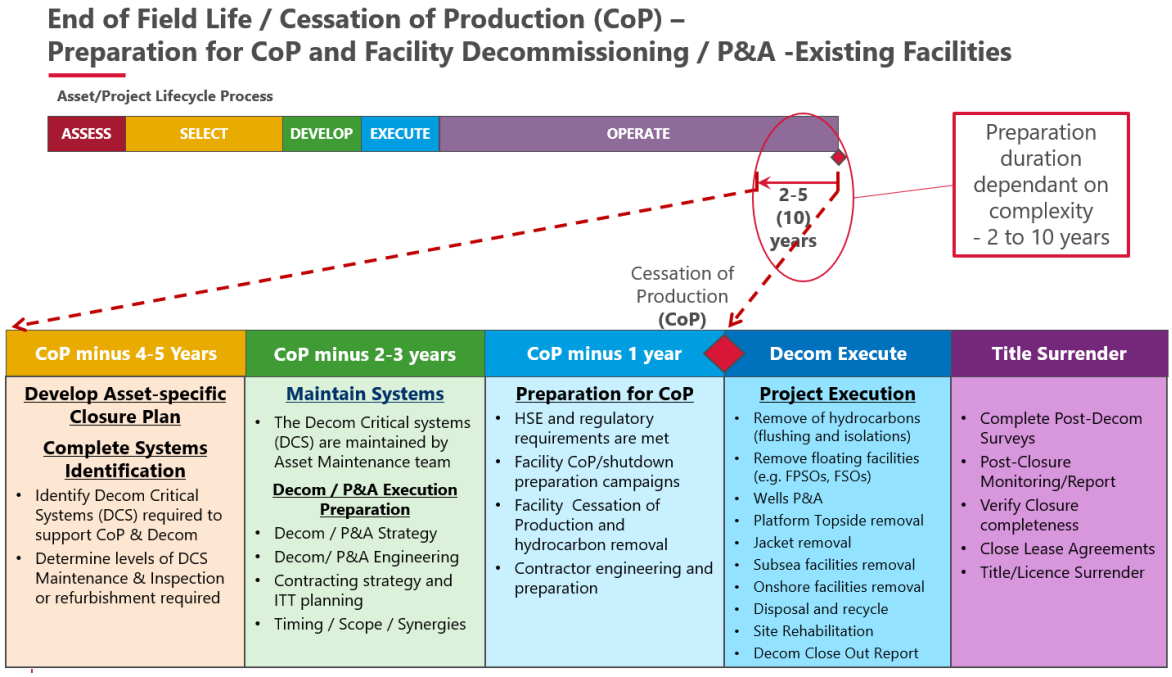


Figure 7-5: Woodside's process for decommissioning planning

7.5.3 Pluto Decommissioning Strategy

The base plan for decommissioning consists of permanent plugging and abandonment (P&A) of wells, removal of trees, wellheads and all other subsea equipment (e.g. XT's, manifolds, Valve stations) by cleaning and flushing and removal to shore.

The Pluto topsides to be cleaned and disconnected then removed via modular reverse lift and transported onshore for recycling/disposal. Alternative decommissioning strategies to full removal will be explored for the Pluto Jacket and rigid pipelines.

The decommissioning strategy will be matured over the time through various studies and data gathering targeted to support that the final proposed Pluto Decommissioning Plan represents an ALARP position in respect of the environmental, safety and the socio-economical outcomes.

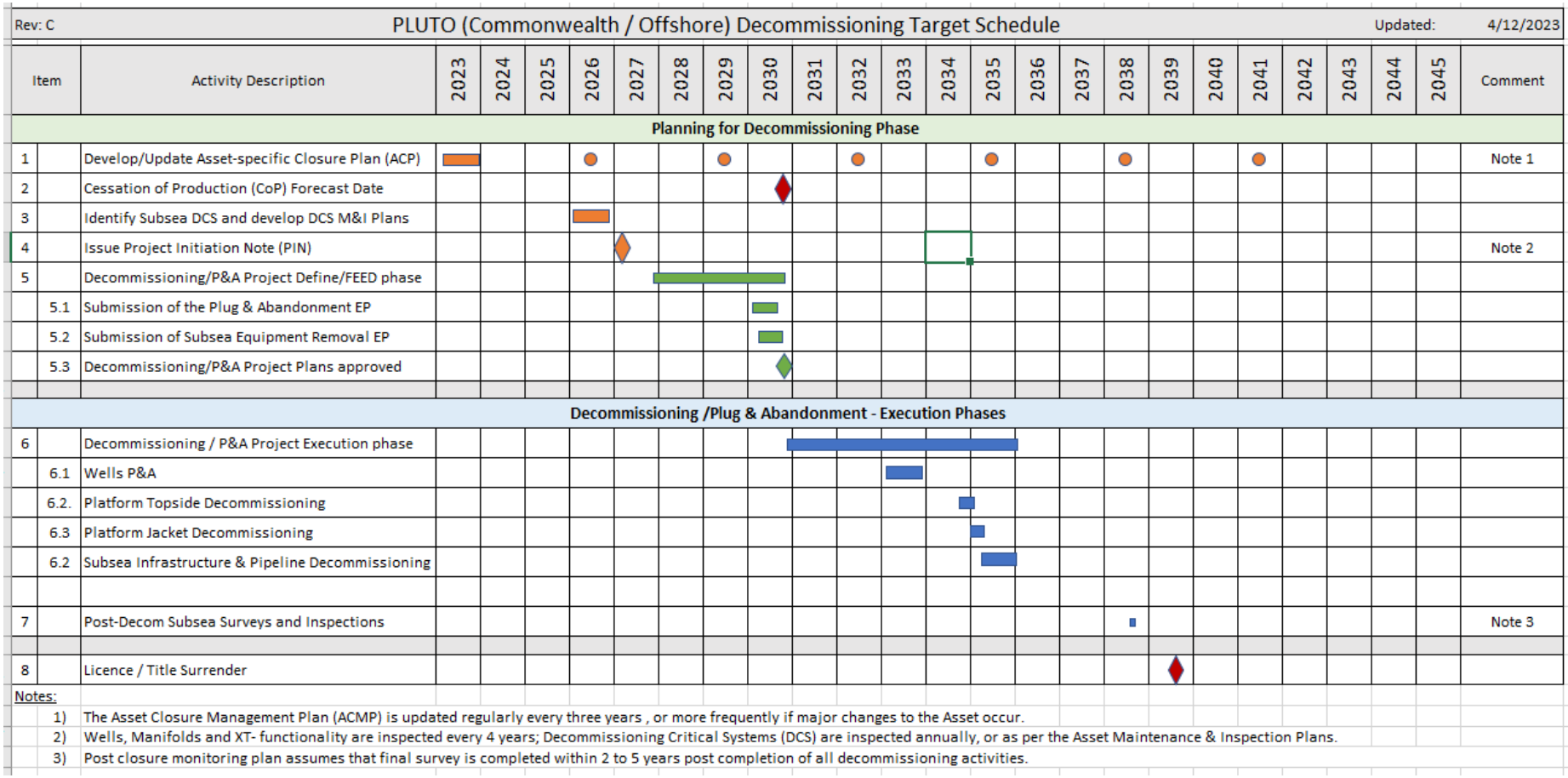
7.5.4 Pluto Decommissioning Phasing

Decommissioning of the Pluto facilities has been planned in two phases:

- Phase-1 - Planning for decommissioning / P&A of the Pluto offshore facilities
- Phase-2 – Execute decommissioning / P&A of the Pluto offshore facilities.

The expected Cessation of Production (CoP) for the Pluto offshore facilities is around 2030.

Currently Woodside is commencing early studies in support of the preparations for the future decommissioning activities to optimise the scope and strategy to deliver safe and effective decommissioning outcomes. The key envisaged activities related to the decommissioning are outlined in the indicative Pluto Decommissioning Planning Lifecycle Schedule shown in Figure 7-6. Timing is indicative - subject to reservoir performance outcomes through the remaining field life.



Rev: C — PLUTO (Commonwealth / Offshore) Decommissioning Target Schedule — Updated: 4/12/2023

Item		Activity Description	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Comment
Planning for Decommissioning Phase																										
1		Develop/Update Asset-specific Closure Plan (ACP)																								Note 1
2		Cessation of Production (CoP) Forecast Date																								
3		Identify Subsea DCS and develop DCS M&I Plans																								
4		Issue Project Initiation Note (PIN)																								Note 2
5		Decommissioning/P&A Project Define/FEED phase																								
	5.1	Submission of the Plug & Abandonment EP																								
	5.2	Submission of Subsea Equipment Removal EP																								
	5.3	Decommissioning/P&A Project Plans approved																								
Decommissioning /Plug & Abandonment - Execution Phases																										
6		Decommissioning / P&A Project Execution phase																								
	6.1	Wells P&A																								
	6.2.	Platform Topside Decommissioning																								
	6.3	Platform Jacket Decommissioning																								
	6.2	Subsea Infrastructure & Pipeline Decommissioning																								
7		Post-Decom Subsea Surveys and Inspections																								Note 3
8		Licence / Title Surrender																								

Notes:

1) The Asset Closure Management Plan (ACMP) is updated regularly every three years , or more frequently if major changes to the Asset occur.
2) Wells, Manifolds and XT- functionality are inspected every 4 years; Decommissioning Critical Systems (DCS) are inspected annually, or as per the Asset Maintenance & Inspection Plans.
3) Post closure monitoring plan assumes that final survey is completed within 2 to 5 years post completion of all decommissioning activities.

Figure 7-6: Indicative Pluto Decommissioning Planning Lifecycle and Schedule

7.5.4.1 Phase 1: Planning for Decommissioning - Key Activities

2023: Developed Asset-specific Closure Management Plan (CMP) – (the CMP will be updated regularly to reflect changes to the asset infrastructure, or to address major changes in Regulator requirements).

2026: Complete Decommissioning Critical Systems (DCS) identifications, define DCS Maintenance & Inspection requirements and update the Asset Maintenance & Inspection Plans (if required).

2027: Initiate Define/FEED works for the Pluto Offshore facilities decommissioning program.

2027 to 2030: Complete Define/FEED Phase works for Decommissioning / P&A of the Pluto offshore facilities.

Submission of the Environmental Plan(s) for the activities related to flushing of the subsea systems and for isolations/separation of the wells from the flushed subsea infrastructure.

2030: Commence Pluto Offshore Asset Cessation of Production (CoP) activities.

7.5.4.2 Phase 2: Execute Decommissioning and P&A – Key Activities:

2030 to 2035: Execute P&A of the wells – (target within 3 years from the CoP). Execute decommissioning/removal of the PLA platform and the subsea equipment – (target within 5 years from the CoP date).

7.6 Organisation Structure

The following Woodside organisational structure provides leadership and direction for operation of the Pluto facility and environmental performance:

- The Executive Vice President (EVP) Australian Operations reports to the Chief Executive Officer.
- The Pluto and Scarborough Vice President (VP) reports to the EVP.
- The Asset Manager reports to the Pluto and Scarborough VP.
- The Reliability & Integrity Manager reports to the Pluto and Scarborough VP.
- The PLA Superintendent reports to the Asset Manager.
- The functional support teams report to the corresponding Functional VP.

Production facilities are supported by a team of environmental professionals who report to the Environment and Sustainability Manager – Australian Operations.

All facilities are supported by other Woodside functional teams, including:

- HSE – provides specific guidance and access to specialist HSE resources including assistance for governance and training, as well as guidance on Woodside HSE standards
- Subsea – responsible for the installation and IMMR activities on subsea infrastructure including facility structures, flowlines, manifolds and subsea isolation valves to ensure integrity
- Global Wells and Seismic – ensures the safe planning and execution of drilling, completion and work over operations
- Projects – responsible for the engineering, construction and execution of small projects on operational facilities to ensure ongoing integrity and safe operation
- Marine Group – responsible for chartering vessels to support Woodside's offshore production facilities including vessels to aid emergency response

- Aviation Group – provides personnel transport, material transport, emergency evacuation and search and rescue capabilities.

7.7 Roles and Responsibilities

Key roles and responsibilities for Woodside and contractor personnel in relation to implementing, managing and reviewing this EP are described in Table 7-4. Roles and responsibilities for hydrocarbon spill preparation and response are outlined in Table 7-4 and the Woodside Oil Pollution Emergency Arrangements (Australia).

It is the responsibility of all Woodside employees and contractors to apply the Woodside's Health and Safety Policy, and Environment and Biodiversity Policy in their areas of responsibility and that the personnel are suitably trained and competent in their respective roles.

Table 7-4: Roles and responsibilities

Title (role)	Environmental Responsibilities
All Personnel	
All onshore and offshore personnel	understand the Woodside standards and procedures that apply to their area of work. understand the environmental risks and control measures that apply to their area of work. carry out assigned activities in accordance with approved procedures and the EP. follow instructions from relevant supervisor with respect to environmental protection. cease operations which are deemed to present an unacceptable risk to the environment. participate in environmental assurance activities and inspections as required. prompt reporting of environmental hazards/incidents to their supervisor and assist in event investigation. attend HSE meetings, training and drills when required.
Office-based Personnel	
Woodside Project Manager	Monitor and manage the activity so it is undertaken as per the relevant standards and commitments in this EP. Notify the Woodside Environment Adviser of any scope changes in a timely manner. Liaise with regulatory authorities as required. Review this EP as necessary and manage change requests. Ensure all project and support vessel crew members complete an HSE induction. Verify that contractors meet environmental related contractual obligations. Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's Health, Safety and Environment Reporting and Investigation Procedure. Monitor and close out corrective actions identified during environmental monitoring or audits.
Woodside Head of Projects/Region (Global Wells and Seismic)	Ensure drilling operations are undertaken as per this EP and approval conditions. Provide sufficient resources to implement the drilling-related management measures (i.e. controls, EPOs, EPSs and MC) in this EP. Confirms controls and performance standards in this EP are actioned, as required, before drilling commences. Ensures the MODU start-up meets the requirements of the Drilling and Managing Rig Operations Process.
Subsea Delivery Lead	Ensure the subsea installation activities are undertaken as per this EP and approval conditions. Provide sufficient resources to implement the subsea installation-related management measures (i.e. controls, EPOs, PSs and MC) in this EP. Ensure installation vessel personnel are given an Environmental Induction as per Section 7.9.1 this EP at the start of the installation activities. Confirm controls and performance standards in this EP are actioned, as required, before installation activities commence. Ensure relevant vessels meet the requirements of Woodside's Marine Operations Operating Standard. Manage change requests for the activity and notify the Woodside Environment Adviser of any scope changes in a timely manner. Confirm that site-based personnel are given an Environmental Induction as per Section 7.9.1 of this EP at the start of the activity. Ensure all chemicals and drill fluids proposed to be discharged are assessed and approved as per the requirements of the EP.
Woodside Drilling Superintendent	Ensure the drilling program meets the requirements detailed in this EP. Ensure changes to the drilling program are communicated to the Woodside Environmental Adviser. Ensure the Woodside's Well Site Manager is provided with the resources required to ensure the management measures (i.e. controls, EPOs, EPs and MC) in this EP are undertaken.

Title (role)	Environmental Responsibilities
	Confirm environmental incident reporting meets regulatory requirements (as outlined in this EP) and Woodside's Health, Safety and Environment Reporting and Investigation Procedure. Monitor and close out corrective actions identified during environmental monitoring or audits. Ensure MODU and project vessel personnel are given an Environmental Induction as per Section 7.9.1 of this EP at the start of the drilling programs.
Woodside Drilling Engineers	Ensure changes to the drilling program are communicated to the Woodside Environmental Adviser. Ensure all drill and completions fluid chemical components and other fluids that may be used downhole have been reviewed by the Drilling and Completions Environmental Adviser.
Woodside Projects/GWS Environmental Adviser	Verify relevant Environmental Approvals for the activities exist prior to commencing activity. Track compliance with performance outcomes and performance standards as per the requirements of this EP. Prepare environmental component of relevant Induction Package. Assist with the review, investigation and reporting of environmental incidents. Ensure environmental monitoring and inspections/audits are undertaken as per the requirements of this EP. Liaise with relevant regulatory authorities as required. Assist in preparation of external regulatory reports required, in line with environmental approval requirements and Woodside incident reporting procedures. Monitor and close out corrective actions (Campaign Action Register (CAR)) identified during environmental monitoring or audits. Provide advice to relevant Woodside personnel and contractors to assist them to understand their environment responsibilities. Liaise with primary installation contractors to ensure communication and understanding of environment requirements as outlined in this EP and in line with Woodside's Compass values and management systems.
Asset Manager	accountable for ensuring all necessary regulatory approvals are in place to operate. approves (decides on) the content to be contained in the Environment Plan accountable for managing the asset throughout its operations in accordance with legislative/regulatory requirements (including this EP) and WMS requirements. agrees facility key performance indicators (KPIs), including environment KPIs and is accountable for their achievement. responsible for continuous improvement of operations of the facility, including environmental performance. decides on technical decisions where required based on assessed current level of risk. accountable for incident notification, reporting and investigation in line with regulatory requirements, the WMS and EP requirements
PLA Superintendent	Responsible for the safe conduct of all activities within the facility 500 m Safety Zone and within the vicinity of the connected pipelines, through the facility team of coordinators, technicians and specialist resources. Accountable for aspects of integrity management including the evaluation and reporting of conditions against performance standard, integrity envelope, reviewing post-incident / legislative or joint venture requirements and planning and executing planned inspections. Accountable for conformance to operations processes including ISSoW. Accountable for compliance with all legislative and regulatory requirements including Safety Case and Environment Plan. Accountable for ensuring all teams operate on the facility in a safe and reliable manner within the defined technical integrity envelope. Responsible for making safe, repairing and raising technical deviations where necessary for abnormal situations. Accountable and responsible for updating changes to production information in site-controlled documents.

Title (role)	Environmental Responsibilities
	Accountable for the performance and development of direct reports, ensuring operator and maintainer capability and competency across all shifts and ensuring the skill requirements are being met. Accountable for effective handovers between shifts and swings. Decider for high risk MOC decisions associated with PLA and pipelines. Custodian of and therefore responsible for ensuring the facility remains in compliance with PLA Safety Case and Environment Plan.Ensures offshore personnel comply with regulatory/legislative requirements (including the EP) and the WMS. Communicates changes relevant to the EP to the Production Environment team. Implement relevant offshore environment initiatives and review environmental performance to drive continuous improvement. Ensure effective communication with workforce on environmental performance. Ensure incidents are reported and investigated in line with WMS and EP requirements, with appropriate actions initiated and closed out.
Technical Support Lead	Champion technology and new ways of working to explore and implement new and efficient ways for managing performance and maintenance for equipment. Champion and embed risk thinking with Engineers and TICs so that effective and proportionate controls are implemented.
Reliability & Integrity Manager	Steward of Reliability and Integrity for the business unit. Lead a team that expertly ensures that strategies for equipment maintenance and operation are set to meet Reliability, Performance and Integrity goals. Ensuring that the Safety Case, Performance Standard, Regulatory and Reliability driven maintenance tasks for all equipment are known and implemented in the most efficient maintenance strategy possible. Ensuring that Very High and Severe risks are assessed and controlled when they appear, and that the right technical expertise, including technical authorities, is engaged to understand, communicate and manage the risk, as part of the 'Agree' role in the Engineering Management Procedure. Ensuring that refresh of facility baseline risk assessments is completed upon trigger of re-assessment. Assuring that reliability and integrity delivery processes in the assets is being done to correct standard and engaging with relevant process owners.
Integrity Authorities (Technical Integrity Custodians, Technical Authorities and Engineering Authorities)	Manage technical integrity within their designated discipline by ensuring the safe and consistent application of integrity management processes and systems, discipline standards and good engineering practices. Agree technical integrity decisions based on assessed current level of risk. Agree to facility specific Performance Standards and confirm that Performance Standard requirements are met.
Subsea and Pipelines (IMMR) Activity Manager	ensure IMMR activities undertaken in line with EP commitments. manage IMMR change requests for the activity and notify the Subsea and Pipelines Environment Adviser of any scope changes in a timely manner. responsible for governance of IMMR related activities for Subsea Support Vessels. provide sufficient resources to implement the EP requirements. monitor and close out corrective actions raised from IMMR environmental inspections/audits or incidents
Environment Manager Australian Operations	facilitate operations environmental approval documentation and timely submission in accordance with regulatory requirements. ensure Asset and supporting personnel understand and adhere to legislative and regulatory environment requirements, EP requirements and the environmental requirements of the WMS. develop and maintain appropriate Production environmental processes and procedures.

Title (role)	Environmental Responsibilities
	Monitor and communicate to internal stakeholders all relevant changes to legislation, policies, regulator organisation that may impact the EP or business. facilitate review of the EP, including five-yearly revision and in relation to any technical decisions or proposed changes to operations
Environment Adviser Australian Operations	manage change relevant to the EP in accordance with the Regulations and the EP ensure environmental monitoring, offshore inspections, and reporting is undertaken as per the requirements of this EP. coordinate and monitor closeout of corrective actions. ensure environmental inspections/audits are undertaken as per the requirements of the EP. ensure environmental incident reporting meets regulatory requirements (as described within the EP) and WMS
Corporate Affairs Adviser	Prepare and implement the Consultation Plan for the Petroleum Activities Program. Report on consultation. Ongoing liaison and notification as required.
Woodside Marine Assurance Superintendent	Conducts relevant audit and inspection to confirm vessels comply with relevant Marine Orders and Woodside Marine Charters Instructions requirements to meet safety, navigation and emergency response requirements.
Woodside CIMT Deputy Incident Commander	On receiving notification of an incident, the Woodside CIMT Deputy Incident Commander shall: establish and take control of the IMT and establish an appropriate command structure for the incident. assess situation, identify risks and actions to minimise the risk. communicate incident progress to relevant persons within the organisation. develop the incident action plan (IAP) including setting 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.
Contractor Sponsors	ensure implementation of EP for the contractor's scope of work ensure contractors have adequate environmental capability in order to execute their respective scopes of work. review contractor environmental performance as required.
PLP-based personnel	
Frontline Superintendent	Onshore roles at Pluto LNG Park which are responsible for ensuring that offshore work scopes are conducted in safe manner when platform is not crewed. Other responsibilities associated with onshore gas plant are described in the Pluto LNG Park Safety Case. Issuing Authority in ISSoW Permit to Work system when platform is uncrewed and/or subsea scope that does not involve work execution on PLA platform and is outside the facility 500m Safety Zone. Responsible for emergency response at or near PLA when platform is uncrewed.
Onshore Installation Manager (OIM)	Normally Site Controller in ISSoW process. Other responsibilities associated with onshore gas plant are described in the Pluto LNG Park Safety Case. Accountable for Permit to Work governance, processes and permit requirements. The OIM, supported by Frontline Superintendent, is the single point responsible person for the coordination of SIMOPS for activities that have ability to impact onshore or its operations.
Environment Advisor	liaise with managers/supervisors on day-to-day management of environmental risks and issues assist in the ongoing promotion of environmental performance at the facilities and day-to-day management HSE risks and issues.

Title (role)	Environmental Responsibilities
	identify opportunities for continuous improvement and communicate these to the PLA Superintendent and Environment Team implement environmental improvement plans. support operational personnel to understand the EP requirements applicable to their role. communicate environmental performance information and training material to offshore personnel and maintain associated records.
PLA-based Personnel (in crewed mode)	
Person in Charge (PIC) (offshore crewed mode)	Offshore roles at PLA which are responsible for ensuring that offshore work scopes are conducted in a safe manner when platform is crewed. Accountable for the day-to-day operations of the platform when crewed including, SIMOPS affecting PLA, effective shift handover; completion and logging of operator routine. Responsible for operations shift compliance to all legislative and regulatory requirements as defined in the Safety Case and Environmental Plan. Issuing Authority in ISSoW Permit to Work systemwhen platform is crewed. Responsible for auditing and maintaining maintenance procedures. Responsible for leading and coordinating a multi-disciplined team that is responsible for the duties required to support the facility, including helicopter operations, vessel movements and consumable controls. Responsible for emergency response at or near PLA when platform is crewed, including ensuring exercises and drills are carried out such that the facility's ability to respond effectively to an emergency is assured.
Production and Maintenance Technicians	responsible for daily operations on the facility within their operational control. undertake daily operational and maintenance tasks in accordance with approved standards and procedures to ensure compliance with the EP. manage day-to-day environmental risks through use of ISSoW and other risk management tools. identify opportunities for continuous improvement and communicate these to their Supervisor. complete training requirements to maintain competence and knowledge in operating and maintaining equipment and manage environmental risks and impacts. participate in environmental assurance activities and inspections as required. report all environmental hazards and incidents and assist in investigations.
MODU-based Personnel	
MODU Offshore Installation Manager (OIM)	Ensure the MODU's management system and procedures are implemented. Ensure personnel starting work on the MODU receive an environmental induction that meets the requirements specified in this EP. Ensure personnel are competent to undertake the work they have been assigned. Verify that emergency drills are conducted as per the MODU's schedule. Ensure the MODU's Emergency Response Team has been given sufficient training to implement the MODU's SOPEP. Ensure any environmental incidents or breaches of outcomes or standards are reported immediately to the Well Site Manager. Ensure corrective actions for incidents or breaches are developed, communicated to the Well Site Manager, and tracked to close out in a timely manner. Close out of actions is communicated to the Well Site Manager.
Woodside Well Site Manager	Ensure the drilling program is undertaken as detailed in this EP. Ensure the management measures (i.e. controls, EPOs, PSs and MC) detailed in this EP (relevant to offshore activities) are implemented on the MODU (other controls will be implemented onshore). Ensure environmental incidents or breaches of outcomes or standards are reported as per the Woodside Corporate Event Notification Matrix. Corrective actions for incidents and breaches are developed, tracked and closed out in a timely manner. Ensure actions in the Drilling and Completions HSE Improvement Plan are undertaken.

Title (role)	Environmental Responsibilities
	Ensure periodic environmental inspections/reviews are completed. Corrective actions from inspections are developed, tracked and closed out in a timely manner.
Woodside Offshore HSE Adviser	Support the Well Site Manager to ensure the controls detailed in this EP relevant to offshore activities are implemented on the MODU and help collect and record evidence of implementation (other controls are implemented, and evidence collected onshore). Support the Well Site Manager to ensure the Environmental Performance Outcomes are met and the performance standards detailed in this EP are implemented on the MODU. Confirm actions in the Drilling and Completions HSE Improvement Plan are undertaken. Support the Well Site Manager to ensure environmental incidents or breaches of outcomes or standards outlined in this EP, are reported, and corrective actions for incidents and breaches are developed, tracked and closed out in a timely manner. Ensure periodic environmental inspections/reviews are completed and corrective actions from inspections are developed, tracked and closed out in a timely manner. Review Contractors procedures, input into Toolbox talks and JSAs. Provide day to day environmental support for activities in consultation with the Woodside Environment Adviser.
Drilling Logistics Coordinator	Waste is managed on the MODU and sent to shore as per the Drilling and Completions Waste Management Plan.
Vessel-based Personnel	
Vessel Master (Installation Vessel Master, Activity Support Vessel Master, Support Vessel (Platform and Subsea Support Vessels)	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 undertake the work they have been assigned. Verify SOPEP drills are conducted as per the vessel's schedule. Ensure the vessel Emergency Response Team (ERT) has been given sufficient training to implement the SOPEP. Ensure any environmental incidents or breaches of relevant Environmental Performance Outcomes or performance standards detailed in this EP, are reported immediately to the Woodside Representative. Ensure corrective actions for incidents or breaches are developed, communicated to the Woodside Representative, and tracked to close out in a timely manner. Close out of actions is communicated to the Woodside Representative.
Vessel Logistics Coordinators	Ensure waste is managed on the relevant support vessels or installation vessel and sent to shore as per the relevant Waste Management Plan.
Vessel HSE Advisers	Refer to Woodside HSE Offshore Adviser responsibilities detailed above under MODU-based personnel.
Contractor Project Manager	Confirm that activities are undertaken in accordance with this EP, as detailed in the Woodside approved Contactor Environmental Management Plan 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 undertake the work they have been assigned. Ensure any environmental incidents or breaches of objectives, standards or criteria outlined in this EP, are reported immediately to the Woodside Responsible Engineer or Vessel Master.

Title (role)	Environmental Responsibilities
Woodside Site Representative/ Resident Engineer	Ensure activities are undertaken as detailed in this EP. Ensure the management measures made in this EP are implemented on the vessel. Ensure environmental incidents or breaches of objectives, standards or criteria outlined in this EP, are reported as per the Woodside Corporate Event Notification Matrix Verify HSE improvement actions identified during the project are implemented where practicable. Ensure periodic environmental inspections are completed.

7.8 Unexpected Finds Procedure

In the event of the discovery of what appears to be Underwater Cultural Heritage (defined as 'any trace of human existence that has a cultural, historical or archaeological character and is located under water'); the following Unexpected Finds Procedure will apply:

- All activities with the potential to impact the suspected Underwater Cultural Heritage must cease immediately. Retain all records of the potential Underwater Cultural Heritage, including any imagery, description and location.
- Person who discovers the heritage object must inform the Activity Supervisor.
- Activity Supervisor must notify Woodside's Global Heritage Manager.

Woodside will specify an appropriate buffer around the potential Underwater Cultural Heritage, taking into consideration the nature and scale of the potential Underwater Cultural Heritage and the activities to be managed.

No seabed disturbance may occur within the buffer area around the potential Underwater Cultural Heritage until approved by Woodside's Global Heritage Manager. Woodside's Global Heritage Manager must notify a qualified underwater archaeologist and provide all available documentation of the potential Underwater Cultural Heritage. If the potential Underwater Cultural Heritage appears to be Aboriginal underwater cultural heritage, Woodside's Global Heritage Manager must notify the appropriate Traditional Custodians to determine whether it is a heritage site and if so, how the site should be managed.

If the potential Underwater Cultural Heritage appears to be a shipwreck or aircraft that has been wrecked for more than 75 years or is otherwise reportable under Section 40 of the UCH Act, Woodside's Global Heritage Manager must notify the Minister responsible for the UCH Act, the DCCEEW underwater archaeology section through the Australasian Underwater Cultural Heritage Database, and the Western Australian Museum.

If the suspected heritage object includes human remains, Woodside's Global Heritage Manager must also notify:

- The Australian Federal Police (phone: 131 444) of the location of the remains, that the remains are likely to be historic or Aboriginal in origin, and that it may be appropriate that Traditional Custodians and a maritime archaeologist are present during any handling of the remains; and
- The Office of the Federal Environment Minister in accordance with Section 20 of the ATSIHP Act.

Work must not recommence in the vicinity of the potential heritage object until Woodside's Principal Heritage Adviser provides written approval. Woodside's Global Heritage Manager must only provide written approval once agreed management measures are implemented consistent with approvals and legislation or where the potential Underwater Cultural Heritage is confirmed to not be Underwater Cultural Heritage.

7.9 Training and Competency

Woodside as part of its contracting process undertakes assessments of a proposed Contractor's environmental management system to determine the level of compliance with the standard AS/NZS ISO 14001. This assessment is undertaken for the Petroleum Activities Program as part of the pre-mobilisation process. The assessment determines whether there is a clearly defined organisational structure that outlines the roles and responsibilities for key positions. The assessment also considers whether there is an up-to-date training matrix that defines any corporate and site/activity-specific environmental training and competency requirements.

As a minimum, environmental awareness during inductions is required for all Pluto facility and MODU personnel, detailing awareness and compliance with the Pluto facility, MODU and project vessel Contractor's environmental policy and environmental management system.

Impacts to training roll-out have arisen in the last five years due to major external disruptions beyond Woodside's control, namely associated with the COVID-19 pandemic. In the event of similar future disruptions, the adequacy of training and competency processes and procedures will be subject to Woodside's MoC process for ongoing safe operations of its facilities.

7.9.1 Inductions and Training

Inductions are provided to all relevant personnel (e.g. contractors and Company representatives) before mobilising to or on arrival at the activity location. The induction covers the HSE requirements and environmental information specific to the activity location. Attendance records will be maintained.

The Petroleum Activities Program induction may cover information about:

- Description of the activity
- Ecological and socio-economic values of the activity location (including Underwater Cultural Heritage).
- Regulations relevant to the activity
- Woodside's Environmental Management System – Health and Safety, and Environment and Biodiversity Policies.
- EP importance/structure/implementation/roles and responsibilities
- Main environmental aspects/hazards and potential environmental impacts and related performance outcomes
- Oil spill preparedness and response
- Monitoring and reporting on performance outcomes and standards using MC
- Incident reporting
- Inductions for offshore facility workers and visitors
- Operations competency framework training
- Permit to work training (ISSoW)
- Production environmental leadership training and environment awareness training
- Emergency and hydrocarbon spill response training
- Inductions for subsea IMMR (vessel based) personnel.
- Unexpected Finds Procedure and reporting requirements (Section 7.8).

- Records for Woodside operations personnel, in relation to the above listed training, are maintained in Woodside's learning management system. Contractor training records are also maintained.
- Competence of operations personnel can be reviewed via online dashboards.

7.9.2 Activities Program Specific Environmental Awareness

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

During operations, regular HSE meetings will be held on the Pluto facility, MODU and project vessels which cover all crew. During these meetings, recent environmental incidents are regularly reviewed, and awareness material presented.

7.9.3 Inductions for Offshore Facility Workers and Visitors

A comprehensive induction process is in place for personnel working on or visiting Woodside's offshore production facilities. The induction process is designed to equip personnel with the HSE awareness and skills necessary for them to manage their own safety and environmental performance and contribute to others working around them. The induction process includes:

Common Production Induction – All employees and contractors who have not accessed a production facility within twelve months are required to undertake this induction prior to mobilisation. It includes Woodside's values, HSEQ and Process Safety, continuous improvement, risk management and ISSoW.

Facility Specific Induction – All employees and contractors that have not accessed the production facility within twelve months are required to undertake this induction on arrival at the facility. This induction covers the HSE and emergency response issues specific to each facility. For environment, this induction covers the EP, prevention of spills, waste management, fauna interactions, hazard identification and risk assessment, and incident reporting.

Production Offshore Environmental Leadership Training – Key operations leadership roles (as specified within the Operations Competency Framework) are required to complete this competency on commencement of the new role and three yearly thereafter. The training covers Woodside's policies and standards, environmental legislative requirements, the EP, key environmental risk and impacts, environmental reporting, environmental management tools (e.g. improvement planning, compliance reviews and audits), hydrocarbon spill response and environmental accountabilities.

Production Offshore Environmental Awareness Training – All new offshore operational personnel are required to undertake this online training on commencement of the new role and two yearly thereafter. This training covers environmental legislative requirements, the facility EP, key environmental hazards and control measures (including waste management, spill prevention, chemical storage, wildlife interactions), environmental management tools, hazard and incident reporting, spill response, and environmental responsibilities.

7.9.4 Operations Competency Framework Training

The Operations Competency Guideline defines a framework to make sure all personnel on operating facilities are competent to perform their work and that competency is managed. By doing this, the potential for unplanned (accident/incident) type events that could result in environmental impact is minimised.

Operational Area License to Operate (LTO) roles are those roles related to oil and gas processing, equipment maintenance, marine regulations, emergency response and any other roles involved with safeguarding the facility integrity, including all roles where high-risk work licenses are required. Additionally, roles mandated by Woodside such as HSEC and helicopter landing officer are included in the LTO roles process.

The requisite competency and training for each LTO role has been defined. Competencies for these LTO roles are stipulated by the governance group for each respective position and are based on the relevant Australian or International standards which apply. In cases where no Australian or International standards are available or applicable, training is based on the relevant Woodside Standard as determined by the respective governance group.

Contractors working on Woodside facilities are required to verify the competency of their personnel through the contractor's own verification systems. Additionally, contractor personnel working on Woodside facilities are required to be registered in Woodside's Contractor Verification Service (CVS) beforehand. Personnel registered in CVS have had their skills and qualifications independently verified on behalf of Woodside thereby confirming that contractor personnel hold the required competencies before mobilisation to the facility.

The LTO Roles Report (available online on the Woodside Competency Reporting Dashboard on the Production Academy Intranet page) provides the conformance status of the facility against the LTO roles requirements.

7.9.5 Permit to Work System Training

The ISSoW permit to work (i.e. participation in crisis or emergency management exercises). Roles based training is further described in Section 7.14.

An overview of Woodside's hydrocarbon spill response training and competency requirements are provided in dashboards for key responder roles. The roles are consistent with Woodside's crisis and emergency management incident control structure. system (see Section 7.2.1) is a key element in ensuring that all necessary steps are taken for the safety of personnel, protection of the environment and technical integrity of the facility. The ISSoW system takes a risk-based approach to all activities, thus tasks with higher levels of risk are subjected to greater scrutiny and control.

All members of the workforce that are required to work with ISSoW (Section 7.2.1) receive training commensurate with the level of authority and responsibility they hold in ISSoW.

7.9.6 Emergency and Hydrocarbon Spill Response Training

All operations personnel involved in crisis and emergency management are required to commit to ongoing training, process improvement and participation in emergency and crisis response (both real and simulated), including emergency drills specific to potential incidents at the Pluto facility. Training includes task specific training and role based training and 'on the job' experience.

Woodside Hydrocarbon Spill Preparedness Advisor(s) are responsible for maintaining hydrocarbon spill preparedness competency. For more information see Section 7.14.

7.9.7 Subsea IMMR Activity Environmental Awareness

At the beginning of, and during a new Subsea IMMR activity, the Subsea Support Vessel crew including contractor crew, Woodside representatives and other relevant personnel are required to undertake a vessel induction before commencing work. This induction covers HSE requirements for the vessel and IMMR activities, and as required environmental information specific to the activity location. The induction may cover the following environmental information:

- adherence to standards and procedures, and the use of Job Safety Analysis and permit to work hazard identification and management process.

- spill management including prevention, response and clean-up, location of spill kits and reporting requirements.
- waste management requirements and location of bins
- reporting of marine fauna, location of forms and charts
- chemical management requirements.

All personnel who undertake the project induction are required to sign an attendance sheet which is retained.

Regular HSE meetings are held on Subsea Support Vessels with crew. During these meetings, any environmental incidents are reviewed, and environmental awareness material presented.

7.9.8 Management of Training Requirements

All personnel on the Pluto facility, MODU and project vessels are required to be competent to perform their assigned positions. This may be in the form of external or 'on the job' training. The vessel Safety Training Coordinator (or equivalent) is responsible for identifying training needs, keeping records of training performed and identifying minimum training requirements.

7.10 Monitoring, Auditing, Management of Non-conformance and Review

Regulation 22(5) states that the implementation strategy is to provide for the monitoring, audit, management of non-conformance and review of operator's environmental performance and the implementation strategy itself.

Regulation 22(6) further states that the implementation strategy is to provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise).

This section of the EP outlines the measures undertaken by Woodside to regularly monitor the management of environmental risks and impacts of the Pluto facility against the EPOs, EPSs and MC, with a view to continuous improvement of environmental performance. The section also outlines records that are to be used to assess whether the EPOs and EPSs in the environment plan are being met.

The effectiveness of the implementation strategy is also reviewed periodically as part of the monitoring and assurance process.

7.10.1 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 the Program. This information will be collected using the tools and systems outlined below, developed based on the EPOs, EPSs and MC in this EP. The tools and systems will collect, as a minimum, the data (evidence) referred to in the relevant measurement criteria.

The collection of this data will form part of the permanent record of compliance maintained by Woodside and will form the basis for demonstrating that the EPOs and EPSs are met, which will be summarised in a series of routine reporting documents.

Source-based Impacts and Risks

The tools and systems to monitor environmental performance, where relevant, will include:

- Daily reports which include leading indicator compliance.
- Periodic review of waste management and recycling records.

- Use of contractor's risk identification program that requires recording and submitting safety and environment risk observation cards routinely (frequency varies with contractor).
- Collection of evidence of compliance with the controls detailed in the EP relevant to offshore activities by the Woodside Offshore HSE Adviser (other compliance evidence is collected onshore).
- Environmental discharge reports that record volumes of planned overboard discharges to the ocean.
- Monitoring of progress against the Global Wells and Seismic and Operations Division scorecards for KPIs.

7.10.1.1 Internal auditing and assurance program

A summary of monitoring and quantitative records of emissions and discharges that will be kept and used to assess environmental performance is provided in Table 7-5.

Table 7-5: Summary of Operations emissions and discharges monitoring for the Petroleum Activities Program

Category	Parameter to be Monitored/Reported	Monitoring Frequency	Monitoring Equipment/Methodology	EP Reference
Planned Emissions				
Atmospheric emissions	Greenhouse, energy and criteria pollutants	Normally continuous process metering/annual reporting	NGERS and NPI reporting estimation methods (e.g. fuel/flare flow meters, throughput meters, process estimation)	Section 6.7.10
	Fuel gas and flare intensity	Normally continuous process metering/monthly reviews	Fuel and flare flowmeters inform intensity profiles – tracked against optimisation targets	Section 6.7.10
Planned Discharges				
Discharge of subsea control fluids during valve actuations	Subsea control fluid consumption	Normally continuous process indication/monthly review	Subsea control fluid consumption surveillance. Process indication for gross leaks/ruptures	Section 6.7.5
Discharge of hydrocarbons and chemicals during subsea IMMR activities	Volumes of hydrocarbons and chemicals released subsea	As required, during IMMR activities (activity specific)	Estimates based on known volumes pumped and ROV observation	Section 6.7.5
Discharge of produced water	Volume discharged overboard	Normally continuous process indication/monthly review	PW flow meter(s), process estimation	Section 6.7.7
	OIW concentration of discharged PW	Normally continuous process indication/monthly review	Online analyser(s) and/or manual sampling	
	Chemical characterisation	Annually	Characterisation of end of pipe sample	
	WET testing	Three yearly	PW ecotoxicity testing	

Category	Parameter to be Monitored/Reported	Monitoring Frequency	Monitoring Equipment/Methodology	EP Reference
Waste recycling and disposal	Quantities of solid and liquid wastes disposed of onshore	Ongoing	Facility waste manifest	Section 6.7.6
Unplanned Emissions and Discharges				
Unplanned emissions and discharges	Nature of release	As required	HSEQ Event Reporting System (First Priority)	Section 6.8 and 6.9.

Throughout this activity, Woodside will continuously identify new source-based risks and impacts through the Monitoring and Auditing systems and tools described above.

Other examples of assurance tasks implemented through the EP include (as an example);

- start of shift operations meetings;
- permit to work hazard, risk management check list, area sign-on, and permit audits (ISSoW – Section 7.2.1);
- technical integrity SCE performance reviews (daily, weekly, monthly) (Section 2.7.5);
- maintenance performance assurance (e.g. conformance dashboards);
- management system performance audits reviews (e.g. MSPSs); and
- data gathering and governance dashboard presentations (e.g. Woodside Integrated Risk and Compliance System).

7.10.1.2 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). New knowledge checks take place both routinely primarily via quarterly and annual knowledge reviews and ad hoc (as information is obtained), and encompasses the following topics:

- Environmental science – update checks conducted via desktop reviews: scientific literature, government publications and Woodside supported publications and studies relating to existing environment topics (including but not limited to species and habitats) as well as EPBC Act Matters of National Environmental Significance (Part 3) and Part 13 statutory instruments.
- Cultural Features and Heritage Values science and information – update checks conducted via desktop reviews: scientific literature, government publications and Woodside consultation as well as reporting progress for the Murujuga Rock Art Monitoring Program.
- Socio-economic environment and stakeholder information – update checks conducted via desktop reviews: scientific literature, government publications and Woodside consultation; and,
- Environmental legislation – monitoring of emerging regulatory changes and the subsequent management of regulatory change (as outlined in the WMS Regulatory Compliance Management Procedure).

A management of knowledge tracker is maintained to record reviews and updates. New knowledge identified will prompt a consideration of MoC, which is actioned and documented appropriately.

The frequency and documentation of reviews, communication of relevant new knowledge and consideration of management of change are documented in the WMS Environment Plan Guideline.

Any relevant new information on cultural values and heritage will be assessed using the EP MoC Process (refer to Section 7.3.2).

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.

Management of Newly Identified Impacts and Risks

New sources of impacts and risks identified through monitoring and auditing systems and tools and the Woodside Environment Knowledge Management System are assessed using the MoC Process (Section 7.3).

7.10.2 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 environmental auditing will be performed to cover each key project activity as summarised.

7.10.2.1 Mobile Offshore Drilling Unit Activities

Internal auditing is performed on a MODU-specific schedule, rather than a schedule to align with the well. This enables continuous review and improvement of environmental performance over the term of the MODU contract. The following internal audits, inspections and reviews will be performed to review the environmental performance of the activities:

- Survey environment rig equipment for a newly contracted MODU (if not previously contracted to Woodside within the last two years) against Woodside's Engineering Standard – Rig Equipment. This standard covers functional and technical requirements for Woodside contracted rigs and their associated equipment. An environment rig equipment survey scope typically includes mud and solids control systems, environmental discharge control (including drainage management), and loss of containment management.
- Complete a minimum of monthly environmental inspection (conducted by offshore Woodside personnel or a delegate) which may include verifying:
  - bunkering/transfers between support vessels and MODU/project vessels
  - environment containment including chemical storage, spill response equipment and housekeeping
  - general MODU environment risks including waste management, drilling fluids oil/water separation, and inspection of subsea and moonpool areas.
- Perform environment audits quarterly during the Petroleum Activities Program, while the MODU is on location (by a Woodside Environment Adviser or delegate), which may include:
  - operational compliance audits relevant to environmental risk of activities which may include compliance with training commitments, discharge requirements, bunkering

activities, verification of use of approved chemicals, and satisfactory close out of items from previous audits

- inspection of selected risk areas/activities (which may include shaker house, drill floor and mud management while commencing riser drilling or reservoir interception) during routine MODU visits throughout the MODU campaign, determined by risk, previous incidents or operation specification requirements.
- audit findings relevant to continuous improvement of environmental performance will be tracked through the MODU or vessel compliance action register, a contractor register between the MODU operator or vessel contractor and Woodside.

7.10.2.2 Project Subsea Scope Activities

The following internal assurance will be performed for the subsea scope activities:

- Pre-mobilisation inspection/audit report will be conducted by a relevant person (before commencing). The scope of the audits are risk-based and specific to the relevant activity, but will generally focus on aspects relating to ensuring appropriate understanding of environmental commitments and the operational readiness of the activity scope, including appropriate environmental controls in place. All installation vessels associated with the above scopes will be audited by Woodside. Support or transport vessels will be assessed on a risk-based approach, but will be audited via the primary subsea installation contractor's process.
- At least one compliance audit relevant to applicable EP commitments will be conducted by a Woodside Environment Adviser for the subsea campaign. The audit may be conducted offshore or office-based, subject to the duration of the activity and logistics of performing the audit offshore for short duration scopes (e.g. pipelay).
- Contractor-specific HSE audits will also be conducted of the associated support vessels. The audits will consider the implementation of HSE management, risk management, as well as pre-mobilisation and offshore readiness.
- Vessel based HSE inspections will be conducted fortnightly by vessel HSE personnel. Each inspection will focus on a specific risk area relevant to the project activity and a formal report will be issued (for example, bunkering controls, chemical and discharge management, cetacean reporting, etc).
- Annual inspection of Woodside's long term hire subsea support vessels are undertaken fore compliance with both the EP and the approved Contractor Management system.
- The internal audits and reviews, combined with the ongoing monitoring described in Section 7.10.1, and collection of evidence for MC are used to assess EPOs and standards.
- As part of Woodside's EMS and/or assurances processes, activities may also be periodically selected for environmental audits as per Woodside's internal auditing process. Audit, inspection and review findings relevant to continuous improvement of environmental performance are tracked through the Environmental Commitments and Actions Register.
- This Environmental Commitments and Actions Register is used to track subsea support vessel and subsea activity compliance with EP commitments, including any findings and corrective actions.

Non-conformances identified will be reported and/or tracked in accordance with Section 7.10.3.

7.10.2.3 Operations Assurance

To provide confidence, based on evidence commensurate with risk, that business objectives are met, business activities are performed and risks are managed, assurance is performed as described

in the Provide Assurance Procedure and the Provide Assurance Guideline. The Guideline aims to explain how the Operations Division Assurance Team implement WMS Assurance requirements, while concurrently satisfying the Operations Division's specific objectives.

Operations Assurance Assignments are contained within the Operations Division Integrated Assurance Assignment Plan.

Environmental assurance activities are conducted on a regular basis to help:

- verify environmental risks and potential impacts are being managed in accordance with the EPOs and EPSs detailed in this EP.
- monitor, review and evaluate the effectiveness of the performance outcomes and standards detailed in this EP.
- verify effectiveness of the EP implementation strategy
- identify potential non-conformances.

The outputs of the assurance process are corrective actions that feed the improvement process. Therefore, assurance is a key driver of continuous improvement.

7.10.2.4 Annual Offshore Inspection/Desktop Review

An inspection/review of the Pluto offshore facility is undertaken every calendar year by the Australian Operations Environment Team, via either an offshore inspection or desktop review. Selected risk areas/activities are inspected to review environmental performance against the EPOs and EPSs and verify that control measures are effective in reducing the environmental risks and impacts of the activity to an ALARP and acceptable level.

The inspection/review also includes review of conformance with selected aspects of the EP implementation strategy. All risk sources/activities applicable to the offshore facility will be reviewed over a three-year rolling period. Records of findings and records of close-out of any corrective or improvement actions are maintained (close-out is tracked in Woodside's action tracking system).

7.10.2.5 Marine Assurance

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

Woodside's Marine Offshore Assurance process is mandatory for all vessels (other than Tankers and Floating Production Storage and Offloading vessels) that are chartered directly by or on behalf of Woodside, including for short term hires (i.e. <3 months in duration). It defines applicable marine offshore assurance activities, ensuring all vessel operators operate seaworthy vessels that meet the requirements for a defined scope of work and are managed with a robust Safety Management System.

The process is multi-faceted and encompasses the following marine assurance activities:

- Safety Management System Assessment
- Dynamic Positioning (DP) System Verification
- Vessel Inspections
- Project support for tender review, evaluation and pre/post contract award.

Vessel inspections are used to verify actual levels of compliance with the company's Safety Management System, the overall condition of the vessel and the status of the planned maintenance system onboard. Woodside Marine Assurance Specialist will conduct a risk assessment on the vessel to determine the level of assurance applied and the type of vessel inspection required.

Methods of vessel inspection may include, and are not limited to:

- Woodside Marine Vessel Inspection
- Oil Companies International Marine Forum (OCIMF) Offshore Vessel Inspection Database (OVID) Inspection
- IMCA CMID Inspection
- Marine Warranty Survey

Upon completion of the marine assurance process, to confirm that identified concerns are addressed appropriately and conditions imposed are managed, the Woodside Marine Assurance Team will issue the vessel a statement of approval. Should a vessel not meet the requirements of the Woodside Marine Offshore Vessel Assurance Process and be rejected, there does exist an opportunity to further scrutinise the proposed vessel.

Where a vessel inspection and/or OVMSA Verification Review is not available and all reasonable efforts based on time and resource availability to complete an vessel inspection and/or OVMSA Verification Review are performed (i.e. short term vessel hire), the Marine Assurance Specialist Offshore may approve the use of an alternate means of inspection, known as a risk assessment (Section 7.10.2.6).

Environmental requirements specific to offshore facility support vessel contractors are communicated via Woodside marine charterers instructions. This document provides the Master of a vessel on hire to Woodside, with a clearly defined set of requirements and procedures for operating the vessel in the vicinity of the Woodside's operating facilities. This includes the management of environmental risks and impacts from the Pluto facility. The document includes information on:

- applicable legislation and guidelines
- roles and responsibilities
- marine fauna interaction guidance
- incident reporting requirements.

Environmental requirements specific to Subsea Support Vessels are communicated via the Subsea Environmental Compliance Package. This document outlines mandatory environmental management requirements for Subsea Support Vessels and associated contractors.

7.10.2.6 Vessel 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.

7.10.3 Management of Non-conformance

Woodside classifies non-conformances with EPOs and standards in this EP as environmental incidents. Woodside employees and contractors are required to report all environmental incidents, and these are managed as per Woodside's internal event recording, investigation and learning requirements.

An internal computerised database called First Priority is used to record and report these incidents. Details of the event, immediate action taken to control the situation, investigation outcomes and corrective actions to prevent reoccurrence are all recorded. Corrective actions are monitored using First Priority and closed out in a timely manner.

Woodside uses a consequence matrix for classification of environmental incidents, with the significant categories being A, B and C (as detailed in Section 2.3). Detailed investigations are completed for all categories A, B, C and high potential environmental incidents.

7.10.4 Review

7.10.4.1 Management Review

Within the Australian Operations Environment Team, senior management regularly monitor and review environmental performance and the effectiveness of managing environmental risks and performance. Within each Function and Business Unit Leadership Team (e.g. Drilling and

Completions, Subsea and Developments/Projects), managers review environmental performance regularly, including through quarterly HSE review meetings.

Woodside's Global, Wells and Seismic Environment Team will perform six-monthly reviews of the effectiveness of the implementation strategy and associated tools. This will involve reviewing the:

- Drilling and Completions environment KPIs (leading and lagging).
- Tools and systems to monitor environmental performance
- Lessons learned about implementation tools and throughout each campaign.

Reviews of oil spill arrangements and testing are performed in accordance with Section 7.12.9.1.

Woodside's Operations Division Environment Team will perform routine reviews of the effectiveness of the implementation strategy and associated tools. This will involve reviewing the:

- Operations Division environment KPIs (leading and lagging).
- Tools and systems to monitor environmental performance

Reviews of oil spill arrangements and testing are performed in accordance with Section 7.12.9.1.

7.10.4.2 Program of Ongoing Engagement with Traditional Custodians

Woodside will undertake an annual review of the Program of Ongoing Engagement with Traditional Custodians to determine its effectiveness and adapt the program accordingly. The annual review will also include an assessment of appropriateness of the methods used to undertake ongoing consultation with Traditional Custodians (Appendix G).

7.10.4.3 Learning and Knowledge Sharing

Learning and knowledge sharing occurs via a number of different methods including:

- Event investigations.
- Event bulletins.
- After action review conducted at the end of each well, including review of environmental incidents as relevant.
- Ongoing communication with MODU and facility operators.
- Formal and informal industry benchmarking.
- Cross asset learnings.
- Engineering and technical authorities discipline communications and sharing.
- Review of impacts, risks and controls across the life of the EP.

7.10.4.4 Continuous Improvement

Continuous Improvement Projects to improve production or environmental performance that involve refurbishment, modification or major maintenance on the facility are typically managed by Brownfields engineering, and required to follow appraise and develop management procedures. Currently, the Procedure requires that all projects be managed in accordance with the Opportunity Management Framework which supports the progressive maturation of an opportunity through value creation in the Assess and Select Phases and the maintenance of value in the Develop and Execute phases.

To support the accountable executive to make a decision on whether a project should proceed to the next phase in the Opportunity Management Framework, it is sometimes necessary to conduct a

trial of the modification to determine the outcomes that can be expected if the modification is implemented. Due to prioritisation of resources, the phased progress of opportunities, competition between different solutions and long-term strategic and financial considerations, it is not possible to set quantitative success criteria to determine whether a modification will be implemented based on the results of trials. Instead, the results of a trial are used to inform a decision on whether to progress the project to the next phase in the Opportunity Management Framework. Decisions are typically made with two key considerations; whether the business is ready to proceed which has a technical/functional focus and whether there is a business case for progressing to the next phase. The business case may consider the ALARP position for the project, if relevant.

7.11 Record Keeping

Compliance records (outlined in MCs in Section 6) are maintained.

Record keeping is in accordance with Regulation 22(6) that addresses maintaining records of emissions and discharges. See also Table 7-5.

7.12 Ongoing Consultation

Although consultation for the purpose of regulation 25 is complete, in accordance with regulation 22(15) of the Environment Regulations, the implementation strategy must provide for appropriate consultation with relevant authorities of the Commonwealth, a State or Territory and other relevant interested persons or organisations.

Woodside proposes to undertake the engagements with directly impacted relevant persons and additional persons listed in Table 7-7. Relevant new information identified during ongoing consultation will be assessed using the EP Management of Knowledge (refer to Section 7.10 and Management of Change Process (refer to Section 7.2.5).

Woodside hosts community forums at which members are provided updates on Woodside activities on a regular basis (for example community reference group meetings). Representatives who present at those meetings are from community and industry and include Woodside, State Government (for instance relevant Regional Development Commissions), Local Government, Indigenous Groups, industry representative bodies, Community and industry organisations.

Relevant persons and those who are simply interested in the activities, can otherwise remain up to date on this activity through subscribing to our website the Woodside website, or by reading the publicly available version of the EP on NOPSEMA's website, where available.

Should consultation feedback be received following EP acceptance that identifies relevant new information or a measure or control that requires implementation or update to meet the intended outcome of consultation (see Section 5.2), Woodside will apply its EP Management of Knowledge process (refer to Section 7.8.1.2) and MoC process (refer to Section 7.2.5), as appropriate.

Woodside has developed a Program of Ongoing Engagement with Traditional Custodians (Appendix G), which is compliant with Corporate Woodside Policies Strategies and procedures and directly informed by feedback from Traditional Custodians. It provides a mechanism for ongoing dialogue so that Traditional Custodians can, on an ongoing basis, provide Woodside with feedback relating to the activity and in relation to caring for and managing country, including Sea Country. The Program will be tailored to each Traditional Custodian group and may include, as agreed with relevant Traditional Custodians:

- social investment to support Indigenous ranger programs
- support for Indigenous oil spill response capabilities
- support for recording Sea Country values

- support to Traditional Custodian groups to build capabilities and capacity with respect to ability to engage with Woodside and the broader O&G industry on activities
- development of ongoing relationships with Traditional Custodian groups
- any other initiatives proposed for the purpose of protecting Country including cultural values.

At the time of EP submission, a number of activities related to ongoing consultation regarding the activity are planned with Traditional Custodian Relevant Persons. These are described in Appendix G. Where Traditional Custodian relevant persons have requested information or further engagement considered as ongoing consultation, but have not requested a consultation agreement, these requests have been captured in Table 7-7. However, a consultation agreement may still be initiated by these groups at any time.

Table 7-6: Ongoing consultation engagements

Report/ Information	Recipient	Purpose	Frequency	Content
Program of Ongoing Engagement with Traditional Custodians	Relevant cultural authorities	Identification, assessment and consideration of cultural values relevant to the PAA and EMBA.	Ongoing	Assessment of cultural values. Any relevant new information on cultural values will be assessed using the EP Management of Knowledge and Management of Change Process (refer to Section 7.3.2).
Notification (email) Updates (email)	AHO	As requested by AMSA during consultation.	No less than 4 weeks prior to commencement. As required.	PS 1.9 Date of activity start. Changes to planned activities
Notification (email) Update (email)	AMSA	As requested by AMSA during consultation	At least 24-48 hours before operations commence. As required.	PS 1.10 Date of activity start. Changes to planned activities
Notification (email)	Other relevant persons	Notification of significant change	As required	Notification of significant change
Notification (email)	AFMA WAFIC CFA DAFF – Fisheries KUFPEC		No less than 10 days prior to commencement and following completion of activities.	Date of activity start and end.
Emails/ Meetings	Persons or organisations who provide feedback to Woodside post EP submission.	Identification, assessment and consideration of feedback, claims and/ or objections	As appropriate	Assessment of claims and/ or objections. Relevant new information will be assessed using the EP Management of Knowledge and MoC Process (refer to Section 7.3.2).

Notification (email)	Australasian Underwater Cultural Heritage Database Any other stakeholders as required in the Unexpected Finds Procedure	Report any unexpected finds of potential Underwater Cultural Heritage.	If triggered by Unexpected Finds Procedure.	Refer to Unexpected Finds Procedure.

7.13 Reporting

7.13.1 Overview

To meet the EPOs and EPSs outlined in this EP, Woodside reports at a number of levels, as outlined in the next sections.

7.13.2 Routine Reporting (Internal)

7.13.2.1 Daily Progress Reports and Meetings

The following daily reports, containing environmental performance information are issued:

- Daily reports for drilling activities provide performance information about drilling activities, heath, safety and environment, and current and planned work activities.
- Pan-Woodside Daily Production Report – The report includes facility performance information on production and a log of any HSE events.
- Subsea support vessel Daily Progress Report(s) – During subsea IMMR activities, daily reports are issued by the Woodside Site Representative. The reports provide performance information on HSE events, diesel use, together with equipment information, 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.

7.13.2.2 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.

7.13.2.3 Performance Reporting

Monthly and quarterly performance reports are developed and reviewed by the Function and Business Unit Leadership Teams (e.g. Drilling and Completions, Operations). 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.
- status of subsea IMMR activities.

7.13.3 Routine Reporting (External)

7.13.3.1 Start and End Notifications of the Petroleum Activities Program

7.13.3.1.1 Pluto Operations

In accordance with Regulation 54, Woodside will notify NOPSEMA within ten days of the completion of the Petroleum Activities Program.

The EP will end when Woodside notifies NOPSEMA that the Petroleum Activities Program has ended, all of the obligations identified in this EP have been completed, and NOPSEMA has accepted the notification, in accordance with Regulation 46 of the Environment Regulations.

The Petroleum Activities Program is not expected to end within the five-year life of this EP.

7.13.3.1.2 Xena-03 Drilling and Tie-back

In accordance with Regulation 54, Woodside will notify NOPSEMA of the commencement of the Petroleum Activities Program at least ten days before the activity commences, and will notify NOPSEMA within ten days of completing the activity.

7.13.3.2 Cetacean and Whale Shark Sightings Reporting

In accordance with EPBC Act approval conditions for the activity (refer Table 1-4), Woodside will keep a record of any cetacean and whale shark sightings for the life of this EP. A sightings report will be submitted to the Australian Antarctic Division annually with the reporting period being by calendar year (see also Table 7-7).

7.13.3.3 Environmental Performance Review and Reporting

In accordance with applicable environmental legislation for the activity, Woodside is required to report information on environmental performance to the appropriate regulator. Regulatory reporting requirements are summarised in Table 7-7.

Table 7-7: Routine external reporting requirements

Report	Recipient	Frequency	Content
Monthly Recordable Incident Reports	NOPSEMA	Monthly, by 15 of each month	Details of recordable incidents that have occurred during the Petroleum Activities Program for previous month (if applicable).
Annual EP Performance Report	NOPSEMA	Annual, by 30 April of the year following reporting period	Compliance with EPOs, controls and standards outlined in this EP, in accordance with the Environment Regulations (regulation 22(7).
NPI Report	DCCEEW	Annual, by 30 September each year	Summary of the emissions to land, air and water including those from the facility. Reporting period 1 July to 30 June each year.
National Greenhouse and Energy Reporting (NGERS)	Clean Energy Regulator	Annual, by 31 October each year	Summary of energy use and greenhouse gas emissions including those from the facility. Reporting period is 1 July to 30 June each year.
Cetacean and Whale Shark Sightings Report	Australian Antarctic Division	Annually, by 31 January each year	Summary of any sightings of cetaceans or whale sharks. Reporting period is 1 Jan to 31 December.

7.13.3.4 End of the Petroleum Activities Program Notification

In accordance with Regulation 54, Woodside will notify NOPSEMA within ten days of the completion of the Petroleum Activities Program.

7.13.3.5 End of the Environment Plan

The EP will end when Woodside notifies NOPSEMA that the Petroleum Activities Program has ended, all of the obligations identified in this EP have been completed, and NOPSEMA has accepted the notification, in accordance with Regulation 46 of the Environment Regulations. As noted above, the Petroleum Activities Program is not expected to end within the five-year life of this EP.

7.13.4 Incident Reporting (Internal)

All Woodside employees and contractors are required to report environmental incidents and non-conformances with this EP. Incidents are reported using an Event Report Form which includes details of the event, immediate action taken to control the situation, and corrective actions to prevent reoccurrence.

7.13.5 Incident Reporting (External) – Reportable and Recordable

7.13.5.1 Reportable Incidents

A reportable incident is defined under Regulation 5 of the Environment Regulations as:

- ‘an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage’.

A reportable incident for the Petroleum Activities Program is:

- An incident that has caused environmental damage with a Consequence Level of Moderate C+ or above (as defined under Woodside’s Risk Table; refer to Section 2.2).
- An incident that has the potential to cause environmental damage with a Consequence Level of Moderate C+ or above (as defined under Woodside’s Risk Table – refer to Section 2.6).

The environmental risk assessment (Section 6) for the Petroleum Activities Program identifies those risks with a potential consequence level of C+ for environment. The incidents that have the potential to cause this level of impact include hydrocarbon loss of containment events to ocean resulting from either:

- Well loss of containment (MEE-01)
- Subsea equipment loss of containment (MEE-02)
- Loss of structural integrity (MEE-03)
- Loss of marine vessel separation with platform (MEE-04)
- Loss of control of suspended load from platform (MEE-05)
- Unplanned Hydrocarbon Release: Loss of Well Integrity during Drilling Operations.

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

7.13.5.1.1 Notification

NOPSEMA will be notified of all reportable incidents, according to the requirements of Regulations 47, 48 and 49 of the Environment Regulations. Woodside will:

- Report all reportable incidents to the regulator (orally) as soon as practicable (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 which must be submitted to NOPSEMA ASAP, but within three days of the incident or of its detection by Woodside.
- Provide a copy of the written report to the NOPTA and DMIRS, within seven days of the written report being provided to NOPSEMA.

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

7.13.5.2 Recordable Incidents

A recordable incident is defined under Regulation 5 of the Environment Regulations as a 'breach of an EPO or EPS, in the EP that applies to the activity, that is not a reportable incident'.

Any breach of the EPOs or EPSs (as presented within Section 6) will be raised as a recordable incident and managed as per the notification and reporting requirements outlined below and internal requirements outlined in Section 7.11.4.

7.13.5.2.1 Notification

NOPSEMA will be notified of all recordable incidents, according to the requirements of Regulation 50(2), 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.

7.13.5.3 Other External Reporting Requirements and Notifications

In addition to the notification and reporting of environmental incidents defined under the Environment Regulations and Woodside requirements, Table 7-8 describes the incident reporting requirements that also apply in the PAA if a spill originates from a vessel.

Table 7-8: External Incident Reporting Requirements

Event	Responsibility	Notifiable party	Notification requirements	Contact	Contact detail
Any marine incidents during Petroleum Activities Program	Vessel Master	AMSA	Incident Alert Form 18 as soon as reasonably practicable* Within 72 hours after becoming aware of the incident, submit Incident Report Form 19	AMSA	reports@amsa.gov.au
Oil pollution incidents in Commonwealth waters	Vessel Master	AMSA Rescue Coordination Centre (RCC)	As per Article 8 and Protocol I of MARPOL within two hours via the national emergency 24-hour notification contacts and a written report within 24 hours of the request by AMSA	AMSA RCC Australia	If the ship is at sea, reports are to be made to: Free call: 1800 641 792 Phone: 08 9430 2100 (Fremantle)
Oil pollution incidents in Commonwealth waters	Vessel Master	AMSA	Without delay as per Protection of the Sea Act, part II, section 11(1), AMSA RCC notified verbally via the national emergency 24-hour notification contact of the hydrocarbon spill; follow up with a written Pollution Report ASAP after verbal notification	RCC Australia	Phone: 1800 641 792 or +61 2 6230 6811 AFTN: YSARYCYX
Any oil pollution incident which has the potential to enter a National Park or requires oil spill response activities to be conducted within a National Park	Vessel Master	DCCEEW	Reported verbally, ASAP	Director of National Parks	Phone: 02 6274 2220
Activity causes unintentional death of or injury to fauna species listed as Threatened or Migratory under the EPBC Act	Vessel Master	DCCEEW	Within seven days of becoming aware	Secretary of the DCCEEW	Phone: 1800 803 772 Email: protected.species@environment.gov.au

7.14 Emergency Preparedness and Response

7.14.1 Overview

Under Regulation 22(8), the implementation strategy must contain an oil pollution emergency plan (OPEP) and provide for the updating of the OPEP. Regulation 22(9) outlines the requirements for the OPEP which must include adequate arrangements for responding to and monitoring of oil pollution.

A summary of how this EP and supporting documents address the various requirements of Environment Regulations relating to oil pollution response arrangements is shown in Table 7-9.

Table 7-9: Oil Pollution Preparedness and Response Overview

Content	Environment Regulations Reference	Document/Section Reference
Details (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 21 (5), (6), 22 (2)	Oil Spill Preparedness and Response Mitigation Assessment
Describes the OPEP	Regulation 22 (8)	EP: Section 7.9. Woodside's oil pollution emergency plan has the following components: Woodside Oil Pollution Emergency Arrangements (Australia) Pluto Operations Oil Pollution First Strike Plan Xena-03 Tie-back Oil Pollution First Strike Plan Oil Spill Preparedness and Response Mitigation Assessment
Details the arrangements for responding to and monitoring oil pollution (to inform response activities), including control measures	Regulation 22 (9)	Oil Spill Preparedness and Response Mitigation Assessment Pluto Operations Oil Pollution First Strike Plan Xena-03 Tie-back Oil Pollution First Strike Plan
Details the arrangements for updating and testing the oil pollution response arrangements	Regulation 22 (8)(12)(13)(14)	Environment Plan: Section 7.12.9 Oil Spill Preparedness and Response Mitigation Assessment
Details provisions for monitoring impacts to the environment from oil pollution and response activities	Regulation 22(10)	Oil Spill Preparedness and Response Mitigation Assessment
Demonstrates that the oil pollution response arrangements are consistent with the national system for oil pollution preparedness and control	Regulation 22(11)	Oil Pollution Emergency Arrangements (Australia).

7.14.2 Emergency Response Training

Regulation 22(4) 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 emergency response (Table 7-10).

Table 7-10: Emergency Response Training Requirements

IMT Position	Minimum Competency
Corporate Incident Management Team (CIMT) Incident Commander and Deputy Incident Commander	• IMT Fundamentals Course (internal course) or equivalent • ICS 100/200 • IMO3 or equivalent spill response specialist level with an oil spill response organisation (OSRO) • Participation in L2 activation, exercise or skills maintenance
Operations, Planning, Logistics and Finance Sections, and other rostered members of the CIMT	• IMT Fundamentals Course or equivalent • ICS 100/200 • Oil spill theory • Participation in L2 activation, exercise or skills maintenance
Environment Unit Leader	• IMT Fundamentals Course • ICS 100/200 • IMO2 or equivalent spill response specialist level with an OSRO • Participation in L2 activation, exercise or skills maintenance
Note on competency/equivalency	
In 2023, 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 Crisis and Emergency Management training and the oil spill response training requirements for IMT roles. The revised IMT Fundamentals training Program aligns with the performance requirements of the PMAOMIR320 – Manage Incident Response Information and PMAOM0R418 - Coordinate Incident Response. In 2023, Woodside took the decision to align its global incident command arrangements to the Incident Command System (ICS). As such all rostered members of the Incident Management Team are trained up to ICS 200. In addition to baseline incident management training, all rostered members of the CIMT undertake a level of hydrocarbon spill response training. Depending upon the role, this may take the form of IMO training or completion of Woodside's internal oil spill training course (OSREC) which involves the completion of two online AMSA Modules (Introduction to National Plan and Incident Management; and Introduction to Oil Spills) and face-to-face training. Woodside Learning Services (WLS) are responsible for collating and maintaining personnel training records. The HSP Dashboard reflects the competencies required for each oil spill role (IMT/operational).	

7.14.3 Emergency Response Preparation

The Corporate Incident Management Team (CIMT) based in Woodside's head office in Perth, is the onshore coordination point for an offshore emergency. The CIMT is staffed by a roster of appropriately skilled personnel available on call 24 hours a day. The CIMT, under the leadership of the CIMT Leader, supports the site-based Incident Management Team by providing additional support in areas such as operations, logistics, planning, people management and public information (corporate affairs). A description of Woodside's Incident Command Structure and arrangements is further detailed in the Woodside Oil Pollution Emergency Arrangements (Australia).

Woodside will have a number of Emergency Response Plans (ERP) in place relevant to the PAP. The ERP provides procedural guidance specific to the asset and location of operations to control, coordinate and respond to an emergency or incident.

For the tie-back activity, the ERP will be a bridging document to the contracted rig's emergency documentation. This document summarises the emergency command, control and communications processes for the integrated operation and management of an emergency. It is developed in collaboration with the contracted rig so that roles and responsibilities between the contracted rig and Woodside personnel are identified and understood. The ERPs will contain instructions for vessel emergency, medical emergency, search and rescue, reportable incidents, incident notification, contact information and activation of the contractor's emergency centre and Woodside Communication Centre (WCC). Electronic copies of the ERPs are available on the facility Virtual

Bookshelves and the Security and Emergency Management intranet page. Hard controlled copies are available on the facilities.

In addition, the Emergency Preparedness MSPS (M06) is in place to assure that in the event of an incident, the organisation is appropriately prepared for all necessary actions which may be required for the protection of People, Environment, Asset, Reputation and Livelihood.

7.14.4 Emergency Event During Tie-back Activity

In the event of an emergency of any type:

- On the MODU the OIM will assume overall onsite command and act as the Incident Controller (IC). All persons aboard the MODU will be required to act under the IC's directions. The MODU/vessels will maintain communications with the onshore Drilling Superintendent and/or other emergency services in the event of an emergency. Emergency response support can be provided by the contractor's emergency centre or WCC if requested by the IC.
- Vessel Master (depending on the location of the emergency) will assume overall onsite command and act as the IC. All persons will be required to act under the IC's directions. The vessels will maintain communications with the onshore project manager and/or other emergency services in the event of an emergency. Emergency response support can be provided by the contractor's emergency centre or WCC if requested by the IC.
- The MODU and project vessels will have on-board equipment for responding to emergencies including medical equipment, fire-fighting equipment and oil spill response equipment.

7.14.5 Initial Response to Facility Incident

The facility is equipped with emergency shutdown systems designed to protect personnel, the facility and the environment from unsafe operating conditions and catastrophic situations.

Emergency shutdown systems are provided as a means of isolation in response to process upsets and facility conditions (including associated flowlines and risers) that could result in loss of hydrocarbon inventories, or to reduce the potential impact from a hydrocarbon loss of containment event on the facility. Provision has been made for process and facility alarm systems to provide early indication of any process upset conditions and potential hazardous events, including fire and gas alarms.

The key ERP relevant to the facility and subsea infrastructure (excluding the export pipeline) is the Pluto Emergency Response Plan. This plan covers health, safety, asset and environmental risks (including fire, structural integrity, sabotage, etc.) so that the range of occupational, asset and environmental risk exposures from incidents have been considered and plans are in place for their management. The plan provides specific details on the initial response required during events with potential significant environmental consequences such as a hydrocarbon spill, subsea hydrocarbon leak or potential collision.

The Pipelines Emergency Response Plan covers key ERP relevant to the export pipeline, as well as other major pipelines on Woodside's NWS facilities. The Pluto. 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 Pluto Operations 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, EPSs and MC to be used for hydrocarbon spill response during the Petroleum Activities Program.

7.14.6 Oil and Other Hazardous Materials Spill

A significant hydrocarbon spill during the Petroleum Activities Program is unlikely, but should such an event occur, it has the potential to cause serious environmental and reputational damage if not managed properly. The Woodside Oil Pollution Emergency Arrangements (Australia) document, supported by the Oil Pollution First Strike Plan which provides tactical response guidance to the activity/area and Oil Spill Preparedness and Response Strategy Selection and Evaluation of this EP, cover spill response for this Petroleum Activities Program.

The Security and Emergency Management Function is responsible for the management of Woodside's hydrocarbon spill response equipment and for the maintenance of hydrocarbon 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 Oil Pollution Emergency Arrangements (Australia). AMSA and Woodside have a Memorandum of Understanding in place to support Woodside in the event of a hydrocarbon spill.

The Oil Pollution First Strike Plan provides immediate actions required to commence a response.

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

Woodside has established EPOs, performance standards and MC to be used for oil spill response during the Petroleum Activities Program.

7.14.7 Emergency and Spill Response

Woodside categorises incidents in relation to response requirements as follows:

7.14.7.1 Level 1 Incident

A Level 1 incident can be resolved through the use of existing resources, equipment and personnel. A Level 1 incident is contained, controlled and resolved by site / regionally based teams using existing resources and functional support services.

7.14.7.2 Level 2 Incident

A Level 2 incident is characterised by a response that requires external operational support to manage the incident. It is triggered in the event the capabilities of the tactical level response are exceeded. This support is provided to the activity via the activation of all, or part of, the responsible CIMT.

7.14.7.3 Level 3 Incident

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 CIMT may also be activated as required to manage the operational incident response.

7.14.8 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 7-11. Emergency response testing is aligned to existing or developing risks associated with Woodside's operations and activities. Corporate hazards/risks outlined in the corporate risk register, respective Safety Cases or project Risk Registers, are reference points developing and scheduling emergency and crisis management exercises. External participants may be invited to attend exercises (e.g. government agencies, specialist service providers, oil spill response organisations, or industry members with which Woodside has mutual aid arrangements).

The overall objective of exercises is to test procedures, skills and the teamwork of the Emergency Response and Command Teams in their ability to respond to major accident / major environment events. After each exercise, the team holds a debriefing session, during which the exercise is reviewed. Any lessons learned or areas for improvement are identified and incorporated into revised procedures, where appropriate.

Table 7-11: Testing of response capability

Response Category	Scope	Response Testing Frequency – tie-back activities	Response Testing Frequency – Operations	Response Testing Objective
Level 1 Response	Exercises are project-/ activity-specific	One Level 1 'First Strike' drill conducted within two weeks of commencing activity*. For campaigns with an operational duration of greater than one month this will occur within the first two weeks of commencing the activity and then at least every 6-month hire period thereafter.	Two Level 1 'First Strike' drills conducted per year, per asset. Additional Level 1 emergency drills routinely conducted (approximately one per fortnight).	Operations: Drills test elements of the Pluto Facility Operations Oil Pollution First Strike Plan. Tie-back activities: Drills test elements of the Xena-03 Drilling and Tie-back Oil Pollution First Strike Plan. Emergency drills are scheduled to test other aspects of the Emergency Response Plan.
Level 2 Response	Exercises are facility 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 per campaign must be conducted within the first month of commencing the activity and then at every 6 month hire period thereafter, where applicable based on duration.	A minimum of one Emergency Management exercise is conducted biennially.	Testing both the facility IMT response and/or that of the CIMT 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

** For drilling and tie-back activities, this applies to the project installation vessel (PIV) and MODU only*

7.14.9 Hydrocarbon Spill Response testing of Arrangements

There are a number of arrangements which, in the event of a spill, will underpin Woodside's ability to implement a response across its petroleum activities. So that these arrangements are adequately tested, the Capability Development Team within Security and Emergency Management ensures tests are conducted in alignment with the Hydrocarbon Spill Testing of Arrangements Schedule.

Woodside's arrangements for spill response are common across its Australian operating assets and activities so that the controls are consistent. The overall objective of testing these arrangements is so that Woodside maintains an ability to respond to a hydrocarbon spill, specifically so that:

- relevant responders, contractors and key personnel understand and practise their assigned roles and responsibilities.
- response arrangements and actions to validate response plans are tested.
- 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 7-11, up to eight formal exercises are planned annually, across Woodside, to specifically test arrangements for responding to a hydrocarbon spill to the marine environment.

7.14.9.1 Testing of Arrangements Schedule

Woodside's Testing of Arrangements Schedule (Figure 7-7) aligns with international good practice for spill preparedness and response management; the testing is compatible with the IPIECA Good Practice Guide and the Australian Institute for Disaster Resilience (AIDR) Australian Emergency Management Arrangements Handbook. If a spill occurs, enacting these arrangements will underpin Woodside's ability to implement a response across its petroleum activities.

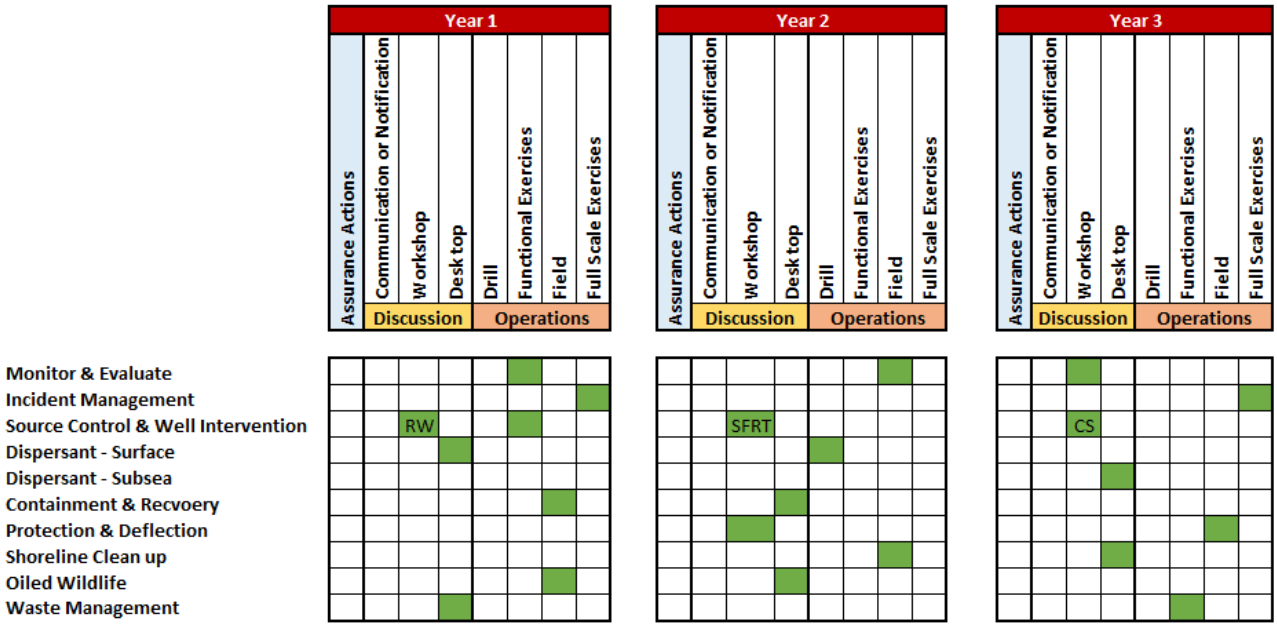


Figure 7-7: Indicative 3-yearly testing of arrangements schedule

The hydrocarbon spill arrangements shown in the rows of the schedule are tested against Woodside's regulatory commitments. Each arrangement has a support agency/company and an area to be tested (e.g., capability, equipment and personnel). For example, an arrangement could be to test Woodside's personnel capability for conducting scientific monitoring, or the ability of the Australian Marine Oil Spill Centre to provide response personnel and equipment.

The vertical columns relate to how hydrocarbon spill arrangements will be tested over the 3-year rolling schedule. The sub-heading for the column describes the standard method of testing likely to be undertaken (e.g., discussion exercise, desktop exercise), and the green cells indicate the arrangements that could be tested for each method.

Some arrangements may be tested across multiple exercises (e.g., critical arrangements) or via other 'additional assurance' methods outside the formal Testing of Arrangements Schedule that also constitute sufficient evidence of testing of arrangements (e.g., audits, no-notice drills, internal exercises, assurance drills).

7.14.10 Cyclone and Dangerous Weather Preparation

Tropical cyclones and other severe weather events are a potential risk to the safety and health of personnel and can potentially cause spills of hazardous materials into the environment from infrastructure and/or damaged vessels.

Facilities and relevant support vessels on hire to Woodside receive regular forecasts from Woodside Meteorologists, who liaise closely with the Bureau of Meteorology (BOM). If a cyclone (or severe weather event) is forecast, the path and its development is 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 asset Cyclone Contingency Plan and the vessel's Cyclone Contingency Plan will be actioned. If required, vessels can transit from the proposed track of the cyclone (severe weather event).

8. REFERENCES

Aichinger 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. doi:10.3354/esr00770

ANZG, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

Australian Institute of Marine Science, 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.

Baker, C., Potter, A., Tran, M., Heap, A.D., 2008. Sedimentology and geomorphology of the northwest marine region: a spatial analysis (Geoscience Australia Record No. 2008/07). Geoscience Australia, Canberra.

Balcom, B. J., Graham, B. D., Hart, A. D., & Bestall, G. P., 2012. Benthic Impacts Resulting from the Discharge of Drill Cuttings and Adhering Synthetic Based Drilling Fluid in Deepwater. In International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production. OnePetro.

Barber, M., Jackson, S., 2011. Water and Indigenous People in the Pilbara, Western Australia: A Preliminary Study. CSIRO: Water for a Healthy Country Flagship.

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.

Batten, S., Allen, R., Wotton, C., 1998. The effects of the Sea Empress oil spill on the plankton of the southern Irish Sea. Marine Pollution Bulletin 36: 764–774.

Bednarik, R., 2002. The survival of the Murujuga (Burrup) petroglyphs. Rock Art Research 19(1): 29-40.

Benjamin, J., O'Leary, M., McDonald, J., Wisemen, C., McCarthy, J., Beckett, E., Morrison, P., Stankiewicz, F., Leach, J., Hacker, J., Baggaley, P., Jerbic, K., Fowler, M., Fairweather, J., Jefferies, P., Ulm, S., Bailey, G., 2020. Aboriginal artefacts on the continental shelf reveal ancient drowned cultural landscapes in northwest Australia. PLoS ONE 15(7): e0233912. https://doi.org/10.1371/journal.pone.0233912

Berry WO, 1980, A comparative study of the uptake of toulene by bluegill sunfish Lepomis macrochirus and crayfish Orconectes rusticus. Environmental Pollution 21:109-119.

Black, K., Brand, G., Gwyther, D., Hammond, L., Mourtikas, S., Noyes-Fitzsimmons, R., Smith, J., & Richardson, B. (1994). Environmental implications of offshore oil and gas development in Australia Coastal Facilities (pp. 460– 492). Australian Petroleum Exploration Association (APEA).

BMT Asia Pacific, 2005. Environmental Impact Assessment Study for construction of helipads at Peng Chau and Yung Shue Wan, Lamma Island (Reference No. R/8109/10). BMT Asia Pacific, Hong Kong.

BMT 2021, Goodwyn Alpha Produced Water Ecotoxicity and Chemical Characterisation Assessment 2020. BMT Commercial Australia Pty Ltd, Perth

BMT 2022, Offshore Water and Sediment Sampling Program Pluto. BMT Commercial Australia Pty Ltd, Perth

BMT Oceanica, 2015. Offshore water quality monitoring verification and sediment quality study - Goodwyn A survey report (No. 1178_003/1 Rev 0). BMT Oceanica Pty Ltd, Perth.

BP Azerbaijan, 2013. Drilling and Completion Environmental Impact Assessment, Mitigation and Monitoring. BP Development Pty Ltd. https://www.bp.com/content/dam/bp/country-sites/en_az/azerbaijan/home/pdfs/esias/sd/sd2/9_drilling_eia.pdf

Brewer, D.T., Lyne, V., Skewes, T.D., & Rothlisberg, P., 2007. Trophic Systems of the North West Marine Region. A Report to The Department of the Environment, Water, Heritage and the Arts, by CSIRO Marine and Atmospheric Research: 156 pp.

Cai, W., Cowan, T., 2006. SAM and regional rainfall in IPCC AR4 models: Can anthropogenic forcing account for southwest Western Australia winter rainfall reduction? Geophysical Research Letters 33. https://doi.org/10.1029/2006GL028037

Catry, T., Ramos, J., Le Corre, M., Phillips, R., 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. doi:10.3354/meps07717

Chapman, C.C., Lea, M.A., Meyer, A., Sallée, J.B. and Hindell, M., 2020. Defining Southern Ocean fronts and their influence on biological and physical processes in a changing climate. Nature Climate Change, 10(3), pp.209-219.

Chevron Australia Pty Ltd, 2015. Gorgon gas development and Jansz feed gas pipeline: Long-term marine turtle management plan (No. G1-NT-PLNX0000296). Chevron Australia Pty Ltd, Perth.

Church, John.A., Hunter, John.R., Mcinnes, K., White, Neil.J., 2006. Sea-level rise around the Australian coastline and the changing frequency of extreme events Australian Meteorological Magazine 55, 253–260. https://doi.org/10.1016/j.gloplachs.2006.04.001

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.

Clarkson, C., Jacobs, Z., Marwick, B., Fullagar, R., Wallis, L., Smith, M., Roberts, R.G., Hayes, E., Lowe, K. and Carah, X., 2017. Human occupation of northern Australia by 65,000 years ago. Nature 547, 306-325.

Cohen, A., Gagnon, M.M., Nugegoda, D., 2005. Alterations of metabolic enzymes in Australian bass, Macquaria novemaculeata, after exposure to petroleum Hydrocarbons. Archives of Environmental Contamination and Toxicology 49: 200–205. doi:10.1007/s00244-004-0174-1

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, 2013. Recovery Plan for the White Shark (Carcharodon carcharias). Department of Sustainability, Environment, Water, Population and Communities.

Commonwealth of Australia, 2014. Recovery Plan for the Grey Nurse Shark (Carcharias taurus). Department of the Environment, Canberra.

Commonwealth of Australia, 2015. Wildlife conservation plan for migratory shorebirds. Department of the Environment, Canberra.

Commonwealth of Australia, 2015a. Conservation management plan for the blue whale: A recovery plan under the Environment Protection and Biodiversity Conservation Act 1999 2015-2025. Department of the Environment, Canberra.

Commonwealth of Australia, 2015b. Sawfish and river shark multispecies recovery plan (Recovery Plan). Department of the Environment, Canberra.

Commonwealth of Australia, 2017. Recovery plan for marine turtles in Australia 2017-2027. Department of the Environment and Energy, Canberra.

Commonwealth of Australia, 2018. Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (2018). Department of the Environment and Energy.

Commonwealth of Australia, 2020. National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. Department of the Environment and Energy, Canberra.

Commonwealth of Australia, 2022. Wildlife Conservation Plan for Seabirds. Canberra, Australian Capital Territory: Department of Agriculture, Water and the Environmnet (Australian Government). https://www.dcceew.gov.au/sites/default/files/documents/wildlife-conservation-plan-for-seabirds.pdf.

Crecelius, E., Trefry, J., McKinley, J., Lasorsa, B., Trocine, R., 2007. Study of barite solubility and the release of trace components to the marine environment (OCS Study No. MMS 2007-061). United States Department of the Interior, New Orleans.

CSIRO, 2017. Climate Change in Australia [WWW Document]. URL https://www.climatechangeinaustralia.gov.au/en/

Dai, A., 2013. Increasing drought under global warming in observations and models. Nature climate change 3, 52.

Data Analysis Australia, 2016. Review of Statistical Aspects of Burrup Peninsula Rock Art Monitoring. Project DER/1.

de Lestand, S., Walsh, A. 2023. West Coast Rock Lobster Resource Status Report 2023. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries eds. Newman, S.J., Santoro, K.G., Gaughan, D.J., Department of Primary Industries and Regional Development, Western Australia. pp. 41-47.

Dean, T.A., Stekoll, M.S., Jewett, S.C., Smith, R.O., Hose, J.E., 1998. Eelgrass (Zostera marina L.) in Prince William Sound, Alaska: Effects of the Exxon Valdez oil spill. Marine Pollution Bulletin 36: 201–210.

Deepwater Horizon Natural Resource Damage Assessment Trustees, 2016. Deepwater Horizon oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. National Oceanic and Atmospheric Administration, Silver Spring.

[DAWE] Department of Agriculture, Water and the Environment, 2021. Species Profile and Threats Database – Key Ecological Features. Commonwealth of Australia, Canberra.

[DCCEEW] Department of Climate Change, Energy, the Environment and Water, 2021. Loss of Terrestrial Climatic Habitat Caused by Anthropogenic Emissions of Greenhouse Gases. Department of Climate
Change, Energy, the Environment and Water. 2021. https://www.dcceew.gov.au/environment/biodiversity/threatened/key-threatening-processes/loss-ofhabitat-caused-by-greenhousegases#:~:text=The%20'Loss%20of%20climatic%20habitat,human%20activities%20of%20greenhouse%20gases.

[DCCEEW] Department of Climate Change, Energy, the Environment and Water, 2022. Australia's emissions projections 2022. www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2022

[DCCEEW] Department of Climate Change, the Environment, Energy and Water, 2023a. Indigenous Protected Areas. Accessed at https://www.dcceew.gov.au/environment/land/indigenous-protected-areas

[DCCEEW] Department of Climate Change, Energy, the Environment and Water, 2023b. Continental slope demersal fish communities. Australian Government. URL: https://www.environment.gov.au/sprat-public/action/kef/view/79;jsessionid=01AD87551D0DE1B0248C8722BE137004

[DCCEEW] Department of Climate Change, Energy, the Environment and Water, 2023c. Conservation Advice for Calidris ferruginea (curlew sandpiper). Canberra: Department of Climate Change, Energy,
the Environment and Water. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice-18122023.pdf.

[DCEEW] Department of Climate Change, Energy, the Environment and Water (DEECCW), 2023d. Australia's emissions projections 2022. https://www.dcceew.gov.au/climate-change/publications/australias-emissions-projections-2022.

[DCEEW] Department of Climate Change, the Environment, Energy and Water (2024). National Recovery Plan for the Southern Right Whale, Department of Climate Change, Energy, the Environment and Water, Canberra. Accessed at dcceew.gov.au/publications

[CALM] Department of Conservation and Land Management, 2005. Management–Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005 - 2015 (Management Plan No. 52). Department of Conservation and Land Management, Perth.

[DEC] Department of Environment and Conservation, 2007. Management plan for the Montebello/Barrow Islands Marine Conservation Reserves. Marine Parks and Reserves Authority, Perth.

[DoE] Department of Environment, 2015. Wildlife Conservation Plan for Migratory Shorebirds. Commonwealth of Australia, 2015.

[DOE] Department of the Environment 2015b. Conservation Advice Calidris ferruginea curlew sandpiper. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice.pdf

[DISER] Department of Industry, Science and Resources, 2021. Australia's Long-Term Emissions Reduction Plan – A Whole-of-Economy Plan to Achieve Net Zero Emissions by 2050. Canberra, Australian Capital Territory: Department of Industry, Science, Energy and Resources (Australian Government).

[DISER] Department of Industry, Science and Resources, 2022. Australia's Nationally Determined Contribution Communication 2022. Canberra, Australian Capital Territory: Department of Industry,
Science, Energy and Resources (Australian Government). https://unfccc.int/sites/default/files/NDC/2022-06/Australias%20NDC%20June%202022%20Update%20%283%29.pdf.

[DPIRD] Department of Primary Industries and Regional Development, 2022. Fish Cube WA – Commercial Collector Component Public Cube. Department of Primary Industries and Regional Development, Western Australia, Perth.

[DPIRD] Department of Primary Industries and Regional Development, 2023. Fish Cube WA – Commercial Collector Component Public Cube. Department of Primary Industries and Regional Development, Western Australia, Perth.

[DSEWPaC] Department of Sustainability, Environment, Water, Population and Communities, 2012. Marine bioregional plan for the North-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999.

[DSEWPaC] Department of Sustainability, Environment, Water, Population and Communities 2012a. Conservation Management Plan for the Southern Right Whale. A Recovery Plan under the Environment Protection and Biodiveristy Conservation Act 1999 2011-2021. Canberra, Australian Capitol Territory: Department of Sustainability, Environment, Water, Population and Communities. http://www.environment.gov.au/resource/conservation-management-plan-southern-right-whalerecovery-plan-under-environment.

[DSEWPaC] Department of Sustainability, Environment, Water, Population and Communities 2013a. Recovery Plan for the Australian Sea Lion (Neophoca cinerea) 2013. Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/system/files/resources/1eb9233c-8474-40bb-8566-0ea02bbaa5b3/files/neophoca-cinerea-recovery-plan.pdf

[DoEE] Department of the Environment and Energy. 2018. Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris. Accessed at http://www.environment.gov.au/biodiversity/threatened/key-threatening-processes/harmful-marine-debris

[DoEE] Department of the Environment and Energy, 2019. Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases [WWW Document]. URL https://www.environment.gov.au/climate-change/climate-solutions-package (accessed 6.4.19).

[DEWHA] Department of the Environment, Water, Heritage and the Arts, 2008. The north-west marine bioregional plan: bioregional profile. Department of the Environment, Water, Heritage and the Arts, Canberra.

[DNP] Director of National Parks, 2018. Australian Marine Parks: North-West Marine Parks Network Management Plan 2018. Canberra, Australian Capital Territory: Director of National Parks, Australian Government. https://parksaustralia.gov.au/marine/pub/plans/north-west-managementplan-2018.pdf.

Dix, G.R., James, N.P., Kyser, T.K., Bone, Y., Collins, L.B., 2005. Genesis and dispersal of carbonate mud relative to late quaternary sea-level change along a distally-steepened carbonate ramp (Northwestern Shelf, Western Australia). Journal of Sedimentary Research 75: 665–678.

Dokulil, M. T., 1994. Environmental control of phytoplankton productivity in turbulent turbid systems. In Phytoplankton in Turbid Environments: Rivers and Shallow Lakes (pp. 65-72). Springer, Dordrecht.

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., 2012. Satellite tracking of northbound humpback whales (Megaptera novaeangliae) off Western Australia. Australian Marine Mammals Centre, Hobart.

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.

Duffy, N., Ramanaidou, E., Alexander, D., Lau, D., 2017. Burrup Peninsula Aboriginal petroglyphs: colour change and spectral mineralogy 2004-2016. CSIRO, Australia. Confidential Report EP161761.

Dunlop, M., Hilbert, D., Ferrier, S., House, A., Liedloff, A., Prober, S., Smyth, A., Martin, T., Harwood, T., Williams, K., Fletcher, C., Murphy, H., 2012. The Implications of Climate Change for Biodiversity, Conservation and the National Reserve System: Final Synthesis. CSIRO Climate Adaptation Flagship. https://doi.org/10.4225/08/5850384d796c6

Environment Australia, 2002. Ningaloo Marine Park (Commonwealth Waters) Management Plan. Federal Register of Legislative Instruments F2007B00971. Commonwealth of Australia, Canberra.

Environmental Protection Agency, 2016, State Waters Technical Guidance: Protecting the quality of Western Australia's marine environment.

Erbe, C., 2012. Effects of underwater noise on marine mammals. Advances in Experimental Medicine and Biology. 730:pp. 17-23.

Erbe, C., Dunlop, R., and Dolman, S., 2018. Effects of Noise on Marine Mammals. Effects of Anthropogenic Noise on Animals pp 277-309.

Erbe, C., Reichmuth, C., Cunningham, K., Lucke, K., and Dooling, R., 2015. Communication masking in marine mammals: A review and research strategy. Marine Pollution Bulletin. 103 1-2: pp. 15-38.

Falkner, I., Whiteway, T., Przeslawski, R., Heap, A.D., 2009. Review of Ten Key Ecological Features (KEFs) in the Northwest Marine Region: a report to the Department of the Environment, Water, Heritage and the Arts by Geoscience Australia, Geoscience Australia Record. Geoscience Australia, Canberra.

Field, C.D., 1995. Impact of expected climate change on mangroves. Hydrobiologia 295, 75–81.

Finneran, J., Henderson, E., Houser, D., Jenkins, K., Kotecki, S. and Mulsow, J., 2017. Criteria and thresholds for U.S. navy acoustic and explosive effects analysis (phase III). Department of Navy, San Diego, California, USA. 183 pp.

Fletcher, W., Mumme, M., Webster, F., 2017. Status reports of the fisheries and aquatic resources of Western Australia 2015/2016: State of the fisheries. Department of Fisheries, Perth.

Fodrie, F.J., heck, K.L., 2011. Response of coastal fishes to the Gulf of Mexico oil disaster. PLoS ONE 6: e21609. doi:10.1371/journal.pone.0021609

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. US Environmental Protection Agency, Georgia. July 2001.

Furnas, M., Mitchell, A., 1999. Wintertime carbon and nitrogen fluxes on Australia's Northwest Shelf. Estuarine, Coastal and Shelf Science 49: 165–175.

Gagan, M.K., Halide, H., Permana, R.C.E., Lebe, R., Dunbar, G., Kimbrough, A.K., Scott-Gagan, H., Zwartz, D., Hantoro, W.S., 2022. The historical impact of anthropogenic air-borne sulphur on the Pleistocene rock art of Sulawesi. Scientific Reports 12.

Gagnon, M.M., Rawson, C., 2010. Montara well release: Report on necropsies from a Timor Sea green turtle. Curtin University, Perth.

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.

Geraci, J., 1988. Physiologic and toxicologic effects of cetaceans, in: Geraci, J., St Aubin, D. (Eds.), Synthesis of Effects of Oil on Marine Mammals, OCS Study. Department of Interior, Ventura, pp. 168–202.

Gilmour, J., Smith, L., Pincock, S., Cook, K., 2013. Discovering Scott Reef: 20 years of exploration and research. Australian Institute of Marine Science, Townsville.

Gilmour, J., Speed, C.W., Babcock, R., 2016. Coral reproduction in Western Australia. PeerJ 4, e2010. https://doi.org/10.7717/peerj.2010

Gophen, M., 2015. Ecological devastation in Lake Victoria: Part B: Plankton and fish communities. Open Journal of Ecology, 5(07), 315.

Greene, Jr., C. R., 1987. Characteristics of oil industry dredge and drilling sounds in the Beaufort Sea. Journal of the Acoustical Society of America 82: 1315–1324.

Hanson, C.E., Waite, A.M., Thompson, P.A., Pattiaratchi, C.B., 2007. Phytoplankton community structure and nitrogen nutrition in Leeuwin Current and coastal waters off the Gascoyne region of Western Australia. Deep Sea Research Part II: Topical Studies in Oceanography 54, 902–924.

Hassan, A., Javed, H., 2011. Effects of Tasman Spirit oil spill on coastal birds at Clifton, Karachi coast, Pakistan. Journal of Animal and Plant Sciences 21: 333–339.

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.

Heatwole, H., Cogger, H.G., 1993. Chapter 36: Family Hydrophiidae, in: Fauna of Australia. Australian Government Publishing Service, Canberra.

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. Wiley, pp. 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: 676–685. doi:10.1525/bio.2012.62.7.10

Hinwood, J.B., Potts, A.E., Dennis, L.R., Carey, J.M., Houridis, H., Bell, R.J., Thomson, J.R., Boudreau, P. and Ayling, A.M. (1994), "Environmental Implications of Offshore Oil and Gas Development in Australia - Drilling Activities" in Environmental Implications of Offshore Oil and Gas Development in Australia - the Findings of an Independent Scientific Review , Swan, J.M., Neff, J.M., Young, P.C. eds, Australian Petroleum Exploration Association, pp 124 - 207.

Hjermann, D.Ø., Melsom, A., Dingsør, G.E., Durant, J.M., Eikeset, A.M., Røed, L.P., Ottersen, G., Storvik, G., Stenseth, N.C., 2007. Fish and oil in the Lofoten–Barents Sea system: synoptic review of the effect of oil spills on fish populations. Marine Ecology Progress Series 339: 283–299.

Hoegh-Guldberg, O., 1999. Climate change, coral bleaching and the future of the world's coral reefs. Marine and freshwater research 50, 839–866.

Hoegh-Guldberg, O., Jacob, D., Taylor, M., Bindi, M., Brown, S., Camilloni, I., Diedhiou, A., Djalante, R., Ebi, K.L., Engelbrecht, F., Guiot, J., Hijioka, Y., Mehrotra, S., Payne, A., Seneviratne, S.I., Thomas, A., Warren, R., Zhou, G., 2018. Impacts of 1.5oC Global Warming on Natural and Human Systems, in: Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global

Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty.

Hughes, L., 2003. Climate change and Australia: Trends, projections and impacts. Austral Ecology 28, 423–443. https://doi.org/10.1111/j.1442-9993.2003.tb00266.x

IEA International Energy Agency (2021), Net Zero by 2050, IEA, Paris https://www.iea.org/reports/net-zero-by-2050, License: CC BY 4.0

Ingole, B. S. Goltekar, R., Gonsalves, S and Ansari, Z. A., 2005. Recovery of Deep-sea Meiofauna after Artificial Disturbance in the Central Indian Basin. Marine Georesources & Geotechnology Vol. 23(4)

International Panel on Climate Change (IPCC), 2021. Climate Change 2021: The Physical Science Basis. Working Group 1 Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896.

International Panel on Climate Change (IPCC), 2021b. 'Technical Summary' In Climage Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York: Cambridge University Press. Doi:10.1017/9781009157896.002

International Petroleum Industry Environmental Conservation Association, 2004. A guide to oiled wildlife response planning (IPIECA Report Series No. 13). International Petroleum Industry Environmental Conservation Association, London.

International Tanker Owners Pollution Federation, 2011a. Effects of oil pollution on the marine environment (Technical Information Paper No. 13). International Tanker Owners Pollution Federation Limited, London.

International Tanker Owners Pollution Federation, 2011b. Effects of oil pollution on fisheries and mariculture (Technical Information Paper No. 11). International Tanker Owners Pollution Federation Limited, London.

IUCN, 2020a. "Great Barrier Reef". IUCN World Heritage Outlook. 2020. https://worldheritageoutlook.iucn.org/explore-sites/wdpaid/2571.

IUCN, 2020b. "Ningaloo Coast". IUCN World Heritage Outlook. 2020. https://worldheritageoutlook.iucn.org/explore-sites/wdpaid/555542338.

IUCN, 2020c. "Shark Bay, Western Australia". IUCN World Heritage Outlook. 2020. https://worldheritageoutlook.iucn.org/explore-sites/wdpaid/67724.

Jacobs, 2014. Lambert Deep Development: Environmental Baseline Report. Report prepared for Woodside Energy Ltd. Jacobs Group (Australia) Pty Ltd, Perth.

Jacobs, 2016, Offshore Facilities Produced Water: Chemical Characterisation and Sedimentation Assessment 2016, Document number: IW118700-0000-NM-RPT-0004.

Jacobs, 2018. Offshore Production Facilities Marine Discharges Modelling Study – Angel. Report prepared for Jacobs by Rob Phillips Consulting Pty Ltd.

James, N.P., Bone, Y., Kyser, T.K., Dix, G.R., Collins, L.B., 2004. The importance of changing oceanography in controlling late Quaternary carbonate sedimentation on a high-energy, tropical, oceanic ramp: north-western Australia. Sedimentology 51: 1179–1205. doi:10.1111/j.1365-3091.2004.00666.x

Jarman, S., Wilson, S., 2004. DNA-based species identification of krill consumed by whale sharks. Journal of Fish Biology 65: 586–591.

Jenkins, G., and McKinnon, L., 2006, Port Phillip Bay Channel Deepening Project: supplemental environmental effects statement – aquaculture and fisheries

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. and Wyatt, R. 2017. Review on Existing Data on Underwater Sounds Produced by the Oil and Gas Industry. Prepared by Seiche Ltd. E&P Sound & Marine Life (JIP). August 2017

Johansen, J.L., Allan, B.J., Rummer, J.L., Esbaugh, A.J., 2017. Oil exposure disrupts early life-history stages of coral Reef fishes via behavioural impairments. Nature Ecology & Evolution 1: 1146–1152. doi:10.1038/s41559-017-0232-5

Johnston, D., Harris, D., Mckinley, S., Blay, N. 2023. North Coast Crab Resource Status Report 2023. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries eds. Newman, S.J., Santoro, K.G., Gaughan, D.J., Department of Primary Industries and Regional Development, Western Australia. pp. 191-200.

Jones, R., Wakeford, M., Currey-Randall, L., Miller, K. and Tonin, H. 2021. Drill cuttings and drilling fluids (muds) transport, fate and effects near a coral reef mesophotic zone. Marine Pollution Bulletin 172, 35 pp.

Keller, K., Blake, S., Cao, A., 2023. Western Deepwater Trawl Fishery. In: Butler, I., Patterson, H., Bromhead, D., Galeano, D., Timmiss, T., Woodhams, J., Curtotti, R., 2023. Fishery status reports 2023. Australian Bureau of Agriculture and Resources Economics and Sciences, Canberra.249-256. URL: https://doi.org/10.25814/vgp4-xr81

Keller, K., Curtotti, R., 2023. North-West Slope Trawl Fishery. In: Butler, I., Patterson, H., Bromhead, D., Galeano, D., Timmiss, T., Woodhams, J., Curtotti, R., 2023. Fishery status reports 2023. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. 70-77. URL: https://doi.org/10.25814/vgp4-xr81

King, D., Lyne, R., Girling, A., Peterson, D., Stephenson, R., Short, D., 1996. Environmental risk assessment of petroleum substances: The hydrocarbon block method (CONCAWE No. 96/52). CONCAWE, Brussels.

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.

Lawrence, J., Mackey, B., Chiew, F., Costello, M., Hennessy, K., Lansbury, N., Nidumolu, U., et al., 2022. 'Australia'. In Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge. United Kingdom and New York: Cambridge University Press.

Lewis, P and Watt, M. 2023. Statewide Large Pelagic Finfish Resource Status Report 2022. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/2022: The State of the Fisheries eds. Newman, S.J., Wise, B.S., Santoro, K.G., Gaughan, D.J. Department of Primary Industries and Regional Development, Western Australia. Pp 255 - 261

Longcore, T., Rich, C. 2004. Ecological light pollution. Frontiers in Ecology and the Environment 2: 191-198.

Lutcavage, M., Lutz, P., Bossart, G., Hudson, D., 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. Archives of Environmental Contamination and Toxicology 28: 417–422.

Mackie, M., Nardi, A., Lewis, P., Newman, S., 2007. Small pelagic fishes of the north-west marine region. Department of Fisheries, Perth.

Martin, S.B., K.A., Kowarski, E.E. Maxner, and C.C. Wilson. 2019. Acoustic Monitoring During Scotian Basin Exploration Project: Summer 2018. Document 01687, Version 2.0. Technical report by JASCO Applied Sciences for BP Canada Energy Group ULC.

Matkin, C.O., Saulitis, E.L., Ellis, G.M., Olesiuk, P., Rice, S.D., 2008. Ongoing population-level impacts on killer whales Orcinus orca following the 'Exxon Valdez'oil spill in Prince William Sound, Alaska. Marine Ecology Progress Series 356: 269–281.

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.D., 2002. Underwater noise generated by the Cossack Pioneer FPSO and its translation to the proposed Vincent petroleum field. 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., Jenner, C., Bannister, J., Cato, D. and Duncan, A. 2000. Blue whale calling in the Rottnest trench, Western Australia, and low frequency sea noise. Acoustics Australia / Australian Acoustical Society: 245-250.

McCauley, R. andJenner, C., 2010. Migratory patterns and estimated population size of pygmy blue whales (Balaenoptera musculus brevicauda) traversing the Western Australian coast based on passive acoustics (International Whaling Commission Report No. SC/62/SH26). International Whaling Commission.

McDonald, E.M., & Phillips, T., 2021. Report of an Ethnographic Consultation Regarding Woodside's Scarborough Gas Project & Submerged Landscape, Pilbara, Western Australia – Phase I. Report by Ethnosciences to Murujuga Aboriginal Corporation.

McInnes, K., 2015. Wet Tropics Cluster Report, in: Ekström, M., Whetton, P., Gerbing, C., Grose, M., Webb, L., Risbey, J. (Eds.), Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports. CSIRO and Bureau of Meteorology, Australia.

McLean, D.L., Partridge, J.C., Bond, T., Birt, M.J., Bornt, K.R., Langlois, T.J., 2017. Using industry ROV videos to assess fish associations with subsea pipelines. Continental Shelf Research 141: 76–97. doi:10.1016/j.csr.2017.05.006

McNiven, I., 2004. Saltwater People: spiritscapes, maritime rituals and the archaeology of Australian indigenous seascapes. World Archaeology, 35(3): 329-349.

McPherson, C., Wlech, S., Zykov, M., Wood, M., and Koessler, M., 2019. Scarborough US4AB Noise Modelling Study. Acoustic modelling for assessing marine fauna sound exposures. JASCO Applied Sciences (Australia) Pty Ltd.

Milton, S.L., Lutz, P.L., 2003. Physiological and genetic responses to environmental stress, in: Lutz, P.L., Musick, J.A., Wyneken, J. (Eds.), The Biology of Sea Turtles. CRC Press, Boca Raton, pp. 164–198.

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.

MGP, 2022. 'Methane Guiding Principles – Enabling Action to Reduce Global Methane Emissions'. Methane Guiding Principles. 2022.

National Energy Resources Australia (2018). Environment Plan Reference Case – Consequence analysis of an accidental release of diesel. Available at: https://referencecases.nera.org.au/

National Marine Fisheries Services (NMFS), 2005. Habitat Conservation and Restoration Anadromous Fish Policy (National Marine Fisheries Service Instruction No. 03-401-11). National Marine Fisheries Service, U.S.A.

National Marine Fisheries Service (US), 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 Marine Fisheries Service (US). 2014. Marine mammals acoustic thresholds guidance. National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. Viewed online on 24 February 2019 at <http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guidance.html.>.

National Oceanic and Atmospheric Administration (US). 2019. ESA Section 7 Consultation tools for marine mammals on the west coast, www.fisheries.noaa.gov/westcoast/endangered-species-conservation/esa-section-7-consultation-tools-marine-mammals-west.

National Oceanic and Atmospheric Administration, 2006. Fact Sheet: Small Diesel Spills (500-5000 gallons).

National Oceanic and Atmospheric Administration, 2010. Oil and sea turtles: Biology, planning and response. National Oceanic and Atmospheric Administration, Washington.

National Oceanic and Atmospheric Administration, 2014. Oil spills in mangroves: Planning & response considerations. National Oceanic and Atmospheric Administration, Washington.

National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), 2019. Oil spill modelling bulletin.

Nedwed, T., Smith, J.P., Melton, R., 2006. Fate of nonaqueous drilling fluid cuttings discharged from a deepwater exploration well. Presented at the SPE International Health, Safety and Environment Conference, Society of Petroleum Engineers, Abu Dhabi.

Neff, J. M., 2010. Fate and effects of water based drilling muds and cuttings in cold water environments. Houston (TX): Report to Shell Exploration and Production Company.

Neff, J., 2002. Bioaccumulation in Marine Organisms - Effect of Contaminants from Oil Well Produced Water. Elsevier, Amsterdam

Neff, J., Lee, K. and DeBlois, E.M. 2011. Produced water: Overview of composition, fate and effects. In: Produced Water, Environmental Risks and Advances in Mitigation Technologies (Eds. Lee K and Neff J) pp 608. Springer New York.

Neff, J., McKelvie, S., Ayers Jr., R., 2000. Environmental impacts of synthetic based drilling fluids (OCS Study No. MMS 2000-064). United States Department of the Interior, New Orleans.

Neff, J.M., 2005. Composition, environmental fates, and biological effecrs of water based drilling muds and cuttings discharged to the marine environment: a synthesis and annotated biography. Prepared for the Petroleum Environment Research Forum (PERF) and the American Petroleum Institute. American Petroleum Institute, Washington, DC, 73 pp.

Neff and Sauer, 1996. Aromatic Hydrocarbons in Produced Water, in: Reed, M., Johnsen, S. (Eds.), Produced Water 2: Environmental Issues and Mitigation Technologies. Springer US, Boston, MA, pp. 163–175. https://doi.org/10.1007/978-1-4613-0379-4_16

Neff, J.M., 2008. Estimation of bioavailability of metals from drilling mud barite. Integrated Environmental Assessment and Management 4, 184–193.

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: 420 –427.

Newman, S., Bruce, C., Steele, A. 2023. Statewide Marine Aquarium Fish and Hermit Crab Resources Status Report 2023. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries eds. Newman, S.J., Santoro, K.G., Gaughan, D.J., Department of Primary Industries and Regional Development, Western Australia. pp. 279-285

Newell, R. C., Seiderer, L. J., & Hitchcock, D. R., 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Oceanography and Marine Biology: an annual review, 36(1), 127-178.

O'Leary, M.J., Paumard, V., Ward I., 2020. Exploring Sea Country through High-Resolution 3D Seismic Imaging of Australia's NW Shelf: Resolving Early Coastal Landscapes and Preservation of Underwater Cultural Heritage. Quaternary Science Reviews 239, 106353.

Offshore: Risk and Technology Consulting Inc., 2002. Post mortem failure assessment on MODUs during Hurricae Lili (MMS Order No. 0103PO72450). Minerals Management Service, Houston.

Oil and Gas UK, 2014. Guidance on risk related decision making (Issue No. 2). United Kingdom Offshore Operators Association, London.

OSPAR Commission 2021. OSPAR List of Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment (PLONOR) – Update 2021. Agreement 2013-06. 9pp

Oxford Economics, 2010. Potential impact of the Gulf oil spill on tourism. Oxford Economics, Oxford.

Pangerc, T., Robinson, S., and Theobald, P., 2016. Underwater sound measurement data during diamond wire cutting: First description of radiated noise. Proc. Mtgs. Acoust. 27, 040012 (2017). Acoustical Society of America

Patterson, H., Bromhead, D., Dylewski, M., 2023. Western Tuna and Billfish Fishery. In: Butler, I., Patterson, H., Bromhead, D., Galeano, D., Timmiss, T., Woodhams, J., Curtotti, R., 2023. Fishery status reports 2023. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. 352-365. URL: https://doi.org/10.25814/vgp4-xr81

Patterson, H., Dylewski, M., 2023a. Southern Bluefin Tuna Fishery. In: Butler, I., Patterson, H., Bromhead, D., Galeano, D., Timmiss, T., Woodhams, J., Curtotti, R., 2023. Fishery status reports 2023. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. 344-351. URL: https://doi.org/10.25814/vgp4-xr81Patterson, H., Dylewski, M., 2023b. Western skipjack tuna fishery. In: Butler, I., Patterson, H., Bromhead, D., Galeano, D., Timmiss, T., Woodhams, J., Curtotti, R., 2023. Fishery status reports 2023. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. 336-343. URL: https://doi.org/10.25814/vgp4-xr81

Paterson, A., Anderson, R., Mulvaney, K., de Koning, S., Dortch, J., McDonald, J., 2019. So ends this day: American whalers in Yaburara country, Dampier Archipelago. Antiquity, 93(367), 218-236.

Patterson, H, Bromhead, D, Galeano, D, Larcombe, J, Timmiss, T, Woodhams, J and Curtotti, R 2022, Fishery status reports 2022, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/gx9r-3n90

PENV 2020. Scarborough Desktop Lighting Impact Assessment. Unpublished report prepared by Pendoley Environmental Pty for Advisian, February 2020.

Popper, A.N., Hawkins, A.D., Fay, R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W., Gentry, R., Halvorsen, M., Løkkeborg, S., Rogers, P., Southall, B., Zeddies, D. and Tavolga, W. 2014. Sound exposure guidelines for fishes and sea turtles: a technical report Prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI. 978-3-319-06658-5. Springer International Publishing, New York, USA.

Quijano, J.E., McPherson, C.R., 2018. Acoustic Characterisation of the Technip Deep Orient: Measuring and Modelling Operational Sound Levels (Document Number 01647, Version 1.0). Technical report by JASCo Applied Sciences for Woodside Energy Limited

Quijano, J. and McPherson, C., 2021. Subsea cutting of the Nganhurra Riser Turret Mooring: Acoustic Modelling for Assessing Marine Fauna Sound Exposures. Document 02511, Version 1.0. Technical Report by JASCO Applied Sciences for Woodside Energy Limited

Ramboll 2022. Study of the cumulative impacts of air emissions in the Murujuga Airshed. Department of Water and Regulation.

Richardson, W.J., Greene Jr, C.R., Malme, C.I., Thomson, D.H., 1995. Marine Mammals and Noise. Academic Press, San Diego.

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, R.M., Parks, S.E., Hunt, K.E., Castellote, M., Corkeron, P.J., Nowacek, D.P., Wasser, S.K., and Kraus, S.D. 2012. Evidence that ship noise increases stress in right whales. Proc.R.Soc.B Biol.Sci., 27 (2012), pp. 2363-2368

Romero, I.C., Schwing, P.T., Brooks, G.R., Larson, R.A., Hastings, D.W., Ellis, G., Goddard, E.A., Hollander, D.J., 2015. Hydrocarbons in deep-sea sediments following the 2010 Deepwater Horizon blowout in the northeast Gulf of Mexico. PLOS ONE 10: e0128371. doi:10.1371/journal.pone.0128371

RPS Environment and Planning, 2011. Field report July 2011: Apache Julimar Development Pipeline Corridor Biological Seabed Survey. RPS Environment and Planning Pty Ltd, Subiaco.

RPS Group (RPS), 2010. Apache Julimar Development Project Pipeline and Umbilical Route Seabed Survey. Field Report April–May 2010, Rev 0. Prepared for Apache Energy Limited Ltd by RPS Bowman Bishaw Gorham, Perth, Western Australia.

RPS Group (RPS), 2019. Woodside GWF-3/Lambert Deep Quantitative Spill Risk Assessment - Preliminary Results. Report prepared for Woodside Energy Ltd.

RPS Group, 2021. Woodside Goodwyn Alpha Operations – Quantitative Spill Risk Assessment Report. April 2021. RPS Group, Perth.

RPS Group, 2023. Woodside Pluto-A Riser Platform Marine Dispersion Modelling of (non-routine) Produced Water Discharges. Revision 4, December 2023.

RPS Group, 2024a. Woodside Pluto Offshore Facility Operations: Scenario 1. Preliminary results. 604-MSOSCPER-338568. Rev 0. January 2024

RPS Group, 2024b. Woodside Pluto Offshore Facility Operations: Scenario 2. Preliminary results - 604-MSOSCPER-338568. Rev 0. January 2024

RPS Group 2024c. Woodside Pluto Offshore Facility Operations: Scenario 3 – Preliminary results. 604-MSOSCPER-338568. Rev 0. January 2024

RPS Group, 2024d. Woodside Pluto Offshore Facility Operations: Scenario 4. Preliminary results - 604-MSOSCPER-338568. Rev 0. January 2024

RPS Group, 2024e. Woodside Pluto Offshore Facility Operations: Scenario 5 - Preliminary results. 604-MSOSCPER-338568. Rev 0. February 2024

Ruffolo, S.A., La Russa, M.F., Rovella, N., Ricca, M., 2023. The Impact of Air Pollution on Stone Materials. Environments 10(7): 119.

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.

Salgado-Kent, C., 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. Centre for Marine Science and Technology (CMST), Curtin University.

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., 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.

Salmon, M., Witherington, B.E., 1995. 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.

SGS Economics & Planning, 2012. Economic development opportunities for the Gascoyne region associated with resource sector investment and expansion. Gascoyne Development Commission, Fortitude Valley.

Shigenaka, G., 2001. Toxicity of oil to reef building corals: a spill response perspective (NOAA Technical Memorandum No. NOS OR&R 8). National Oceanic and Atmospheric Administration, Seattle.

Simmonds, M., Dolman, S., Weilgart, L., 2004. Oceans of noise, WDCS Science Report. Whale and Dolphin Conservation Society, Chippenham.

SINTEF, 2017. SINTEF Offshore Blowout Database - SINTEF [WWW Document]. SINTEF Offshore Blowout Database. URL https://www.sintef.no/en/projects/sintef-offshore-blowout-database/ (accessed 8.17.17).

Sinclair Knight Marz (SKM), 2006. Pluto LNG Development Offshore Marine Environmental Survey.

SKM 2013, Offshore Marine Discharges Study – Modelling and Sedimentation Analysis. Report prepared for Woodside Energy Ltd.

Smallwood, C.B., Beckley, L.E., Moore, S.A., Kobryn, H.T., 2011. Assessing patterns of recreational use in large marine parks: A case study from Ningaloo Marine Park, Australia. Ocean and Coastal Management 54: 330–340. doi:10.1016/j.ocecoaman.2010.11.007

Smyth, D., 2007. Sea Countries of the North-west: Literature review on Indigenous connection to and uses of the North West Marine Region. Department of the Environment and Water Resources, Canberra.

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., Tyack, P.L., 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic mammals, 33, 511-414.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtgall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P., and Tyack, P.L. 2019. Marine mammal noise exposure criteria: updated scientific recommendations for residual hearing effects

Spalding, M.D., Brown, B.E., 2015. Warm-water coral reefs and climate change. Science 350, 769–771.

Steffen, W., Burbidge, A.A., Hughes, L., Kitching, R., Lindenmayer, D., Musgrave, W., Staford Smith, M., Werner, P., 2009. Australia´s biodiversity and climate change: A strategic assessment of vulnerability of Australia´s biodiversity to climate change. A report to the Natural resource Management Ministerial Council commissioned by Australian Government. CSIRO Publishing.

Strain, L., Fabris, F., Blay, N. 2023. South Coast Greenlip/Brownlip Abalone Resource Status Report 2023. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries eds. Newman, S.J., Santoro, K.G., Gaughan, D.J., Department of Primary Industries and Regional Development, Western Australia. pp. 218-224.

Stroot, D. H., Koessler, M. W. and McPherson, C.R. 2022. Acoustic Modelling for Assessing Marine Fauna Sound Exposures. Woodside NWS MODU Drilling Operations. JASCO Applied Sciences (Australia) Pty Ltd. 4 November 2022

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.

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.

Terrens, G.W., Gwyther, D., Keough, M.J., Tait, R.D., 1998. Environmental Assessment of Synthetic-Based Drilling-Mud Discharges to Bass Strait, Australia. Presented at the International Conference on Health, Safety, and Environment in Oil and Gas Exploration and Production, Society of Petroleum Engineers, Caracas, p. SPE-46622-MS. Doi:10.2118/46622-MS.

Thomson, P.G., Pillan, R., Jaine, F.R.A., Harcourt, R.G., Taylor, M.D., Pattiaratchi, C.B. and McLean, D.L. 2021. Acoustic Telemetry Around Western Australia's Oil and Gas Infrastructure Helps Detect the Presence of an Elusive and Endangered Migratory Giant. Frontiers in Marine Science, 8: https://www.frontiersin.org/articles/10.3389/fmars.2021.631449

[TSSC] Threatened Species Scientific Committee 2015a. Conservation Advice Balaenoptera borealis sei whale. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/34-conservation-advice-01102015.pdf

[TSSC] Threatened Species Scientific Committee 2015b. Conservation Advice Balaenoptera Physalus (Fin Whale). Canberra, Australian Capital Territory: Threatened Species Scientific Committee.
Department of the Environment. http://www.environment.gov.au/biodiversity/threatened/species/pubs/37-conservation-advice-01102015.pdf.

[TSSC] Threatened Species Scientific Committee, 2015d. Conservation Advice Rhincodon typus whale shark. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66680-conservation-advice-01102015.pdf

[TSSC] Threatened Species Scientific Committee 2016a. Conservation Advice Calidris tenuirostriss Great knot. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/862-conservation-advice-05052016.pdf

Thums, M., Ferreira, L. C., Jenner, C., Jenner, M., Harris, D., Davenport, A., ... & McCauley, R., 2022. Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean. Global Ecology and Conservation, 35, e02054.

Tomajka, J., 1985. The influence of petroleum hydrocarbons on the primary production of the Danube River plankton. Acta Hydrochimica et Hydrobiologica 13: 615–618.

Tourism Western Australia, 2023. The Pilbara Region, Overnight Visitor Factsheet 2022. Prepared by Tourism WA Insights and Planning, April 2023.

Tuffley, E., How, J., Wiberg, L. 2023. West Coast Deep Sea Crustacean Resource Status Report 2023. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries eds. Newman, S.J., Santoro, K.G., Gaughan, D.J., Department of Primary Industries and Regional Development, Western Australia. pp. 127-133.

Twachtman Snyder & Byrd, Inc. and Center 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. 50 pp.

Underwood, J.N., 2009. Genetic diversity and divergence among coastal and offshore reefs in a hard coral depend on geographic discontinuity and oceanic currents. Evolutionary Applications 2: 222–233. doi:10.1111/j.1752-4571.2008.00065.x

UWA, 2021. Scarborough Pipeline Cultural Heritage Assessment: Establishing Archaeological Potential and Significance. Technical report by UWA for Woodside Energy Limited.

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

Veth, P., Ward, I., Manne, T., Ulm, S., Ditchfield, K., Dortch, J., Hook, F., Petchey, D., Hogg, A., Questiaux, D., Demuro, M., Arnold, L., Spooner, N., Levchenko, V., Skippington, J., Byrne, C., Basgall, M., Zeanah, D., Belton, D., Helmholz, P., Bajkan, S., Bailey, R., Placzek, C., Kendrick, P., 2017. Early human occupation of a maritime desert, Barrow Island, North-West Australia. Quaternary Science Reviews Volume, 168, 19-29.

Veth, P., McDonald, J., Ward, I., O'Leary, M., Beckett, E., Benjamin, J., Ulm, S., Hacker, J., Ross, P., Bailey, G., 2019. A Strategy for Assessing Continuity in Terrestrial and Maritime Landscapes from Murujuga (Dampier Archipelago), North West Shelf, Australia. The Journal of Island and Coastal Archaeology 15(4): 477-503. Doi: 10.1080/15564894.2019.1572677

Vik EA, Bakke DR and Verburgh J, 1996, The N-octanol/water partition coefficient: a critical parameter in environmental risk assessment of offshore EandP chemicals, in Ray, JP and Engelhardt FR., (eds), Produced Water: Technological/Environmental Issues and Solutions, Plenum Press, New York.

[WAFIC] Western Australian Fishing Industry Council. 2024. West Coast Deep Sea Crustacean Fishery. https://www.wafic.org.au/fishery/west-coast-deep-sea-crustacean-fishery/

Wakefield, C., Trinnie, F., Skepper, C., Boddington, D., Newman, S., Steele, A., 2023. North Coast Demersal Resource Status Report 2022. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/2022: The State of the Fisheries eds. Newman, S.J., Wise, B.S., Santoro, K.G., Gaughan, D.J. Department of Primary Industries and Regional Development, Western Australia. Pp 172 - 181

Warne MSTJ, Batley GE, van Dam RA, Chapman JC, Fox DR, Hickey CW and Stauber JL. (2015). Revised Method for Deriving Australian and New Zealand Water Quality Guideline Value for Toxicants. Updated January, 2017. Prepared for the Council of Australian Government's Standing Council on Environment and Water (SCEW). Department of Science, Information Technology and Innovation, Brisbane, Queensland. 48 pp.

Wecker, H., Koessler, M. W., Connel, S. J. and McPherson, C.R. 2022. Acoustic Modelling for Assessing Marine Fauna Sound Exposures. Woodside Pluto Drilling Campaign. JASCO Applied Sciences (Australia) Pty Ltd 27 September 2022

Weilgart, L.S., 2007. A brief review of known effect of noise on marine mammals. International Journal of Comparative Psychology, 20 (2-3), 159-168

Whittock, P.A., Pendoley, K.L., & Hamann, M., 2014. Inter-nesting distribution of flatback turtles

Whittock, P.A., Pendoley, K.L., & Hamann, M., 2016. Using habitat suitability models in an industrial setting: the case for internesting flatback turtles. Ecosphere, 7(11): e01551. 10.1002/ecs2.1551.

Wilkin, S., Koefoed, I., Brown, S., How, J. 2023a. Exmouth Gulf Prawn Resource Status Report 2023. In: : Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries eds. Newman, S.J., Santoro, K.G., Gaughan, D.J., Department of Primary Industries and Regional Development, Western Australia. pp. 119-127.

Wilkin, S., Shanks, M., How, J., Leaversuch, R. 2023b. North Coast Prawn Resource Status Report 2023. In: Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries eds. Newman, S.J., Santoro, K.G., Gaughan, D.J., Department of Primary Industries and Regional Development, Western Australia. pp. 161-167.

Williams, A., Ulm, S., Sapienza, T. Lewis, S. Turney, C. 2018. Sea-level change and demography during the last glacial termination and early Holocene across the Australian continent. Quaternary Science Reviews (182), 144-154.

Woodside Energy Limited, 2006. Pluto LNG development draft Public Environment Report / Public. Environment Review (EPBC Act Referral No 2006/98). Woodside Energy Limited, Perth.

Woodside Energy Limited, 2011. Browse LNG Development Draft Upstream Environmental Impact Statement (No. EPBC Referral 2008/4111). Woodside Energy Limited, Perth.

Woodside Energy Ltd. 2014. Browse FLNG Development Draft Environmental Impact Statement.

Woodside Energy Limited, 2022. Description of the Existing Environment. Perth (under Section 56 of the Environment Regulations, this Master Existing Environment was accepted on 3

March 2022 as Appendix C in the Goodwyn Alpha (GWA) Facility Operations Environment Plan, which can be accessed here: https://docs.nopsema.gov.au/A825979)

Woodside Energy Limited, 2022a. Climate Report 2022. Perth, Western Australia: Woodside Energy Limited. https://www.woodside.com/docs/default-source/investordocuments/major-reports-(static-pdfs)/2022-climate-report/climate-report-2022.pdf?sfvrsn=240783fc_16.

Woodside Energy Limited, 2023a. Scarborough, Dredging and Spoil Disposal Management Plan. SA0006AH0000002.

Woodside Energy Limited, 2024. Climate Transition Action Plan and 2023 Progress Report, Perth, Western Australia. Woodside Energy Limited. https://www.woodside.com/docs/default-source/investor-documents/major-reports-(static-pdfs)/ctap2023/climate-transition-action-plan-and-2023-progress-report.pdf?sfvrsn=d6f6eed4_11

Yender, R., Michel, J., Lord, C., 2002. Managing seafood safety after and oil spill. National Oceanic and Atmospheric Administration, Seattle.

Zieman, J.C., Orth, R., Phillips, R.C., Thayer, G., Thorhaug, A., 1984. Effects of oil on seagrass ecosystems, in: Cairns Jr., J., Buikema, A.L. (Eds.), Restoration of Habitats Impacted by Oil Spills. Butterworth-Heinemann, Boston, pp. 37–64.

9. GLOSSARY AND ABBREVIATIONS

Acronym	Description
1TL	First Trunkline
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABN	Australian Business Number
AEP	Australian Energy Producers
AFMA	Australian Fisheries Management Authority
AHS	Australian Hydrographic Service
AHV	Anchor Handling Vessel
AHO	Australian Hydrographic Office
AIMS	Australian Institute of Marine Science
AIS	Automatic Identification System
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ANZECC	Australian and New Zealand Environment and Conservation Council
ASV	Accommodation Support Vessel
AUSREP	Australian Ship Reporting System
AUV	Autonomous underwater vehicles
bbl	Barrel unit
BDV	Blowdown valve
BIA	Biologically Important Area
BoM	Bureau of Meteorology
BOP	Blowout Preventer
BP	Boiling Point
BTAC	Buurabalayji Thalanyji Aboriginal Corporation
BTEX	Benzene, toluene, ethylbenzene and xylenes
BWCMP	Blue Whale Conservation Management Plan
CAES	Catch and Effort System
CCE	Common Cause Effect
CCR	Central Control Room
CEFAS	Centre for environment, fisheries and aquaculture science
CFA	Commonwealth Fisheries Association
CHARM	Chemical Hazard and Risk Management
CIMT	Corporate Incident Management Team
CITV	Chemical Injection Throttle Valve

Acronym	Description
cm	Centimetres
CMMS	Computerised Maintenance Management System
CMT	Crisis management Team
CoP	Cessation of Production
CP	Cathodic protection
CS	Cost Sacrifice
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth
CV	Company Values
CVI	Close Visual Inspections
CVS	Contractor Verification Service
DAA	Department of Aboriginal Affairs
DAWE	Department of Agriculture, Water and the Environment
dB	Decibel
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCLM	Department of Conservation and Land Management
DEC	Department of Environment and Conservation
DEWHA	Department of the Environment, Water, Heritage and the Arts
DGPS	Differential Global Surface Positioning System
DISER	Department of Industry, Science, Energy and Resources
DMIRS	Department of Mining, Industry Regulation and Safety
DNP	Director of National Parks
DoD	Department of Defence
DoEE	Department of the Environment and Energy
DoT	Department of Transport
DP	Dynamic positioning
DPIRD	Department of Primary Industry and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
DWT	Dead Weight Tonnage
EDS	Emergency Disconnect Sequences
EET	Emission Estimation Techniques
EEZ	Exclusive Economic Zone
EFL	Electrical Flying Lead
EIO	East Indian Ocean
EMBA	Environment that may be affected
ENVID	Environmental Risk Identification Studies

Acronym	Description
EP	Environment Plan
EPBC Act	Environment Protection and Biodiversity Conservation Act
EPOs	Environmental performance outcomes
EPS	Environment Performance Standards
EoFL	End of field life
ERP	Emergency Response Plan
ESD	Emergency Shutdown
ESDev	Ecologically Sustainable Development
EVP	Executive Vice President
FEED	Front End Engineering and Design
FEWD	Formation Evaluation While Drilling
FFS	Fit for Services
FPSO	Floating Production Storage and Offloading
FRC	Fast Rescue Craft
GHG	Greenhouse Gas
GP	Good Industry Practice
GSM	Grid Stability Module
GVI	General Visual Inspections
GWA	Goodwyn Alpha
HAT	Highest Astronomical Tide
HAZID/ENVID	Hazard identification studies
HFL	Hydraulic Flying Lead
HIGF	Horizontal Induced Gas Floatation
HIPPS	High Integrity Pressure Protection System
HP	High Pressure
HPU	Hydraulic Power Unit
HQ	Hazard Quotient
HSE	Health, Safety and Environment
HSEC	Health, Safety and Environment Coordinator
HSEQ	Health, Safety, Environment and Quality
HVAC	Heating, ventilation and air conditioning
ICLDP	Incident and Crisis Leaders Development Program
ILUAs	Indigenous Land Use Agreements
IUCN	International Union for the Conservation of Nature
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMMR	Inspection, monitoring, maintenance and repair
IMS	Invasive Marine Species

Acronym	Description
IMSMP	Invasive Marine Species Management Plan
IPIECA	International Petroleum Industry Environmental Conservation Association
ISO	International Organisation of Standardisation
ISSoW	Integrated Safe System of Work
ISV	IMMR support vessel
JRCC	Joint Rescue Coordination Centre
KEF	Key Ecological Feature
Kg	Kilogram
KGP	Karratha Gas Plant
km	Kilometre
KPI	Key performance Indicator
L	Litres
LAT	Lowest Astronomical Tide
LBL	Long Baseline
LCS	Legislation, Codes and Standards
LNG	Liquefied natural gas
LOA	Length Overall
LP	Low Pressure
LTO	Licence to Operate
LW	Lambert West
LWI	Light Well Intervention
m3	Cubic metres
MAEs	Major Accident Events
MAH	Monocyclic Aromatic Hydrocarbons
MBES	Multibeam Echo Sounder
MC	Measurement Criteria
MCS	Master Control Station
MEEs	Major Environmental Events
MEG	Monoethylene glycol
MFO	Marine Fauna Observer
MLCS	Mid-line Connector System
MNES	Matters of Environmental Significance
MoC	Management of Change
MODU	Mobile Offshore Drilling Unit
MOPO	Manual of Permitted Operation
MoU	Memorandum of Understanding
MPAs	Marine Protected Areas

Acronym	Description
MPPE	Macro Porous Polymer Extraction
MSIN	Maritime Safety Information Notifications
MSPS	Management System Performance Standards
MW	Megawatts
NAC	Nanda Aboriginal Corporation
NCVA	National Conservation Values Atlas
NDC	Nationally Determine Contributions
NDT	Non Destructive Testing
NGA	Nganhurra
NGERS	National Greenhouse and Energy Reporting
NIMS	Non-Indigenous Marine Species
NLPG	National Light Pollution Guidelines
NMFS	National Marine Fisheries Service
nm	Nautical miles
NNC	Not Normally Crewed
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NORM	Naturally occurring radioactive material
NPI	National Pollutant Inventory
NRC	North Rankin Complex
NRV	Non-return Valve
NTA	Native Title Act 1993 (Cth)
NTGAC	Nganhurra Thanardi Garrbu Aboriginal Corporation
NTM	Notice to Mariners
NW	North-west
NWBM	Non Water Based Muds
NWMR	North West Marine Region
NWS	North West Shelf
NWSP	North West Shelf Province
NZE	Net Zero Emissions
OA	Operational Area
OCIMF	Oil Companies International Marine Forum
OCNS	Offshore Chemical Notification Scheme
OIM	Offshore Installation Manager
OIW	Oil in water
OMDAMP	Offshore Marine Discharges Adaptive Management Plan

Acronym	Description
OPEP	Oil Pollution Emergency Plan
OPEX	Operational expenditure
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth)
OPP	Offshore Project Proposal
OSPAR Convention	Convention for the Protection of the Marine environment of the North-East Atlantic
OSREC	Oil Spill Response Skills Enhancement Course
OSRO	Oil Spill Response Organisation
OVID	Offshore Vessel Inspection Database
OWS	Oily Water Separator
PAA	Petroleum Activities Area
PAP	Petroleum Activities Program
PAH	Polycyclic aromatic hydrocarbon
PBA	Pre-emptive baseline areas
PBC	Prescribed Bodies Corporates
PER	Public Environment Report
PFW	Produced Formation Water
PHD	Process historian database
PIC	Person in Charge
PJ	Professional Judgement
PLA	Pluto-Alpha platform
PLET	Pipeline End Termination
PLONOR	Pose little or no risk
PLP	Pluto LNG Park
PMST	Protected Matters Search Tool
PNEC	Predicted No-effect concentration
POB	Personnel on board
PoW	Octanol-Water Partition
ppb	Parts per Billion
PROC	Pluto Remote Operations Centre
PSM	Process Safety Management
PSRA	Process Safety Risk Assessment
PSV	Pressure safety Valves
PSZ	Petroleum Safety Zone
PTS	Permanent Threshold Shift
PTW	Permit to Work
PW	Produced Water
PWCS	Primary water/condensate separators

Acronym	Description
RAR	Rig Anchor Release
RATSIB	Representative Aboriginal/Torres Strait Islander Bodies
RBA	Risk Based Analysis
RBI	Risk Based Inspection
RCC	Rescue Coordination Service
rms SPL	Root Square Mean Sound Pressure Level
ROV	Remotely Operated Vehicle
SBP	Sub-bottom Profiling
SBV	Standby Vessel
SCC	Safety and Environment Critical Component
SCE	Safety and Environmental Critical Element
SCEW	Standing Council on Environment and Water
SCM	Subsea Control Module
SCSSSV	Surface controlled sub-surface safety valves
SEL	Sound Exposure Level
SEZ	Safety Exclusion Zone
SIMAP	Spill Impact Mapping and Analysis program
SIMOPS	Simultaneous Operations
SMP	Scientific Monitoring Program
SOPEP	Ship Oil Pollution Emergency Plan
SPL	Sound Pressure Level
SSPL	Subsea Pipeline
SSS	Side Scan Sonar
SV	Societal Values
TAP	Threat Abatement Plan
TD	Total Depth
THS	Tubing Head Spool
TPH	Total petroleum hydrocarbon
TSS	Total Suspended Solids
TTS	Temporary Threshold Shift
UK	United Kingdom
µm	micrometer
UPS	Uninterruptable Power System
USBL	Ultra-Short Baseline
USEPA	U.S. Environmental Protection Agency
UTA	Umbilical Termination Assemblies
VLS	Vertical Lay System

Acronym	Description
VOC	Volatile organic compound
VP	Vice President
WA	Western Australia
WAC	Wirrawandi Aboriginal Corporation
WAFIC	Western Australian Fishing Industry Council
WALGA	Western Australia Local Government Association
WBM	Water Based Muds
WHA	World Heritage Area
WLS	Woodside Learning Services
WLSADS	Well location and Site Appraisal Data Sheet
WMS	Woodside Management System
WOMP	Well Operations Management Plan
YAC	Yindjibarndi Aboriginal Corporation

APPENDIX A: WOODSIDE POLICIES

Environment and Biodiversity Policy

OBJECTIVE

Woodside recognises the intrinsic value of nature and the importance of conserving biodiversity and ecosystem services to support the sustainable development of our society. We are committed to doing our part. We understand and embrace our responsibility to undertake activities in an environmentally sustainable way.

PRINCIPLES

Woodside commits to:

- Implementing a systematic approach to the management of the impacts and risks of our operating activities on an ongoing basis, including emissions and air quality, discharge and waste management, water management, biodiversity and protected areas.
- Applying the mitigation hierarchy principle (avoid, minimise, restore) and a continuous improvement approach to ensure we maintain compliance, improve resource use efficiency and reduce our environmental impacts.
- Embedding environmental and biodiversity management, and opportunities, in our business planning and decision making processes.
- Complying with relevant laws and regulations and applying responsible standards where laws do not exist.
- Not undertaking new exploration or development of hydrocarbons within the boundaries of natural sites on the UNESCO World Heritage List (as specified at 1 December 2022). Existing activity may continue if compatible with maintenance of the listed outstanding universal values.
- Not undertaking new exploration or development of hydrocarbons within IUCN Protected Areas (as specified at 1 December 2022) unless compatible with management plans in place for the area. Existing activity may continue if compatible with management plans in place for the area.
- Achieving net zero deforestation[1] associated with new projects that take a Final Investment Decision (FID) after 1 December 2022.
- Developing Biodiversity Action Plans for all new major projects (CAPEX >USD$2 billion) that take a FID after 1 December 2022.
- Supporting positive biodiversity outcomes in regions and areas in which we operate.
- Setting targets and publicly reporting on our environmental and biodiversity performance.

APPLICABILITY

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures.

This Policy will be reviewed regularly and updated as required.

Reviewed by the Woodside Energy Group Ltd Board in December 2023.

[1] Definition of Forest: 'trees higher than 5 metres and a canopy cover of more than 10 percent on the land to be cleared'.

Risk Management Policy

OBJECTIVES

Woodside recognises that risk is inherent in our business and the effective management of risk is vital to deliver our strategic objectives, continued growth and success. We are committed to managing risks in a proactive and effective manner as a source of competitive advantage.

Our approach protects us against potential negative impacts, enables us to take risk for reward and improves our resilience against emerging risks. The objective of our risk management framework is to provide a single consolidated view of risks across the company to understand our full risk exposure and prioritise risk management and governance.

The success of our approach lies in the responsibility placed on everyone at all levels to proactively identify, assess and treat risks relating to the objectives they are accountable for delivering.

PRINCIPLES

Woodside achieves these objectives by:

- Applying a structured and comprehensive framework for the identification, assessment and treatment of current risks and response to emerging risks;
- Ensuring line of sight of financial and non-financial risks at appropriate levels of the organisation;
- Demonstrating leadership and commitment to integrating risk management into our business activities and governance practices;
- Recognising the value of stakeholder engagement, best available information and proactive identification of potential changes in external and internal context;
- Embedding risk management into our critical business processes and control framework;
- Understanding our exposure to risk and tolerance for uncertainty to inform our decision making and assure that Woodside is operating with due regard to the risk appetite endorsed by the Board; and
- Evaluating and improving the effectiveness and efficiency our approach.

APPLICABILITY

The Managing Director of Woodside is accountable to the Board of Directors for ensuring this Policy is effectively implemented.

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures.

This Policy will be reviewed regularly and updated as required.

Reviewed by the Woodside Energy Group Ltd Board in December 2023.

Climate Policy

BACKGROUND

The Intergovernmental Panel on Climate Change has stated that "it is unequivocal that human influence has warmed the atmosphere, ocean and land". An objective of the Paris Agreement is to hold "the increase in the global average temperature to well below 2ºC above pre-industrial levels" and to pursue "efforts to limit the temperature increase to 1.5ºC". Many countries have set targets to reduce greenhouse gas emissions, including by changing the way they produce and consume energy.

OBJECTIVE

Woodside's objective is to thrive in this energy transition as a low cost, lower carbon energy provider.

PRINCIPLES

Woodside aims to achieve the objective by:

- Setting science-based[1] near, mid, and long-term net emissions reduction targets that are consistent with Paris-aligned[2] scenarios, covering equity scope 1 and 2 emissions, both operated and non-operated.[3]
- Developing and operating oil and gas projects in a manner that is consistent with these targets. This includes the deployment of lower-emission technologies (Design Out), supporting efficient operations (Operate Out) and use of robust offsets (Offset) as methods to reduce and offset greenhouse gas emissions.
- Investing in new energy products and lower carbon services to reduce customers' emissions (part of Woodside's Scope 3 emissions), including but not limited to hydrogen, ammonia and carbon capture, utilisation and storage.
- Publishing transparent climate-related disclosures aligned to the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) or other recognised global reporting standards.
- Aligning our advocacy to the principles of this Climate Policy.

[1] Woodside is using the draft Prototype IFRS Sustainability Disclosure Standard definition of "science-based" (published 2021) which states "targets are considered 'science-based' if they are in line with what the most recent climate science sets out is necessary to meet the goals of the Paris Agreement—limiting global warming to below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit warming to 1.5 degrees Celsius.". See https://www.ifrs.org/content/dam/ifrs/groups/trwg/trwg-climate-related-disclosures-prototype.pdf (Appendix A).

[2] Woodside is using the draft Prototype IFRS Sustainability Disclosure Standard definition of "Paris-aligned scenarios" (published 2021) which states "scenarios consistent with limiting global warming to below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit warming to 1.5 degrees Celsius." See https://www.ifrs.org/content/dam/ifrs/groups/trwg/trwg-climate-related-disclosures-prototype.pdf (Appendix A).

[3] Equity emissions means the share of the total emissions arising from an activity that are attributable to Woodside in proportion to Woodside's ownership interest in the activity, irrespective of whether Woodside operates the activity. Operated emissions are the total emissions arising from an activity that Woodside operates, irrespective of Woodside's ownership interest.

APPLICABILITY

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venture participants engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures.

This Policy will be reviewed regularly and updated as required.

Reviewed by the Woodside Energy Group Ltd Board in December 2023.

APPENDIX B: RELEVANT REQUIREMENTS

The below table refers to Commonwealth Legislation related to the project.

Commonwealth Legislation	Legislation Summary
Air Navigation Act 1920 Air Navigation Regulations 1947 Air Navigation (Aerodrome Flight Corridors) Regulations 1994 Air Navigation (Aircraft Engine Emissions) Regulations 1995 Air Navigation (Aircraft Noise) Regulations 1984 Air Navigation (Fuel Spillage) Regulations 1999	This Act relates to the management of air navigation.
Australian Maritime Safety Authority Act 1990	This Act establishes a legal framework for the Australian Maritime Safety Authority (AMSA), which represents the Australian Government and international forums in the development, implementation and enforcement of international standards including those governing ship safety and marine environment protection. AMSA is responsible for administering the Marine Orders in Commonwealth waters.
Australian Radiation Protection and Nuclear Safety Act 1998	This Act relates to the protection of the health and safety of people, and the protection of the environment from the harmful effects of radiation.
Biosecurity Act 2015 Quarantine Regulations 2000 Biosecurity Regulation 2016 Australian Ballast Water Management Requirements 2017 Biosecurity Amendment (Biofouling Management) Regulations 2021	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. The Biofouling Management Regulations requires ships to report information about biofouling management and the voyage history of the ship in the past 12 months through a pre-arrival report.
Environment Protection and Biodiversity Conservation Act 1999 Environment Protection and Biodiversity Conservation Regulations 2000	This Act protects matters of national environmental significance (NES). It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and culturally significant places. Under this Act, actions that may be likely to have a significant impact on matters of NES must be referred to the Commonwealth Environment Minister.
Environment Protection (Sea Dumping) Act 1981 Environment Protection (Sea Dumping) Regulations 1983	This Act provides for the protection of the environment by regulating dumping matter into the sea, incineration of waste at sea and placement of artificial reefs.
Industrial Chemicals (Notification and Assessment Act) 1989 Industrial Chemicals (Notification and Assessment) Regulations 1990	This Act creates a national register of industrial chemicals. The Act also provides for restrictions on the use of certain chemicals which could have harmful effects on the environment or health.

Commonwealth Legislation	Legislation Summary
National Environment Protection Measures (Implementation) Act 1998 National Environment Protection Measures (Implementation) Regulations 1999	This Act and Regulations provide for the implementation of National Environment Protection Measures (NEPMs) to protect, restore and enhance the quality of the environment in Australia and ensure that the community has access to relevant and meaningful information about pollution. The National Environment Protection Council has made NEPMs relating to ambient air quality, the movement of controlled waste between states and territories, the national pollutant inventory, and used packaging materials.
National Greenhouse and Energy Reporting Act 2007 National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015	This Act and associated Rule establishes the legislative framework for the NGER scheme for reporting greenhouse gas emissions and energy consumption and production by corporations in Australia.
Navigation Act 2012 Marine order 12 – Construction – subdivision and stability, machinery and electrical installations Marine order 30 - Prevention of collisions Marine order 47 – Offshore Industry units Marine order 57 - Helicopter operations Marine order 91 - Marine pollution prevention—oil Marine order 93 - Marine pollution prevention—noxious liquid substances Marine order 94 - Marine pollution prevention—packaged harmful substances Marine order 96 - Marine pollution prevention—sewage Marine order 97 - Marine pollution prevention—air pollution	This Act regulates navigation and shipping including Safety of Life at Sea (SOLAS). The Act will apply to some activities of the 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 2023 Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011 Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009	This Act is the principal Act governing offshore petroleum exploration and production in Commonwealth waters. Specific environmental, resource management and safety obligations are set out in the Regulations listed.
Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995	This Act provides for measures to protect ozone in the atmosphere by controlling and ultimately reducing the manufacture, import and export of ozone depleting substances (ODS) and synthetic greenhouse gases, and replacing them with suitable alternatives. The Act will only apply to Woodside if it manufactures, imports or exports ozone depleting substances.
Protection of the Sea (Powers of Intervention) Act 1981	This Act authorises the Commonwealth to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and provides legal immunity for persons acting under an AMSA direction.

Commonwealth Legislation	Legislation Summary
Recycling and Waste Reduction (Mandatory Product Stewardship—Mercury-added Products) Rules 2021 (Minamata Convention on Mercury 2017)	This Convention is an agreement to protect human and environmental health from the effects of releases of mercury and mercury-containing compounds to the environment. The Convention was ratified by Australia in December 2021 and is implemented in Commonwealth law under the Recycling and Waste Reduction (Mandatory Product Stewardship – Mercury added Products) Rules 2021).
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994 Marine order 91 - Marine pollution prevention—oil Marine order 93 - Marine pollution prevention—noxious liquid substances Marine order 94 - Marine pollution prevention—packaged harmful substances Marine order 95 - Marine pollution prevention—garbage Marine order 96 - Marine pollution prevention—sewage Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007 MARPOL Convention	This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. Under this Act, discharge of oil or other harmful substances from ships into the sea is an offence. There is also a requirement to keep records of the ships dealing with such substances. The Act applies to all Australian ships, regardless of their location. It applies to foreign ships operating between 3 nautical miles (nm) off the coast out to the end of the Australian Exclusive Economic Zone (200 nm). It also applies within the 3 nm of the coast where the State/Northern Territory does not have complementary legislation. All the Marine Orders listed, except for Marine Order 95, are enacted under both the Navigation Act 2012 and the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. This Act is an amendment to the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. This amended Act provides the protection of the sea from pollution by oil and other harmful substances discharged from ships.
Protection of the Sea (Harmful Antifouling Systems) Act 2006 Marine order 98—(Marine pollution—anti-fouling systems)	This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the application or reapplication of harmful anti-fouling compounds on Australian ships or foreign ships that are in an Australian shipping facility.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	This Act seeks “to preserve and protect places, areas and objects of particular significance” to Aboriginal people. Under the Section 9 and 10 provisions of the Act, the Minister for the Environment may declare significant Aboriginal areas temporarily or permanently protected if they are considered under threat. Similar declarations regarding Aboriginal objects can be made under Section 12. Under Section 22 of the Act, the contravention of any of these declarations is an offence. Additionally, the discovery of any Aboriginal remains must be reported to the Minister under Section 20. Damage or interference with Aboriginal objects or places is not an offence under the ATSIHO Act except within Victoria under Section 21U.
Underwater Cultural Heritage Act 2018 Underwater Cultural Heritage Guidance for Offshore Developments DRAFT Guidelines to Protect Underwater Cultural Heritage.	The Act prescribes penalties for damage to protected Underwater Cultural Heritage without a permit under Section 30 or in contravention of a permit under Section 28. Protected Underwater Cultural Heritage is prescribed in Section 16 to automatically include the remains and associated artefacts of any vessel or aircraft that has been in Australian waters for 75 years, whether known or unknown. This protection is also extended to Underwater Cultural Heritage in Commonwealth waters specified by the Environment Minister under Section 17. Without a declaration under this section, Aboriginal Underwater Cultural Heritage is not protected under the UCH Act.

APPENDIX C: EPBC ACT PROTECTED MATTERS SEARCH TOOL REPORTS

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 04-Dec-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	23
Listed Migratory Species:	38

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	67
Whales and Other Cetaceans:	28
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	1

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	34
Key Ecological Features (Marine):	2
Biologically Important Areas:	8
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
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
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
FISH		
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Aipysurus apraefrontalis		
Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	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 likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
SHARK		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
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

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat 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
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat likely to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may 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

Scientific Name	Threatened Category	Presence Text
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis		
Australian Humpback Dolphin [87942]		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 likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
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
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptile		
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat may occur within area
Aipysurus duboisii Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area
Aipysurus laevis Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Aipysurus mosaicus as Aipysurus eydouxii Mosaic Sea Snake [87261]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		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 likely to occur within area
Ephalophis greyi Mangrove Sea Snake [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 czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area
Hydrophis platurus as Pelamis platurus Yellow-bellied Sea Snake [93517]		Species or species habitat may occur within area
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
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

Current Scientific Name	Status	Type of Presence
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Current Scientific 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 sahulensis Australian Humpback Dolphin [87942]		Species or species habitat may 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 may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Montebello	Multiple Use Zone (IUCN VI)

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur

Extra Information

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Gorgon Gas Development	2003/1294		Post-Approval
Project Highclere Cable Lay and Operation	2022/09203		Completed
Controlled action			
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston	2008/4469	Controlled Action	Post-Approval
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Gorgon Gas Development 4th Train Proposal	2011/5942	Controlled Action	Post-Approval
Pluto Gas Project	2005/2258	Controlled Action	Completed
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval
Not controlled action			
Exploration of appraisal wells	2006/3065	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
To construct and operate an offshore submarine fibre optic cable, WA	2014/7373	Not Controlled Action	Completed
Wheatstone 3D seismic survey, 70km north of Barrow Island	2004/1761	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
"Leanne" offshore 3D seismic exploration, WA-356-P	2005/1938	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P	2003/1271	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic survey	2006/2715	Not Controlled Action (Particular Manner)	Post-Approval
Aperio 3D Marine Seismic Survey, WA	2012/6648	Not Controlled Action (Particular Manner)	Post-Approval
Balnaves Condensate Field Development	2011/6188	Not Controlled Action (Particular Manner)	Post-Approval
Cable Seismic Exploration Permit areas WA-323-P and WA-330-P	2008/4227	Not Controlled Action (Particular Manner)	Post-Approval
CGGVERITAS 2010 2D Seismic Survey	2010/5714	Not Controlled Action (Particular Manner)	Post-Approval
Cue Seismic Survey within WA-359-P, WA-361-P and WA-360-P	2007/3647	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Drilling 35-40 offshore exploration wells in deep water	2008/4461	Not Controlled Action (Particular Manner)	Post-Approval
Foxhound 3D Non-Exclusive Marine Seismic Survey	2009/4703	Not Controlled Action (Particular Manner)	Post-Approval
Harmony 3D Marine Seismic Survey	2012/6699	Not Controlled Action (Particular Manner)	Post-Approval
Julimar Brunello Gas Development Project	2011/5936	Not Controlled Action (Particular Manner)	Post-Approval
Moosehead 2D seismic survey within permit WA-192-P	2005/2167	Not Controlled Action (Particular Manner)	Post-Approval
Osprey and Dionysus Marine Seismic Survey	2011/6215	Not Controlled Action (Particular Manner)	Post-Approval
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone 3D MAZ Marine Seismic Survey	2011/6058	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2007/3941	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Wheatstone Iago Appraisal Well Drilling	2008/4134	Not Controlled Action (Particular Manner)	Post-Approval

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Continental Slope Demersal Fish Communities	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Marine Turtles		
Chelonia mydas		
Green Turtle [1765]	Internesting buffer	Known to occur
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Natator depressus		
Flatback Turtle [59257]	Internesting buffer	Known to occur
Seabirds		
Ardenna pacifica		
Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sharks		
Rhincodon typus		
Whale Shark [66680]	Foraging	Known to occur
Whales		
Balaenoptera musculus brevicauda		
Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda		
Pygmy Blue Whale [81317]	Migration	Known to occur

Scientific Name	Behaviour	Presence
Megaptera novaeangliae		
Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 04-Dec-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	24
Listed Migratory Species:	41

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	74
Whales and Other Cetaceans:	28
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	3

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	37
Key Ecological Features (Marine):	2
Biologically Important Areas:	11
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
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
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
FISH		

Scientific Name	Threatened Category	Presence Text
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
SHARK		

Scientific Name	Threatened Category	Presence Text
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	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
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		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
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Congregation or aggregation 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
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		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 likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
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

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
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
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Fish		

Scientific Name	Threatened Category	Presence Text
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
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

Scientific Name	Threatened Category	Presence Text
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
[Trachyrhamphus longirostris](#) Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
[Dugong dugon](#) Dugong [28]		Species or species habitat known to occur within area
Reptile		
[Aipysurus apraefrontalis](#) Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
[Aipysurus duboisii](#) Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area
[Aipysurus foliosquama](#) Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
[Aipysurus laevis](#) Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area
[Aipysurus mosaicus as Aipysurus eydouxii](#) Mosaic Sea Snake [87261]		Species or species habitat may occur within area
[Aipysurus tenuis](#) Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area
Ephalophis greyi Mangrove Sea Snake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Congregation or aggregation known to occur within area
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area
Hydrophis platurus as Pelamis platurus Yellow-bellied Sea Snake [93517]		Species or species habitat may occur within area
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
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

Current Scientific Name	Status	Type of Presence
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
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 sahulensis Australian Humpback Dolphin [87942]		Species or species habitat may 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 likely 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]
Park Name	Zone & IUCN Categories
Montebello	Multiple Use Zone (IUCN VI)

Habitat Critical to the Survival of Marine Turtles		
Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus		
Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas		
Green Turtle [1765]	Nesting	Known to occur
Nov - May		
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
North West Shelf Project Extension, Carnarvon Basin, WA	2018/8335		Approval
Controlled action			
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston	2008/4469	Controlled Action	Post-Approval
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Gorgon Gas Development 4th Train Proposal	2011/5942	Controlled Action	Post-Approval
Pluto Gas Project	2005/2258	Controlled Action	Completed
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval
Not controlled action			

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Drilling of an exploration well Gats-1 in Permit Area WA-261-P	2004/1701	Not Controlled Action	Completed
Exploration of appraisal wells	2006/3065	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Telstra North Rankin Spur Fibre Optic Cable	2016/7836	Not Controlled Action	Completed
To construct and operate an offshore submarine fibre optic cable, WA	2014/7373	Not Controlled Action	Completed
Wheatstone 3D seismic survey, 70km north of Barrow Island	2004/1761	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
"Leanne" offshore 3D seismic exploration, WA-356-P	2005/1938	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2005/2146	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA	2013/6862	Not Controlled Action (Particular Manner)	Post-Approval
Aperio 3D Marine Seismic Survey, WA	2012/6648	Not Controlled Action (Particular Manner)	Post-Approval
Balnaves Condensate Field Development	2011/6188	Not Controlled Action (Particular Manner)	Post-Approval
Cable Seismic Exploration Permit areas WA-323-P and WA-330-P	2008/4227	Not Controlled Action (Particular Manner)	Post-Approval
CGGVERITAS 2010 2D Seismic Survey	2010/5714	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Demeter 3D Seismic Survey, off Dampier, WA	2002/900	Not Controlled Action (Particular Manner)	Post-Approval
Harmony 3D Marine Seismic Survey	2012/6699	Not Controlled Action (Particular Manner)	Post-Approval
Julimar Brunello Gas Development Project	2011/5936	Not Controlled Action (Particular Manner)	Post-Approval
Moosehead 2D seismic survey within permit WA-192-P	2005/2167	Not Controlled Action (Particular Manner)	Post-Approval
Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA	2007/3917	Not Controlled Action (Particular Manner)	Post-Approval
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
Scarborough Development nearshore component, NWS, WA	2018/8362	Not Controlled Action (Particular Manner)	Post-Approval
Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA	2013/7080	Not Controlled Action (Particular Manner)	Post-Approval
Stag Off-bottom Cable Seismic Survey	2007/3696	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Undertake a 3D marine seismic survey	2010/5695	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone 3D MAZ Marine Seismic Survey	2011/6058	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2007/3941	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2008/4134	Not Controlled Action (Particular Manner)	Post-Approval

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Continental Slope Demersal Fish Communities	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur

Scientific Name	Behaviour	Presence
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Migration	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 20-Feb-2024

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	2
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	3
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	53
Listed Migratory Species:	62

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	1
Commonwealth Heritage Places:	2
Listed Marine Species:	103
Whales and Other Cetaceans:	32
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	9
Habitat Critical to the Survival of Marine Turtles:	4

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	24
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	190
Key Ecological Features (Marine):	6
Biologically Important Areas:	37
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties		[Resource Information]
Name	State	Legal Status
The Ningaloo Coast	WA	Declared property

National Heritage Places		[Resource Information]
Name	State	Legal Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place
Natural		
The Ningaloo Coast	WA	Listed place

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	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

Scientific Name	Threatened Category	Presence Text
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Malurus leucopterus edouardi White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
[Phaethon rubricauda westralis](#) Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat known to occur within area
[Pterodroma mollis](#) Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
[Sternula nereis nereis](#) Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
[Thalassarche carteri](#) Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area
FISH		
[Milyeringa veritas](#) Cape Range Cave Gudgeon, 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
[Thunnus maccoyii](#) Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Bettongia lesueur Barrow and Boodie Islands subspecies Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Translocated population known to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isoodon auratus barrowensis Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes hirsutus Central Australian subspecies Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Translocated population known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Osphranter robustus isabellinus Barrow Island Wallaroo, Barrow Island Euro [89262]	Vulnerable	Species or species habitat likely to occur within area
Petrogale lateralis lateralis Black-flanked Rock-wallaby, Moororong, Black-footed Rock Wallaby [66647]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Rhinonicteris aurantia (Pilbara form)		
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
REPTILE		
Aipysurus apraefrontalis		
Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama		
Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus zastictus		
Hamelin Ctenotus [25570]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni		
Pilbara Olive Python [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARK		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
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
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis		
Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations)		
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Vulnerable	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

Scientific Name	Threatened Category	Presence Text
[Calidris melanotos](#) Pectoral Sandpiper [858]		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 veredus](#) Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
[Glareola maldivarum](#) Oriental Pratincole [840]		Species or species habitat may occur within area
[Limnodromus semipalmatus](#) Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
[Pandion haliaetus](#) Osprey [952]		Breeding known to occur within area
[Thalasseus bergii](#) Greater Crested Tern [83000]		Breeding known to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [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.

Commonwealth Land Name	State
Unknown	
Commonwealth Land - [52236]	WA

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Learmonth Air Weapons Range Facility	WA	Listed place
Ningaloo Marine Area - Commonwealth Waters	WA	Listed place

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica as Puffinus pacificus		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Bubulcus ibis as Ardea ibis		
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine 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 overfly marine area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
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 overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat known to occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
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 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

Scientific Name	Threatened Category	Presence Text
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptile		
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Aipysurus duboisii Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area
Aipysurus mosaicus as Aipysurus eydouxii Mosaic Sea Snake [87261]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area
Hydrophis platurus as Pelamis platurus Yellow-bellied Sea Snake [93517]		Species or species habitat may occur within area
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area

Current Scientific Name	Status	Type of Presence
Sousa sahulensis Australian Humpback Dolphin [87942]		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]
Park Name	Zone & IUCN Categories
Dampier	Habitat Protection Zone (IUCN IV)
Gascoyne	Habitat Protection Zone (IUCN IV)
Argo-Rowley Terrace	Multiple Use Zone (IUCN VI)

Park Name	Zone & IUCN Categories
Dampier	Multiple Use Zone (IUCN VI)
Gascoyne	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Dampier	National Park Zone (IUCN II)
Gascoyne	National Park Zone (IUCN II)
Ningaloo	Recreational Use Zone (IUCN IV)

Habitat Critical to the Survival of Marine Turtles		
Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus		
Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas		
Green Turtle [1765]	Nesting	Known to occur
Nov-Feb		
Caretta caretta		
Loggerhead Turtle [1763]	Nesting	Known to occur
Nov - May		
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Barrow Island	Nature Reserve	WA
Barrow Island	Marine Management Area	WA
Barrow Island	Marine Park	WA
Bessieres Island	Nature Reserve	WA
Boodie, Double Middle Islands	Nature Reserve	WA
Cape Range	National Park	WA

Protected Area Name	Reserve Type	State
Jurabi Coastal Park	5(1)(h) Reserve	WA
Montebello Islands	Conservation Park	WA
Montebello Islands	Conservation Park	WA
Montebello Islands	Marine Park	WA
Muiron Islands	Nature Reserve	WA
Muiron Islands	Marine Management Area	WA
Murujuga	National Park	WA
Ningaloo	Marine Park	WA
Round Island	Nature Reserve	WA
Serrurier Island	Nature Reserve	WA
Unnamed WA36907	5(1)(h) Reserve	WA
Unnamed WA36909	5(1)(h) Reserve	WA
Unnamed WA36910	5(1)(h) Reserve	WA
Unnamed WA36915	Nature Reserve	WA
Unnamed WA40828	5(1)(h) Reserve	WA
Unnamed WA40877	5(1)(h) Reserve	WA
Unnamed WA41080	5(1)(h) Reserve	WA
Unnamed WA44665	5(1)(h) Reserve	WA

Nationally Important Wetlands

[Resource Information]

Wetland Name	State
Cape Range Subterranean Waterways	WA

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Browse to North West Shelf Development, Indian Ocean, WA	2018/8319		Approval
Gorgon Gas Development	2003/1294		Post-Approval
North West Shelf Project Extension, Carnarvon Basin, WA	2018/8335		Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Project Highclere Cable Lay and Operation	2022/09203		Completed
Action clearly unacceptable			
Highlands 3D Marine Seismic Survey	2012/6680	Action Clearly Unacceptable	Completed
Controlled action			
'Van Gogh' Petroleum Field Development	2007/3213	Controlled Action	Post-Approval
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston	2008/4469	Controlled Action	Post-Approval
Develop Jansz-Io deepwater gas field in Permit Areas WA-18-R, WA-25-R and WA-26-	2005/2184	Controlled Action	Post-Approval
Development of Angel gas and condensate field, North West Shelf	2004/1805	Controlled Action	Post-Approval
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed
Development of Coniston/Novara fields within the Exmouth Sub-basin	2011/5995	Controlled Action	Post-Approval
Development of Stybarrow petroleum field incl drilling and facility installation	2004/1469	Controlled Action	Post-Approval
Echo-Yodel Production Wells	2000/11	Controlled Action	Post-Approval
Enfield full field development	2001/257	Controlled Action	Post-Approval
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Eramurra Industrial Salt Project	2021/9027	Controlled Action	Assessment Approach
Eramurra Industrial Salt Project, near Karratha, WA	2019/8448	Controlled Action	Completed
Gorgon Gas Development 4th Train Proposal	2011/5942	Controlled Action	Post-Approval
Greater Enfield (Vincent) Development	2005/2110	Controlled Action	Post-Approval
Light Crude Oil Production	2001/365	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Perdaman Urea Project, near Karratha, WA	2018/8383	Controlled Action	Post-Approval
Pluto Gas Project	2005/2258	Controlled Action	Completed
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval
Pyrenees Oil Fields Development	2005/2034	Controlled Action	Post-Approval
The Scarborough Project - FLNG & assoc subsea infrastructure, Carnarvon Basin	2013/6811	Controlled Action	Post-Approval
Vincent Appraisal Well	2000/22	Controlled Action	Post-Approval
Not controlled action			
'Goodwyn A' Low Pressure Train Project	2003/914	Not Controlled Action	Completed
'Van Gogh' Oil Appraisal Drilling Program, Exploration Permit Area WA-155-P(1)	2006/3148	Not Controlled Action	Completed
Bollinger 2D Seismic Survey 200km North of North West Cape WA	2004/1868	Not Controlled Action	Completed
Bultaco-2, Laverda-2, Laverda-3 and Montesa-2 Appraisal Wells	2000/103	Not Controlled Action	Completed
Carnarvon 3D Marine Seismic Survey	2004/1890	Not Controlled Action	Completed
Cazadores 2D seismic survey	2004/1720	Not Controlled Action	Completed
Construction and operation of an unmanned sea platform and connecting pipeline to Varanus Island for	2004/1703	Not Controlled Action	Completed
Controlled Source Electromagnetic Survey	2007/3262	Not Controlled Action	Completed
Development of Halyard Field off the west coast of WA	2010/5611	Not Controlled Action	Completed
Development of Mutineer and Exeter petroleum fields for oil production, Permit	2003/1033	Not Controlled Action	Completed
Drilling of an exploration well Gats-1 in Permit Area WA-261-P	2004/1701	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Eagle-1 Exploration Drilling, North West Shelf, WA	2019/8578	Not Controlled Action	Completed
Echo A Development WA-23-L, WA-24-L	2005/2042	Not Controlled Action	Completed
Exploration drilling well WA-155-P(1)	2003/971	Not Controlled Action	Completed
Exploration of appraisal wells	2006/3065	Not Controlled Action	Completed
Exploration Well in Permit Area WA-155-P(1)	2002/759	Not Controlled Action	Completed
Exploratory drilling in permit area WA-225-P	2001/490	Not Controlled Action	Completed
HCA05X Macedon Experimental Survey	2004/1926	Not Controlled Action	Completed
Hess Exploration Drilling Programme	2007/3566	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Infill Production Well (Griffin-9)	2001/417	Not Controlled Action	Completed
Jansz-2 and 3 Appraisal Wells	2002/754	Not Controlled Action	Completed
Klammer 2D Seismic Survey	2002/868	Not Controlled Action	Completed
Maia-Gaea Exploration wells	2000/17	Not Controlled Action	Completed
Manaslu - 1 and Huascaran - 1 Offshore Exploration Wells	2001/235	Not Controlled Action	Completed
Montesa-1 and Bultaco-1 Exploration Wells	2000/102	Not Controlled Action	Completed
Murujuga archaeological excavation, collection and sampling, Dampier Archipelago, WA	2014/7160	Not Controlled Action	Completed
North Rankin B gas compression facility	2005/2500	Not Controlled Action	Completed
Pipeline System Modifications Project	2000/3	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Port Expansion and Dredging	2003/1265	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Searipple gas and condensate field development	2000/89	Not Controlled Action	Completed
Spool Base Facility	2001/263	Not Controlled Action	Completed
Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline	2005/2033	Not Controlled Action	Completed
sub-sea tieback of Perseus field wells	2004/1326	Not Controlled Action	Completed
Telstra North Rankin Spur Fibre Optic Cable	2016/7836	Not Controlled Action	Completed
Thevenard Island Retirement Project	2015/7423	Not Controlled Action	Completed
To construct and operate an offshore submarine fibre optic cable, WA	2014/7373	Not Controlled Action	Completed
WA-295-P Kerr-McGee Exploration Wells	2001/152	Not Controlled Action	Completed
Wanda Offshore Research Project, 80 km north-east of Exmouth, WA	2018/8293	Not Controlled Action	Completed
Western Flank Gas Development	2005/2464	Not Controlled Action	Completed
Wheatstone 3D seismic survey, 70km north of Barrow Island	2004/1761	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Kate' 3D marine seismic survey, exploration permits WA-320-P and WA-345-P, 60km	2005/2037	Not Controlled Action (Particular Manner)	Post-Approval
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
"Leanne" offshore 3D seismic exploration, WA-356-P	2005/1938	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
2D and 3D seismic surveys	2005/2151	Not Controlled Action (Particular Manner)	Post-Approval
2D marine seismic survey	2012/6296	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey	2008/4493	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2005/2146	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey Permit Area WA-352-P	2008/4628	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey within permit WA-291	2007/3265	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey	2008/4281	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey (WA-482-P, WA-363-P), WA	2013/6761	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P	2003/1271	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA	2013/6862	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey over petroleum title WA-268-P	2007/3458	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Surveys - Contos CT-13 & Supertubes CT-13, offshore WA	2013/6901	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
3D seismic survey	2006/2715	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey, WA	2008/4428	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey in the Carnarvon Bsin on the North West Shelf	2002/778	Not Controlled Action (Particular Manner)	Post-Approval
3D sesmic survey	2006/2781	Not Controlled Action (Particular Manner)	Post-Approval
Acheron Non-Exclusive 2D Seismic Survey	2008/4565	Not Controlled Action (Particular Manner)	Post-Approval
Acheron Non-Exclusive 2D Seismic Survey	2009/4968	Not Controlled Action (Particular Manner)	Post-Approval
Agrippina 3D Seismic Marine Survey	2009/5212	Not Controlled Action (Particular Manner)	Post-Approval
Apache Northwest Shelf Van Gogh Field Appraisal Drilling Program	2007/3495	Not Controlled Action (Particular Manner)	Post-Approval
Aperio 3D Marine Seismic Survey, WA	2012/6648	Not Controlled Action (Particular Manner)	Post-Approval
Artemis-1 Drilling Program (WA-360-P)	2010/5432	Not Controlled Action (Particular Manner)	Post-Approval
Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA	2013/7081	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Balnaves Condensate Field Development	2011/6188	Not Controlled Action (Particular Manner)	Post-Approval
Bonaventure 3D seismic survey	2006/2514	Not Controlled Action (Particular Manner)	Post-Approval
Cable Seismic Exploration Permit areas WA-323-P and WA-330-P	2008/4227	Not Controlled Action (Particular Manner)	Post-Approval
CGGVERITAS 2010 2D Seismic Survey	2010/5714	Not Controlled Action (Particular Manner)	Post-Approval
Charon 3D Marine Seismic Survey	2007/3477	Not Controlled Action (Particular Manner)	Post-Approval
Coverack Marine Seismic Survey	2001/399	Not Controlled Action (Particular Manner)	Post-Approval
Cue Seismic Survey within WA-359-P, WA-361-P and WA-360-P	2007/3647	Not Controlled Action (Particular Manner)	Post-Approval
CVG 3D Marine Seismic Survey	2012/6654	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval
Decommissioning of the Legendre facilities	2010/5681	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Drilling Program	2010/5532	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Demeter 3D Seismic Survey, off Dampier, WA	2002/900	Not Controlled Action (Particular Manner)	Post-Approval
Diesel Fuel Bunker Operation	2012/6289	Not Controlled Action (Particular Manner)	Post-Approval
Draeck 3D Marine Seismic Survey, WA-205-P	2006/3067	Not Controlled Action (Particular Manner)	Post-Approval
Drilling 35-40 offshore exploration wells in deep water	2008/4461	Not Controlled Action (Particular Manner)	Post-Approval
Eendracht Multi-Client 3D Marine Seismic Survey	2009/4749	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M3 & Vincent 4D Marine Seismic Surveys	2008/3981	Not Controlled Action (Particular Manner)	Completed
Enfield M3 4D, Vincent 4D & 4D Line Test Marine Seismic Surveys	2008/4122	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M4 4D Marine Seismic Survey	2008/4558	Not Controlled Action (Particular Manner)	Post-Approval
Enfield oilfield 3D Seismic Survey	2006/3132	Not Controlled Action (Particular Manner)	Post-Approval
Exmouth West 2D Marine Seismic Survey	2008/4132	Not Controlled Action (Particular Manner)	Post-Approval
Exploration drilling of Zeus-1 well	2008/4351	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Fletcher-Finucane Development, WA26-L and WA191-P	2011/6123	Not Controlled Action (Particular Manner)	Post-Approval
Foxhound 3D Non-Exclusive Marine Seismic Survey	2009/4703	Not Controlled Action (Particular Manner)	Post-Approval
Gazelle 3D Marine Seismic Survey in WA-399-P and WA-42-L	2010/5570	Not Controlled Action (Particular Manner)	Post-Approval
Geco Eagle 3D Marine Seismic Survey	2008/3958	Not Controlled Action (Particular Manner)	Post-Approval
Glencoe 3D Marine Seismic Survey WA-390-P	2007/3684	Not Controlled Action (Particular Manner)	Post-Approval
Greater Western Flank Phase 1 gas Development	2011/5980	Not Controlled Action (Particular Manner)	Post-Approval
Grimalkin 3D Seismic Survey	2008/4523	Not Controlled Action (Particular Manner)	Post-Approval
Guacamole 2D Marine Seismic Survey	2008/4381	Not Controlled Action (Particular Manner)	Post-Approval
Harmony 3D Marine Seismic Survey	2012/6699	Not Controlled Action (Particular Manner)	Post-Approval
Harpy 1 exploration well	2001/183	Not Controlled Action (Particular Manner)	Post-Approval
Honeycombs MC3D Marine Seismic Survey	2012/6368	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA	2013/7003	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA	2013/7093	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
John Ross & Rosella Off Bottom Cable Seismic Exploration Program	2008/3966	Not Controlled Action (Particular Manner)	Post-Approval
Judo Marine 3D Seismic Survey within and adjacent to WA-412-P	2009/4801	Not Controlled Action (Particular Manner)	Post-Approval
Judo Marine 3D Seismic Survey within and adjacent to WA-412-P	2008/4630	Not Controlled Action (Particular Manner)	Post-Approval
Julimar Brunello Gas Development Project	2011/5936	Not Controlled Action (Particular Manner)	Post-Approval
Klimt 2D Marine Seismic Survey	2007/3856	Not Controlled Action (Particular Manner)	Post-Approval
Laverda 3D Marine Seismic Survey and Vincent M1 4D Marine Seismic Survey	2010/5415	Not Controlled Action (Particular Manner)	Post-Approval
Leopard 2D marine seismic survey	2005/2290	Not Controlled Action (Particular Manner)	Post-Approval
Lion 2D Marine Seismic Survey	2007/3777	Not Controlled Action (Particular Manner)	Post-Approval
Macedon Gas Field Development	2008/4605	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Marine reconnaissance survey	2008/4466	Not Controlled Action (Particular Manner)	Post-Approval
Moosehead 2D seismic survey within permit WA-192-P	2005/2167	Not Controlled Action (Particular Manner)	Post-Approval
Munmorah 2D seismic survey within permits WA-308/9-P	2003/970	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Program, WA-264-P	2007/3844	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Survey	2005/2017	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Canning Multi Client 2D Marine Seismic Survey	2010/5393	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Drilling Campaign	2011/5830	Not Controlled Action (Particular Manner)	Post-Approval
Orcus 3D Marine Seismic Survey in WA-450-P	2010/5723	Not Controlled Action (Particular Manner)	Post-Approval
Osprey and Dionysus Marine Seismic Survey	2011/6215	Not Controlled Action (Particular Manner)	Post-Approval
Palta-1 exploration well in Petroleum Permit Area WA-384-P	2011/5871	Not Controlled Action (Particular Manner)	Post-Approval
Pomodoro 3D Marine Seismic Survey in WA-426-P and WA-427-P	2010/5472	Not Controlled Action (Particular Manner)	Post-Approval
Pyrenees 4D Marine Seismic Monitor Survey, HCA12A	2012/6579	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Pyrenees-Macedon 3D marine seismic survey	2005/2325	Not Controlled Action (Particular Manner)	Post-Approval
Quiberon 2D Seismic Survey, permit area WA-385P, offshore of Carnarvon	2009/5077	Not Controlled Action (Particular Manner)	Post-Approval
Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA	2007/3917	Not Controlled Action (Particular Manner)	Post-Approval
Repsol 3d & 2D Marine Seismic Survey	2012/6658	Not Controlled Action (Particular Manner)	Post-Approval
Rose 3D Seismic Program	2008/4239	Not Controlled Action (Particular Manner)	Post-Approval
Rydal-1 Petroleum Exploration Well, WA	2012/6522	Not Controlled Action (Particular Manner)	Post-Approval
Salsa 3D Marine Seismic Survey	2010/5629	Not Controlled Action (Particular Manner)	Post-Approval
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
Scarborough Development nearshore component, NWS, WA	2018/8362	Not Controlled Action (Particular Manner)	Post-Approval
Skorpion Marine Seismic Survey WA	2001/416	Not Controlled Action (Particular Manner)	Post-Approval
Sovereign 3D Marine Seismic Survey	2011/5861	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA	2013/7080	Not Controlled Action (Particular Manner)	Post-Approval
Stag Off-bottom Cable Seismic Survey	2007/3696	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow 4D Marine Seismic Survey	2011/5810	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow Baseline 4D marine seismic survey	2008/4530	Not Controlled Action (Particular Manner)	Post-Approval
Tantabiddi Boat Ramp Sand Bypassing	2015/7411	Not Controlled Action (Particular Manner)	Post-Approval
The Dampier Heavy Load Out Facility Berth and Swing Basin Expansion	2012/6271	Not Controlled Action (Particular Manner)	Post-Approval
Tidepole Maz 3D Seismic Survey Campaign	2007/3706	Not Controlled Action (Particular Manner)	Post-Approval
Tortilla 2D Seismic Survey, WA	2011/6110	Not Controlled Action (Particular Manner)	Post-Approval
Triton 3D Marine Seismic Survey, WA-2-R and WA-3-R	2006/2609	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a 3D marine seismic survey	2010/5695	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5715	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5679	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Vincent M1 and Enfield M5 4D Marine Seismic Survey	2010/5720	Not Controlled Action (Particular Manner)	Post-Approval
Warramunga Non-Inclusive 3D Seismic Survey	2008/4553	Not Controlled Action (Particular Manner)	Post-Approval
West Anchor 3D Marine Seismic Survey	2008/4507	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone 3D MAZ Marine Seismic Survey	2011/6058	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2007/3941	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2008/4134	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
3D Seismic Survey	2008/4219	Referral Decision	Completed
Bianchi 3D Marine Seismic Survey, Carnavon Basin, WA	2013/7078	Referral Decision	Completed
CVG 3D Marine Seismic Survey	2012/6270	Referral Decision	Completed
Enfield 4D Marine Seismic Surveys, Production Permit WA-28-L	2005/2370	Referral Decision	Completed
Rose 3D Seismic acquisition survey	2008/4220	Referral Decision	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Referral decision			
Stybarrow Baseline 4D Marine Seismic Survey (Permit Areas WA-255-P, WA-32-L, WA-	2008/4165	Referral Decision	Completed
Two Dimensional Transition Zone Seismic Survey - TP/7 (R1)	2010/5507	Referral Decision	Completed

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Exmouth Plateau	North-west
Glomar Shoals	North-west

Biologically Important Areas

Scientific Name	Behaviour	Presence
Dugong		
Dugong dugon Dugong [28]	Breeding	Known to occur
Dugong dugon Dugong [28]	Calving	Known to occur
Dugong dugon Dugong [28]	Foraging (high density seagrass beds)	Known to occur
Dugong dugon Dugong [28]	Nursing	Known to occur
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur

Scientific Name	Behaviour	Presence
Caretta caretta Loggerhead Turtle [1763]	Nesting	Known to occur
Chelonia mydas Green Turtle [1765]	Aggregation	Known to occur
Chelonia mydas Green Turtle [1765]	Basking	Known to occur
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Mating	Known to occur
Chelonia mydas Green Turtle [1765]	Migration corridor	Known to occur
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Mating	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Migration corridor	Known to occur

Scientific Name	Behaviour	Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur
Natator depressus Flatback Turtle [59257]	Aggregation	Known to occur
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Mating	Known to occur
Natator depressus Flatback Turtle [59257]	Migration corridor	Known to occur
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Rhincodon typus Whale Shark [66680]	Foraging (high density	Known to occur

Scientific Name	Behaviour	Presence
	prey)	
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Migration	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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APPENDIX D: CULTURAL HERITAGE SEARCHES

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

Search Criteria

No Aboriginal Cultural Heritage (ACH) Register in Shapefile - Pluto Operations and Drilling - Petroleum Activities Area. Warning: Search area complex so results may be inaccurate. Contact DPLH for assistance.

Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the *Aboriginal Heritage Act 1972*.

All Aboriginal cultural heritage in Western Australia is protected, whether or not the ACH has been reported or exists on the Register.

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 provide the details to the Department via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form and we will make every effort to rectify it as soon as possible.

Copyright

Coordinates

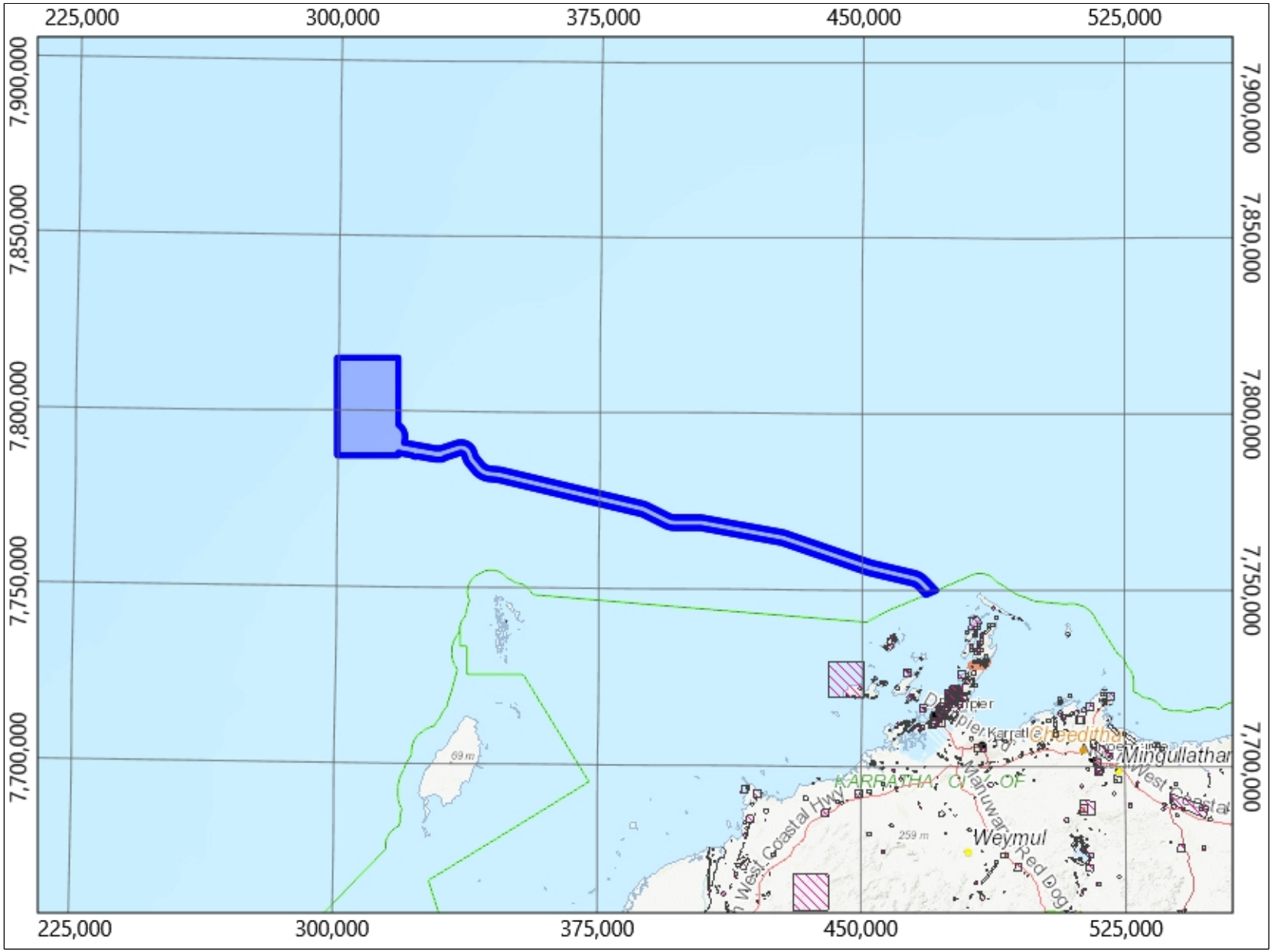
Map coordinates are based on the GDA 94 Datum.

Basemap Copyright

Department of Planning, Lands and Heritage

Aboriginal Cultural Heritage Inquiry System

Map of Aboriginal Cultural Heritage (ACH) Register



Legend

- Aboriginal Cultural Heritage (ACH) Register
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

58.03 kilometres

Map Scale 1 : 1,760,000

MGA Zone 50 (GDA94)

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

Search Criteria

55 Aboriginal Cultural Heritage (ACH) Register in Shapefile - Consultation EMBA

Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the *Aboriginal Heritage Act 1972*.

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Copyright

Terminology

ID: ACH on the Register is assigned a unique ID by the Department of Planning, Lands and Heritage using the format: ACH-00000001. For ACH on the former Register the ID numbers remain unchanged and use the new format. For example the ACH ID of the place Swan River was previously '3536' and is now 'ACH-00003536'.

Access and Restrictions:

- **Boundary Reliable (Yes/No):** Indicates whether to the best knowledge of the Department, the location and extent of the ACH boundary is considered reliable.
- **Boundary Restricted = No:** Represents the actual location of the ACH as understood by the Department..
- **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 ACH 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.
- **Culturally Sensitive = No:** Availability of information that the Department of Planning, Lands and Heritage holds in relation to the ACH is not restricted in any way.
- **Culturally Sensitive = Yes:** Some of the information that the Department of Planning, Lands and Heritage holds in relation to the ACH is restricted if it is considered culturally sensitive information. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the people who provided the information. To request access please contact via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form.
- **Culturally Sensitive Nature:**
  - **No Gender / Initiation Restrictions:** *Anyone* can view the information.
  - **Men only:** Only *males* can view restricted information.
  - **Women only:** Only *females* can view restricted information.

Status:

- **Register:** Aboriginal cultural heritage places that are assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*.
- **Lodged:** Information which has been received in relation to an Aboriginal cultural heritage place, but is yet to be assessed under Section 5 of the *Aboriginal Heritage Act 1972.*
- **Historic:** Aboriginal heritage places assessed as not meeting the criteria of Section 5 of the *Aboriginal Heritage Act 1972*. Includes places that no longer exist as a result of land use activities with existing approvals.

Place Type: The type of Aboriginal cultural heritage place. For example an artefact scatter place or engravings place.
Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

Coordinates

Map coordinates are based on the GDA 94 Datum.

Basemap Copyright

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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.

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Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
919	ENDERBY IS.27: GOODWYN VIEW	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07279
927	ENDERBY IS.16: WHITE BASIN	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07233
933	ENDERBY IS.22: TEREBRALIA	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07239
934	ENDERBY IS.23: GRINDING	No	No	No	No Gender / Initiation Restrictions	Register	Engraving; Grinding areas / Grooves	*Registered Knowledge Holder names available from DPLH	P07240
937	ENDERBY IS.26: NORTH POINT	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden; Quarry	*Registered Knowledge Holder names available from DPLH	P07243
966	ROSEMARY IS.11: CHOOKIE BAY	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07219
967	ROSEMARY IS.12: CHOOKIE BAY	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Quarry	*Registered Knowledge Holder names available from DPLH	P07220
968	ROSEMARY IS.13	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Grinding areas / Grooves; Midden	*Registered Knowledge Holder names available from DPLH	P07221
969	ROSEMARY IS.14	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Grinding areas / Grooves; Midden	*Registered Knowledge Holder names available from DPLH	P07222
970	ROSEMARY IS.15: AIRSTRIP	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Grinding areas / Grooves; Midden	*Registered Knowledge Holder names available from DPLH	P07223
971	ROSEMARY IS.16: AIRSTRIP	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden; Quarry	*Registered Knowledge Holder names available from DPLH	P07224
972	ROSEMARY IS.17: AIRSTRIP	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Quarry	*Registered Knowledge Holder names available from DPLH	P07225
973	ROSEMARY IS.18: DEEP WATER	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07226
974	ROSEMARY IS.19: CHITON	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07227
975	ROSEMARY IS.20: HALFWAY CK	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07228
977	ROSEMARY IS.22	No	No	No	No Gender / Initiation Restrictions	Register	Engraving; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P07230
978	ROSEMARY IS.23: WADJURU R/H	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Engraving; Grinding areas / Grooves; Traditional Structure; Midden; Water Source	*Registered Knowledge Holder names available from DPLH	P07231

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
979	ROSEMARY IS.24: HUNGERFORD	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07232
1112	LEGENDRE 09.	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Shell	*Registered Knowledge Holder names available from DPLH	P07202
1113	LEGENDRE 10.	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Rock Shelter; Shell	*Registered Knowledge Holder names available from DPLH	P07203
6078	ROSEMARY ISLAND 10	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P07019
6079	ENDERBY ISLAND 12	No	Yes	No	No Gender / Initiation Restrictions	Register	Traditional Structure	*Registered Knowledge Holder names available from DPLH	P07020
6080	ENDERBY ISLAND 13	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P07021
6081	ENDERBY ISLAND 14	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P07022
6082	ENDERBY ISLAND 15	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P07023
6185	ENDERBY ISLAND 10: N.	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Camp; Engraving; Midden; Quarry	*Registered Knowledge Holder names available from DPLH	P06918
6186	ENDERBY ISLAND 11: NE.	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Camp; Ritual / Ceremonial; Engraving; Grinding areas / Grooves; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P06919
6227	MALUS ISLAND.	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Camp; Engraving; Grinding areas / Grooves; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P06908
6229	WEST LEWIS ISLAND: NW ARM 1	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Ritual / Ceremonial; Engraving; Grinding areas / Grooves; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P06910
6230	WEST LEWIS ISLAND: NW ARM 2	Yes	Yes	Yes	Men only	Register	Artefacts / Scatter; Ritual / Ceremonial; Engraving; Grinding areas / Grooves; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P06911
6232	WEST LEWIS ISLAND: N	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P06913
6966	ENDERBY ISLAND 08	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P05955
7899	MALUS ISLAND	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	P04947

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
9737	ENDERBY ISLAND 06: BOILER B	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving; Quarry	*Registered Knowledge Holder names available from DPLH	P02449
11328	GAP WELL	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00836
11698	ANGELA COVE	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Engraving	*Registered Knowledge Holder names available from DPLH	P00457
11699	GIDLEY BAY, GIDLEY ISLAND.	No	No	No	No Gender / Initiation Restrictions	Register	Camp; Engraving	*Registered Knowledge Holder names available from DPLH	P00458
11714	GIDLEY ISLAND	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00474
11715	RIM ROCK GORGE.	No	No	No	No Gender / Initiation Restrictions	Register	Camp; Engraving	*Registered Knowledge Holder names available from DPLH	P00475
11729	NGARLUMA POINT, GIDLEY IS.	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P00434
11730	MORS HILL, GIDLEY ISLAND.	No	No	No	No Gender / Initiation Restrictions	Register	Burial; Artefacts / Scatter; Engraving; Shell	*Registered Knowledge Holder names available from DPLH	P00435
11771	ENDERBY ISLAND 05	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00368
11772	ROSEMARY ISLAND 09	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P00369
11773	ROSEMARY ISLAND 08	No	No	No	No Gender / Initiation Restrictions	Register	Engraving; Grinding areas / Grooves; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P00370
11774	ROSEMARY ISLAND 07	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00371
11775	ROSEMARY ISLAND 06	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00372
11776	ROSEMARY ISLAND 04.	No	No	No	No Gender / Initiation Restrictions	Register	Camp; Engraving	*Registered Knowledge Holder names available from DPLH	P00373
11777	ROSEMARY ISLAND 03	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00374
11789	ROSEMARY ISLAND 01	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Engraving; Midden; Quarry	*Registered Knowledge Holder names available from DPLH	P00386
11818	ROSEMARY ISLAND 02	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00362

Aboriginal Cultural Heritage Inquiry System

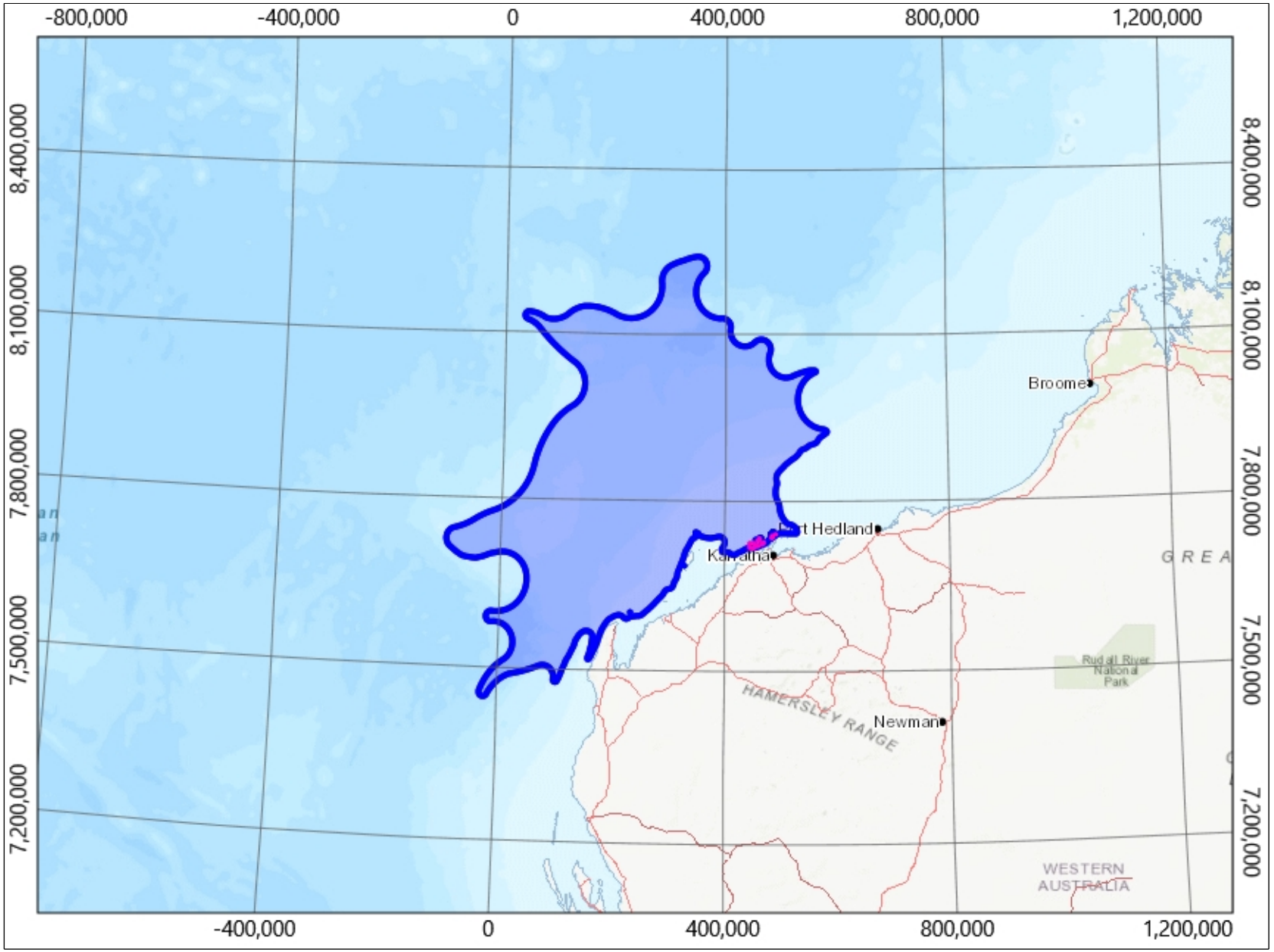
List of Aboriginal Cultural Heritage (ACH) Register

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
11819	ROSEMARY ISLAND 05	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00363
11820	ENDERBY ISLAND 01	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00364
11821	ENDERBY ISLAND 02	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P00365
11823	ENDERBY ISLAND 04	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Engraving; Midden	*Registered Knowledge Holder names available from DPLH	P00367
38533	Cape Bruguieres Channel	No	Yes	No		Register	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	

Department of Planning, Lands and Heritage

Aboriginal Cultural Heritage Inquiry System

Map of Aboriginal Cultural Heritage (ACH) Register



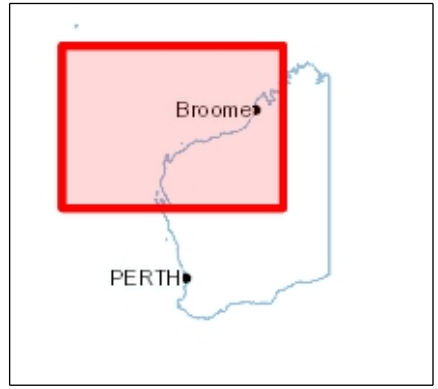
Legend

- Aboriginal Cultural Heritage (ACH) Register
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

363.06 kilometres

Map Scale 1 : 11,000,000

MGA Zone 50 (GDA94)



APPENDIX E: NOPSEMA REPORTING FORMS

NOPSEMA
Australia's offshore energy regulator

FORM

Recordable Environmental Incident Monthly Report

Document No: N-03300-FM0928 A198750

Date: 10/01/2024

Due Date: By the 15th day of the following month.

Send completed form to: submissions@nopsema.gov.au via secure file transfer at https://securefile.nopsema.gov.au/filedrop/submissions

Reference: Regulation 50

Please check the following boxes if applicable to this report **Nil Incident Report:** ☐ **Final report for this activity:** ☐

Titleholder name:		**Titleholder business address:**		**Title of environment plan for the activity:**	
Activity type: (e.g. drilling, seismic, production)		**Month, Year:**		**Facility name and type :** (e.g. MODU, Seismic Vessel, FPSO)	
Contact person:		**Email:**		**Phone:**	
Incident date	**All material facts and circumstances** (including release volumes to environment if applicable)	**Performance outcome(s) and/or standard(s) breached**	**Action taken to avoid or mitigate any adverse environmental impacts of the incident**	**Corrective action taken, or proposed, to stop, control or remedy this incident**	**Action taken, or proposed, to prevent a similar incident occurring in future**

Note 1: As at 28 February 2014, amendments to the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations changed from environmental performance objective to environmental performance outcome. If you are reporting against an EP accepted under the old Regulations please report against the environmental performance objective for that activity.

Note 2: This form may be submitted in conjunction with the 'Injuries and Fatalities – Monthly Summary Report' Form available at www.nopsema.gov.au

Privacy Notice

NOPSEMA collects your contact details for the purpose of administering the OPGGSA and associated regulations. NOPSEMA will not use or disclose your personal information for any other purpose without your consent, unless it is required or authorised by law, or relates to NOPSEMA's enforcement activities. Your personal information may be disclosed to the following organisations, entities or individuals:

- individuals who make a request under the *Freedom of Information Act 1982*
- the Australian National Audit Office and other privately appointed auditors
- NOPSEMA's legal advisors.

NOPSEMA may occasionally be required to disclose information to overseas recipients in order to discharge its functions or exercise its powers, or to perform its necessary business activities. Information about how you can access, or seek correction to, your personal information is contained in NOPSEMA's APP Privacy Policy at www.nopsema.gov.au/privacy. If you have an enquiry or a complaint about your privacy, please contact NOPSEMA's Privacy Contact Officer on 08 6188 8700 or by email at privacy@nopsema.gov.au.

NOPSEMA
Australia's offshore energy regulator

FORM

Report of an accident, dangerous occurrence or environmental incident

Document No: N-03300-FM0831 A159980

Date: 07/09/2023

For instructions and general guidance in the use of this form, please see the last page.

Part 1 is required within 3 days of a notified incident.
Part 2 is required within 30 days of notified incident.

What was the date and time of the initial verbal incident notification to NOPSEMA?			
Date		**Time**	

NOTE: It is a requirement to request permission to interfere with the site of an accident or dangerous occurrence. Refer OPGGS(S)R, Reg. 2.49.

What is the date and time of this written incident report?			
Date		**Time**	

What type of incident is being reported?	*Please tick appropriate incident type*	
Accident or dangerous occurrence		Complete parts 1A, 1B & part 2
Environmental Incident		Complete parts 1A, 1C
BOTH (Accident or dangerous occurrence AND environmental incident)		Complete ALL parts (1A, 1B, 1C, 2)

Please tick all applicable (one or more categories) *To use electronically: MS Word 2007-10 – click in check box*

Categories *Please select one or more*	Accidents	Death or Serious injury Lost time injury ≥3 days	☐ ☐
	Dangerous occurrences	Hydrocarbon release >1 kg or ≥80 L (gas or liquid) Fire or explosion Collision marine vessel and facility Could have caused death, serious injury or LTI Damage to safety-critical equipment Unplanned event – implement ERP Pipeline incident Well kick >50 barrels Other _____	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
	Environmental incidents	Hydrocarbon release Chemical release Drilling fluid/mud release Fauna Incident Other _____	☐ ☐ ☐ ☐ ☐

Part 1A – Information required within 3 days of an accident, dangerous occurrence or environmental incident

General information – all incidents

1.	**Where did the incident occur?**	Facility / field / title name		
		Site name and location *Latitude/longitude*		
2.	**Who is the registered operator/titleholder or other person that controls the works site or activity?**	Name		
		Business address		
		Business phone no.		
3.	**When did the incident occur?**	Time and time zone		
		Date		
4.	**Did anyone witness the incident?**	Yes or No *If yes, provide details below*		
	Witness details	Witness no. 1	Witness no. 2	Witness no. 3
	Full name			
	Phone no. (Business hours)			
	Phone no. (Home) (Mobile)			
	Email (Business) (Private)			
	Postal address			
	NB: If more witnesses, copy and insert this section (4) here, and add extra witness numbers appropriately			
5.	**Details of person submitting this information**	Name		
		Position		
		Email		
		Telephone no.		
6.	**Brief description of incident**			
7.	**Work or activity being undertaken at time of incident**			

Part 1A – Information required within 3 days of an accident, dangerous occurrence or environmental incident

General information – all incidents

8.	**What are the internal investigation arrangements?**					
9.	**Was there any loss of containment of any fluid (liquid or gas)?**	Yes or No *If Yes, provide details below*				
		Type of fluid (liquid or gas) *If hydrocarbon release, please complete item no.15 as well*	Hydrocarbon ☐ *Please specify*_____ Non-hydrocarbon ☐ *Please specify*_____			
		Estimated quantity *Liquid (L), Gas (kg)*				
		Estimation details	Calculation	☐	Measurement	☐
			*Please specify*_____			
		Composition *Percentage and description*				
		Known toxicity to people and/or environment	Toxicity to people			
			Toxicity to environment			
		How was the leak/spill detected?	F&G detection ☐ CCTV ☐		Visual ☐ Other ☐	
		Did ignition occur?	No ☐ Yes ☐		Immediate ☐ Delayed ☐	
			If yes, what was the likely ignition source		Hotwork ☐ Spark electrical source ☐ Spark metallic contact ☐ Hot surface ☐ Other ☐	
10.	**Has the release been stopped and/or contained?**	Yes or No				
		Duration of the release *hh:mm:ss*				
		Estimated rate of release *Litres or kg per hour*				
11.	**Location of release**	What or where is the location of the release?				
		What equipment was involved in the release?				
		Is this functional location listed as safety-critical equipment?				

Part 1A – Information required within 3 days of an accident, dangerous occurrence or environmental incident

General information – all incidents

12.	**Weather conditions** *Please complete as appropriate*	Ambient temperature C°				
		Relative humidity %				
		Wind speed m/s *NB: for enclosed areas use* Air change per hour				
		Wind direction e.g. from SW				
		Significant wave height m				
		Swell m				
		Current speed m/s				
		Current direction e.g. from SW				
13.	**Hydrocarbon release details** *If hydrocarbon fluid (liquid or gas) was released, please complete this section as well*	System of hydrocarbon release	Process ☐ Drilling ☐ Subsea / Pipeline ☐		Utilities ☐ Well related ☐ Marine ☐	
		Estimated inventory in the isolatable system *Litres or kg*				
		System pressure and size of piping or vessel *diameter (d in mm)* *length (l in m)* *or volume (V in L)*	Pressure MPag			
			Size Piping (d) and Piping (l) or Vessel (V)			
		Estimated equivalent hole diameter *d in mm*				

Part 1B - Complete for accidents or dangerous occurrences

Accidents and dangerous occurrences information

	Was NOPSEMA notified through the dedicated notification phone line? *Phone No.* 1300 674 472		Yes	☐	No	☐
15.	**Action taken to make the work-site safe**	Was permission given by a NOPSEMA inspector to interfere with the site? OPGGS(S)R 2.49.	Yes	☐	No	☐
		Action taken				
		Details of any disturbance of the work site				

Part 1B - Complete for accidents or dangerous occurrences

Accidents and dangerous occurrences information

16.	**Was an emergency response initiated?**		Yes	☐	No	☐
		Type of response	Manual Automatic alarm	☐ ☐	Muster Evacuation	☐ ☐
		How effective was the emergency response?				

17.	**Was anyone killed or injured?** *Provide details below*		Yes	☐	No	☐		
	Injured persons (IP)	**Casualty no. 1**						
	If different from item 2. Employer name		Employer address					
	Employer phone no.		Employer email					
	IP full name							
	IP date of birth		Sex	M	☐	F	☐	
	IP residential address							
	IP phone no. (Work)		IP phone no. (Home) (Mobile)					
	IP occupation/job title		Contractor or core crew					
	Details of injury							
	Based on TOOCS (refer last page) Nature of injury	a. Intracranial injury b. Fractures c. Wounds, lacerations, amputations, internal organ damage	☐ ☐ ☐	d. Burn e. Nerve or spinal cord injury f. Joint, ligament, muscle or tendon injury g. Other _____	☐ ☐ ☐ ☐			
	Part of body	G1. Head or face G2. Neck G3. Trunk G4. Shoulder or arm	☐ ☐ ☐ ☐	G5. Hip or leg G6. Multiple locations G7. Internal systems G8. Other _____	☐ ☐ ☐ ☐			
	Mechanism of injury	G0. Falls, stepping, kneeling, sitting on object G1. Hitting object G2. Being hit or trapped	☐ ☐ ☐	G3. Exposure to sound or pressure G4. Muscular stress G5. Heat, cold or radiation G6/7 Chemical, biological substance G8. Other _____	☐ ☐ ☐ ☐ ☐			
	Agency of injury	1. Machinery or fixed plant 2. Mobile plant or transport 3. Powered equipment 4. Non-power equipment	☐ ☐ ☐ ☐	5/6. Chemicals, materials, substances 7. Environmental agencies 8. Human or animal agencies 9. Other _____	☐ ☐ ☐ ☐			

Part 1B - Complete for accidents or dangerous occurrences

Accidents and dangerous occurrences information

	Details of job being undertaken					
	Day and hour of shift	Day *e.g. 5th day of 7 (5 / 7)*		Hour *e.g. 3rd hour of 12 (3 / 12)*		
	NB: If more casualties, please copy/paste this section (19) for each additional casualty and insert here					
18.	**Was there any serious damage?** *Provide details below*			Yes	☐	No ☐
	Details	**Item 1**		**Item 2**		**Item 3**
	Equipment damaged					
	Extent of damage					
19.	**Will the equipment be shut down?** *Yes or No*					
	If yes, for how long?					
	NB: If more equipment seriously damaged, please copy/paste this section as required					
20.	**Will the facility be shut down?**	Yes or No *If yes provide details below*				
	Facility shutdown	Date				dd/mm/yyyy
		Time				24-hour clock
		Duration				days / hours / minutes
21.	**Immediate action taken/intended, if any, to prevent recurrence of incident.**	**Action**		**Responsible party**		**Completion date** *Actual or intended*
22.	**What were the immediate causes of the incident?**					

Attachments

Are you attaching any documents?			Yes or No *If yes, provide details below*	
No.	**ID**	**Revision**	**Date**	**Title/description**

Insert or delete rows as required

Part 1C – Complete for environmental incidents

Environmental Impacts

23.	**What is the current environment plan for this incident?**	Environment plan		
24.	**Has the incident resulted in an impact to the environment?**	Yes or No *If yes, provide details below*		
		Incident details *e.g. estimated area of impact, nature/significance of impact*		
		ENVIRONMENTAL RECEPTORS		
		Open ocean ☐ Shoreline ☐ Population centre ☐ Stakeholders ☐ Other sensitivity ☐ *e.g. conservation area, nesting beach*	Macroalgae ☐ Coral Reef ☐ Benthic invertebrates ☐ Seagrass ☐ Mangrove ☐	
		Further details		

	Details	**Environment 1**	**Environment 2**	**Environment 3**
	Location of receiving environments *Lat/Long*			
	Date & time of impact			
	Action taken to minimise exposure			
	Specify each matter protected under Part 3 of the EPBC Act impacted			

NB: If more environments were damaged, please copy/paste this section (Item E3) and add extra data

25.		Yes or No *If yes, provide details*	

Part 1C – Complete for environmental incidents

Environmental Impacts

	Are any environments at risk? ***Including as a result of spill response measures***	Details *e.g. zone of potential impact*				
		AT RISK ENVIRONMENTS				
		Open ocean	☐	Macroalgae	☐	
		Shoreline	☐	Coral Reef	☐	
		Population Centre	☐	Benthic Invertebrates	☐	
		Stakeholders	☐	Seagrass	☐	
		Other sensitivity *e.g. conservation area, nesting beach*	☐	Mangrove	☐	

	Details	**Environment 1**	**Environment 2**	**Environment 3**
	Estimated location of 'at-risk' environments			
	Estimated impact date & time			
	Action required to minimise exposure			
	Specify each matter protected under Part 3 of the EPBC Act at risk			

NB: If more environments at risk of damage, please copy/paste this section (Item E2) and add extra data

26.	**Was an oil pollution emergency plan activated?**	Yes or No	
		If yes, what action has been implemented /planned?	
		If yes, how effective is/was the spill response?	
27.	**Was an environmental monitoring program initiated?**	Yes or No	
		If yes, what actions have been implemented and/or planned?	

28.	**Did the incident result in the death or injury of any fauna?**	Yes or No (If yes provide details of species in the table below)		
	Injured fauna	**Species 1**	**Species 2**	**Species 3**
	Species name (common or scientific name)			
	Number of individuals killed or injured	Killed: Injured:	Killed: Injured:	Killed: Injured:

NB: If more species were injured or killed, please copy/paste this section (Item E4) and add extra data

29.	**Actions taken to avoid or mitigate any adverse**	**Action**	**Responsible party**	**Completion date** *Actual or intended*

Part 1C – Complete for environmental incidents

Environmental Impacts

	environmental impacts of the incident.			
	NB: If more actions, please add extra rows as required			
30.	**Corrective actions taken, or proposed, to stop, control or remedy the incident.**	**Action**	**Responsible party**	**Completion date** *Actual or intended*
	NB: If more actions, please add extra rows as required			
31.	**Actions taken, or proposed, to prevent a similar incident occurring in the future.**	**Action**	**Responsible party**	**Completion date** *Actual or intended*
	NB: If more actions, please add extra rows as required			

Attachments

Are you attaching any documents?			Yes or No *If yes, provide details below*	
No.	**ID**	**Revision**	**Date**	**Title/Description**
Insert or delete rows as required				

Part 2 – Information required within 30 days of accident or dangerous occurrence

NOPSEMA acknowledges that in many circumstances an operator may not have completed an investigation within 3 days of an accident or first detection of a dangerous occurrence and agrees that these items must be provided within 30 days unless otherwise agreed, in writing with NOPSEMA. In circumstances where an investigation has been completed within 3 days, and these items are available (supplemented, as required by any attachments) this part should also be completed at that time.

32.	**Has the investigation been completed?**	Yes or No	
	Root cause analysis *What were the root causes?*	Root cause 1	
		Root cause 2	
		Root cause 3	
		Other root causes	
	Full report *Describe investigation in detail, including who conducted the investigation and in accordance with what standard/procedure with reference to attachments listed in the 'attachments table' (following) as applicable*		

33.	**Actions to prevent recurrence of same or similar incident**	**Action**	**Responsible party**	**Completion date** *Actual or intended*
	NB: Add or delete rows as appropriate			

Attachments (Insert/delete rows as required)

Are you attaching any documents?			Yes or No *If yes, provide details below*	
No.	**ID**	**Revision**	**Date**	**Title/description**

Instructions and general guidance for use:

1. The use of this form is voluntary and is provided to assist operators and titleholders to comply with their obligations to give notice and provide reports of incidents to NOPSEMA under the applicable legislation.
2. Accidents, dangerous occurrences or environmental incidents can all be reported using this same form.
3. The applicable legislation for incident reporting is:
    a. Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 [OPGGS(S)R]; and
    b. Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 [OPGGS(E)R], for facilities located in Commonwealth waters; or
    c. for facilities located in designated coastal waters, the relevant State or Territory Act and associated Regulations where there is a current conferral of powers to NOPSEMA.
4. In the context of this form an incident is a reportable incident as defined under:
    a. OPGGSA, Schedule 3, Clause 82.
    b. OPGGS(E)R, regulation 4.
5. This form should be used in conjunction with NOPSEMA Guidance Notes available on the NOPSEMA website:
    a. N-03300-GN0099 Notification and Reporting of Accidents and Dangerous Occurrences
    b. N-03300-GN0926 Notification and Reporting of Environmental Incidents
6. Part 1 requires completion for all incidents; then ALSO complete part 2 if the incident is an accident or dangerous occurrence.
7. NOPSEMA considers that a full report will contain copies of documentary material referenced and/or relied on in the course of completing this form, which may include (but not be limited to) as appropriate: witness statements, management system documents, drawings, diagrams and photographs, third party reports (audit, inspection, material analysis etc.), internal records and correspondence.
8. This form is intended to be completed electronically using Microsoft Word by completing the unshaded cells which will expand as required to accept the information required and the check boxes where relevant (NB: check boxes may appear shaded and have reduced functionality in MS Word versions prior to 2010).
9. The completed version of this form (and any attachments, where applicable) should be emailed to:

    submissions@nopsema.gov.au

    or submitted via secure file transfer at: https://securefile.nopsema.gov.au/filedrop/submissions as soon as practicable, but in any case, within three days of the incident.

References

NOPSEMA website: www.nopsema.gov.au

TOOCS – Type of Occurrence Classification System.
The *Type of Occurrence Classification System, Version 3.0* (TOOCS3.0) was developed to improve the quality and consistency of data. This system aligns with the International Classification of Diseases – Australian Modification (ICD10-AM). Type of occurrence classification system (TOOCS) 3rd Edition May 2008 | Safe Work Australia

OPGGS(S)R. Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009. Select Legislative Instrument 2009 No. 382 as amended and made under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006.*Commonwealth of Australia.
OPGGS(E)R. Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009. Statutory Rules 1999 No. 228 as amended and made under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006.* Commonwealth of Australia.

Privacy Notice

NOPSEMA collects your personal information for the purpose of investigating accidents, dangerous occurrences and environmental incidents under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*.

NOPSEMA will not use or disclose your personal information for any other purpose without your consent, unless it is required or authorised by law, or relates to NOPSEMA's enforcement activities. Your personal information may be disclosed to the following organisations, entities or individuals:

- individuals who make a request under the *Freedom of Information Act 1982*
- the Australian National Audit Office and other privately appointed auditors
- other law enforcement bodies (for example, the police or the coroner)
- NOPSEMA's legal advisors.

NOPSEMA may occasionally be required to disclose information to overseas recipients in order to discharge its functions or exercise its powers, or to perform its necessary business activities.

Information about how you can access, or seek correction to, your personal information is contained in NOPSEMA's APP Privacy Policy at www.nopsema.gov.au/privacy. If you have an enquiry or a complaint about your privacy, please contact NOPSEMA's Privacy Contact Officer on (08) 6188 8700 or by email at: privacy@nopsema.gov.au.

APPENDIX F: CONSULTATION

Appendix F

Pluto Facility Operations Environment Plan

- **Consultation Approach**
- **Table 1: Assessment of Relevance**
- **Consultation Activities**
- **Table 2: Consultation Report with Relevant Persons or Organisations**
- **Table 3: Engagement Report with Persons or Organisations Assessed as Not Relevant**
- **Record of Consultation**

Date: July 2024

Revision: 0

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APPENDIX F

CONSULTATION APPROACH

For the Pluto Facility Operations Environment Plan, Woodside has taken a broad and proactive tiered consultation approach over a period of up to 5 months.

This approach was aimed at raising public awareness of the consultation opportunity and enable self-identification. It included a social media campaign and advertising in national, state, regional and Indigenous newspapers.

The tiered consultation approach discharges regulation 25 of the Environment Regulations' requirements. The approach is proactive, extended, has enabled self-identification, and has raised broad awareness of Woodside's activities related to this EP.

Consultation Tiered Approach

Regulation 25	Woodside's consultation approach assessed and identified relevant persons, enabled two-way dialogue and engagement, and included email and phone call follow up. The approach taken satisfies the requirements of regulation 25 to give relevant persons sufficient information and allow a reasonable period of time for consultation (see Section 5 of this EP).
Proactive	To raise awareness of the consultation process, and to enable grass-roots consultation, Woodside undertook advertised regional consultation roadshows and facilitated consultation at regional community events.
Extended	A reasonable consultation period was provided to enable an informed assessment of possible consequences on functions, interests or activities. Consultation with stakeholders extended beyond the initial period as required.
Self-Identification	Broad communication activities were undertaken to build awareness of consultation and enable self-identification, supported by targeted education materials.
Broad Understanding	Broad proactive communication activities were undertaken with the public to raise awareness of Woodside's activities.

Building on the Existing Consultation Approach

For this EP, Woodside has built on its consultation methodology and undertaken additional consultation activities throughout the consultation period to ensure a reasonable period of time and sufficient information has been provided to relevant persons so that they can make an informed assessment of the possible consequences of the activity on their functions, interests or activities.

The approach included:

- A consultation period of up to 5 months
- Undertaking proactive consultation activities to provide sufficient information to relevant persons
- Raising awareness of the consultation process and opportunity to provide feedback
- Driving participation in the consultation process.

An overview of this approach is shown below:

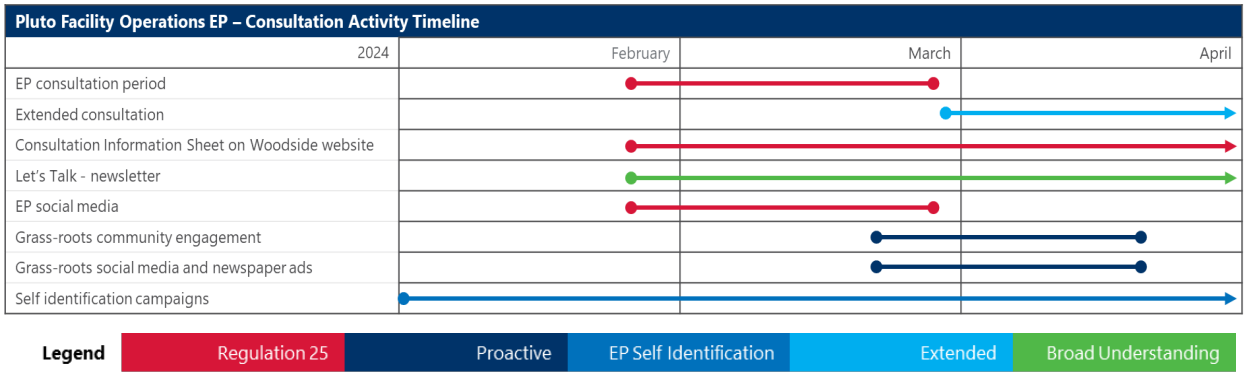

Figure: Pluto Facility Operations Consultation Activity

Traditional Custodian Consultation Approach

Woodside has meaningful long-term relationships with relevant Traditional Custodians specifically tailored to provide for effective engagement which is continuous and is not confined to individual EPs, instead covering all EPs and other issues that are relevant at the time of engagement.

To this end, consultation on any particular EP, including this EP, happens before, during and after the designated consultation period in a more holistic manner allowing for an understanding of the bigger picture and accommodating cultural requirements.

For the past 12 months, where requested, Woodside has been working with nominated representative bodies to develop Consultation Agreement Frameworks which aim to enable each group to be consulted in a manner appropriate to their needs.

NGO Consultation Approach

Woodside has an established history of consulting with environmental non-government organisations (NGOs) as part of its EP consultation. In its methodology **(Section 5.3.4, Table 5-2)**, NGOs are considered "Other non-government groups or organisations" and "Research institutes and local conservation groups or organisations". Relevant person identification for these categories is based on registered non-government groups or organisations with current targeted public website material specific to the proposed activity at the time of developing the EP and who have demonstrated functions, interests or activities relevant to the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation.

So that NGOs were given sufficient information and a reasonable period of time to consult, Woodside:

- Advertised the consultation period (social and traditional media)
- Directly consulted NGOs
- Participated in regional community events (which were advertised) in the Pilbara which could be attended by any NGOs including local groups (if NGOs attended these sessions, they did not identify themselves).

NGO Response

Woodside witnessed a pattern in NGO responses to the consultation process and information provided. Woodside received feedback and request for further information on the last day of

consultation. The delayed responses followed an initial four week consultation period, and generally assert that Woodside has not met regulatory requirements as it has not provided sufficient information or a reasonable period of time for consultation. One further NGO self-identified a month following consultation closing.

RELEVANCY ASSESSMENT

Assessment of Relevant Persons for the Proposed Activity

The result of Woodside's assessment of relevant persons in accordance with regulation 25 (1) of the Environment Regulations is outlined below at **Table 1** and **Table 2**.

Persons or organisations that Woodside assessed as not relevant but nonetheless chose to contact at its discretion in accordance with **Section 5.3.4** in the EP or self-identified and Woodside assessed as not relevant are summarised below at **Table 1** and **Table 3**.

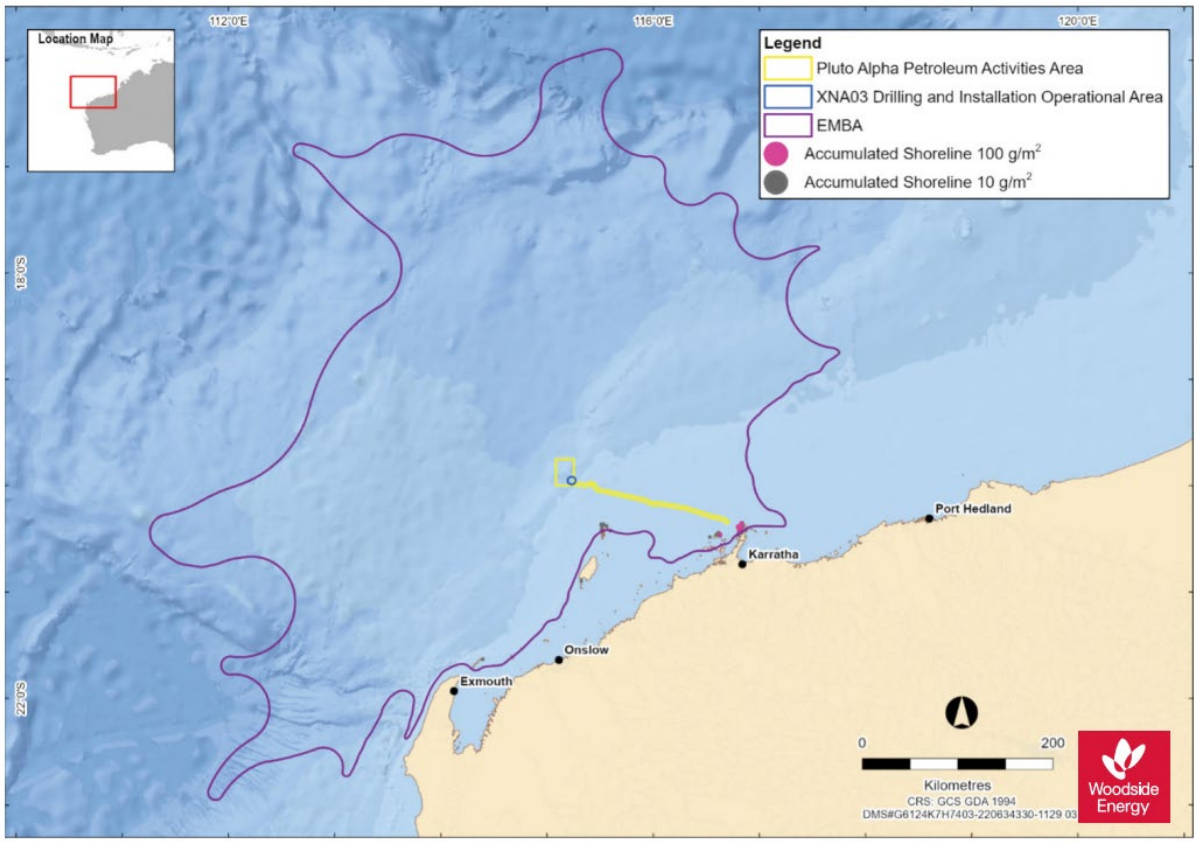

Figure 1: Operational Area and EMBA for this EP

Table 1: Assessment of Relevance

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Commonwealth and WA State Government Departments or Agencies – Marine			
Australian Border Force (ABF)	Responsible for coordinating maritime security	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. ABF's responsibilities may be relevant to the activity as there are proposed vessel activities.	Yes
Australian Communications and Media Authority (ACMA)	Regulator for communications and media	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. ACMA's responsibilities may be relevant to the activity as there may be telecommunications lines that intersect the Operational Area.	Yes
Australian Fisheries Management Authority (AFMA)	Responsible for managing Commonwealth fisheries	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. The North West Slope Trawl Fishery is active in the Operational Area. The North West Slope Trawl Fishery and the Western Deepwater Trawl Fishery are active in the EMBA. AFMA's responsibilities may be relevant to the activity as the North West Slope Trawl Fishery and the Western Deepwater Trawl Fishery are active in the EMBA.	Yes
Australian Hydrographic Office (AHO)	Responsible for maritime safety and Notices to Mariners	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. AHO's responsibilities may be relevant to the activity as there are proposed vessel activities.	Yes
Australian Maritime Safety Authority (AMSA) – Marine Safety	Statutory agency for vessel safety and navigation	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. AMSA – Marine Safety's responsibilities may be relevant to the activity as there are proposed vessel activities.	Yes
Australian Maritime Safety Authority (AMSA) – Marine	Legislated responsibility for oil pollution response in Commonwealth waters	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. AMSA – Marine Pollution's responsibilities may be relevant to the activity as the proposed activity	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Pollution		has a hydrocarbon spill risk which may require AMSA response in Commonwealth waters.	
Department of Agriculture, Fisheries and Forestry (DAFF) – Fisheries	Responsible for implementing Commonwealth policies and programs to support agriculture, fishery, food and forestry industries	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. The North West Slope Trawl Fishery is active in the Operational Area. The North West Slope Trawl Fishery and the Western Deepwater Trawl Fishery are active in the EMBA. DAFF – Fisheries' responsibilities may be relevant to the activity as the North West Slope Trawl Fishery and the Western Deepwater Trawl Fishery are active in the EMBA.	Yes
Department of Defence (DoD)	Responsible for defending Australia and its national interests	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(a) of the Environment Regulations. DoD's responsibilities may be relevant to the activity as defence training areas lie within the EMBA.	Yes
Department of Primary Industries and Regional Development (DPIRD)	Responsible for managing State fisheries	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(b) of the Environment Regulations. The West Australian Sea Cucumber Fishery, Hermit Crab Fishery, Mackerel Managed Fishery (Area 2), Marine Aquarium Fish Managed Fishery, Onslow Prawn Managed Fishery, Pilbara Crab Managed Fishery, Pilbara Fish Trawl Managed Fishery, Pilbara Line Fishery, Specimen Shell Managed Fishery are active in the Operational Area. The Exmouth Gulf Prawn Managed Fishery, West Australian Sea Cucumber Fishery, Hermit Crab Fishery, Mackerel Managed Fishery (Area 2), Marine Aquarium Fish Managed Fishery, Nickol Bay Prawn Managed Fishery, Onslow Prawn Managed Fishery, Pilbara Crab Managed Fishery, Pilbara Fish Trawl Fishery, Specimen Shell Managed Fishery, West Coast Deep Sea Crustacean Managed Fishery have been active in the EMBA within the last 5 years. DPIRD's responsibilities may be relevant to the activity as the government department responsible for State fisheries.	Yes
Department of Transport (DoT)	Legislated responsibility for oil pollution response in State waters	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(b) of the Environment Regulations. The proposed activity has a hydrocarbon spill risk, which may require DoT response in State waters.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Department of Planning, Lands and Heritage (DPLH)	Responsible for state level land use planning and management, and oversight of Aboriginal cultural heritage and built heritage matters	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(b) of the Environment Regulations. There is known Maritime Cultural Heritage overlapping the EMBA.	Yes
Western Australian Museum	Manages 200 shipwreck sites of the 1,500 known to be located off the Western Australian coast	Woodside has applied its methodology for 'Historical cultural heritage groups or organisations' under regulation 25(1)(d) of the Environment Regulations. There is known shipwrecks overlapping the EMBA which the Western Australian Museum may be responsible for.	Yes
Pilbara Ports Authority	Responsible for the operation of the Port of Dampier	Woodside has applied its methodology for 'Government departments / agencies – marine' under regulation 25(1)(b) of the Environment Regulations. The proposed activity has the potential to impact Pilbara Ports Authority's responsibilities as the EMBA overlaps the Pilbara Ports Authority's area of responsibility.	Yes
Commonwealth and WA State Government Departments or Agencies – Environment			
Department of Agriculture, Fisheries and Forestry (DAFF) – Biosecurity (marine pests, vessels, aircraft and personnel)	DAFF administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity has the potential to transfer marine pests. DAFF also has inspection and reporting requirements to ensure that all conveyances (vessels, installations and aircraft) arriving in Australian territory comply with international health regulations and that any	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 25(1)(a) of the Environment Regulations. DAFF – Biosecurity's responsibilities may be relevant to the proposed activities in the EMBA in the prevention of introduced marine species.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
	biosecurity risk is managed. The Dept 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.		
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Responsible for implementing Commonwealth policies and programs to support climate change, sustainable energy use, water resources, the environment and our heritage. Administers the *Underwater Cultural Heritage Act 2018* in collaboration with the States, Northern Territory and Norfolk Island, which is responsible for the protection of shipwrecks, sunken aircraft and other types of underwater heritage and their associated artefacts in Commonwealth waters.	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 25(1)(a) of the Environment Regulations. DCCEEW's responsibilities may be relevant to the proposed activities in the EMBA as there are potential environmental impacts from the proposed activity. There is known Maritime Cultural Heritage overlapping the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Director of National Parks (DNP)	Responsible for the management of Commonwealth parks and conservation zones.	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 25(1)(a) of the Environment Regulations. DNP's responsibilities may be relevant to the activity as DNP requires an awareness of activities that occur within AMPs, and an understanding of potential impacts and risks to the values of parks (NOPSEMA guidance note: N-04750-GN1785 A620236, June 2020). Titleholders are required to consult DNP on offshore petroleum and greenhouse gas exploration activities if they occur in, or may impact on the values of marine parks, including where potential spill response activities may occur in the event of a spill (i.e. scientific monitoring).	Yes
Ningaloo Coast World Heritage Advisory Committee (NCWHAC)	Supports the DBCA to manage the Ningaloo Coast World Heritage Area.	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 25(1)(a) of the Environment Regulations. The NCWHAC's responsibilities may be relevant to the activity as the EMBA overlaps the Ningaloo Marine Park.	Yes
Department of Biodiversity, Conservation and Attractions (DBCA)	Responsible for managing WA's parks, forests and reserves to achieve wildlife conservation and provide sustainable recreation and tourism opportunities.	Woodside has applied its methodology for 'Government departments / agencies – environment' under regulation 25(1)(b) of the Environment Regulations. The DBCA's responsibilities may be relevant to the activity as EMBA overlaps WA parks, forests or reserves. Activities have the potential to impact marine tourism in the EMBA.	Yes
Commonwealth and State Government Departments or Agencies – Industry			
Department of Industry, Science and Resources (DISR)	Department of relevant Commonwealth Minister.	Required to be consulted under regulation 25(1)(a) of the Environment Regulations.	Yes
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	Department of relevant State Minister.	Required to be consulted under regulation 25(1)(c) of the Environment Regulations.	Yes
Commonwealth Commercial fisheries and representative bodies			
North West Slope Trawl Fishery	Commonwealth commercial fishery.	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years.	
Southern Bluefin Tuna Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area and EMBA, it has not been active in the Operational Area or EMBA within the last 5 years. Woodside does not consider that the proposed activity will present a risk to licence holders, given since 1992, the majority of Australian catch has concentrated in south-eastern Australia. (Patterson et al., 2022). In addition, given fishing methods by licence holders for species fished in this fishery (Australia has a 35% share of total global allowable catch of Southern Bluefin Tuna, which is value-added through tuna ranching near Port Lincoln (South Australia), or fishing effort in New South Wales (Australian Southern Bluefin Tuna Industry Association).	No
Western Deepwater Trawl Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery does not overlap the Operational Area. The fishery overlaps EMBA and has been active in the EMBA within the last 5 years.	Yes
Western Skipjack Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area and EMBA, it has not been active in the Operational Area or EMBA within the last 5 years. Woodside does not consider that the activity will present a risk to licence holders, given the fishery spans the Australian Fishing Zone west of Victoria and the Torres Strait. The Fishery is not currently active and no fishing has occurred since 2009 (Patterson et al., 2022). In addition, interactions are not expected given the species' pelagic distribution fishing methods for species fished by licence holders.	No
Western Tuna and Billfish Fishery	Commonwealth commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area and EMBA, it has not been active in the Operational Area or EMBA within the last 5 years.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Commonwealth Fisheries Association (CFA)	Represents the interests of commercial fishers with licences in Commonwealth waters	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The North West Slope Trawl Fishery is active in the Operational Area. The North West Slope Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA. CFA's functions may be relevant to the activity as the North West Slope Trawl Fishery is active in the Operational Area and the North West Slope Trawl Fishery and Western Deepwater Trawl Fishery are active in the EMBA.	Yes
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	Represents the interests of the Southern Bluefin Tuna Fishery and Western Skipjack Fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The Southern Bluefin Tuna Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Southern Bluefin Tuna Fishery, the ASBTIA has also been assessed as not relevant. The Southern Bluefin Tuna Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Southern Bluefin Tuna Fishery, the ASBTIA has also been assessed as not relevant. Woodside has provided information to the ASBTIA at its discretion in line with Section 5.3.4 on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.	No
Tuna Australia	Represents the interests of the Western Tuna and Billfish Fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The Western Tuna and Billfish Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Western Tuna and Billfish Fishery, Tuna Australia has also been assessed as not relevant. The Western Tuna and Billfish Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Western Tuna and Billfish Fishery, Tuna Australia has also been assessed as not relevant. Woodside has provided information to Tuna Australia at its discretion in line with Section 5.3.4 on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Pearl Producers Association (PPA)	Peak representative organisation of The Australian South Sea Pearling Industry, with members in Western Australia and the Northern Territory	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The Pearl Oyster Managed Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the Pearl Oyster Managed Fishery, the PPA has also been assessed as not relevant.	No
State Commercial fisheries and representative bodies			
Marine Aquarium Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. While Woodside assessed the fishery as relevant in the Operational Area, WAFIC has advised there is no need to consult this fishery given the proposed activities operate in depths~180-850m which is outside the depth of the hand collection and diving methods used by this fishery. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	No
South West Coast Salmon Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years. Woodside does not consider that the activity will present a risk to licence holders, given fishers are active south of Perth and from the beach (previous WAFIC advice). Further, no fishing occurs north of the Perth Metropolitan Area and therefore, no effort occurs within the Operational Area or EMBA.	No
Mackerel Managed Fishery (Area 2)	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Woodside acknowledges WAFIC's consultation guidance and has applied this by consulting, via WAFIC, fisheries that are assessed as having a potential for interaction in the Operational Area. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	
Pilbara Crab Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. Woodside acknowledges WAFIC's consultation guidance and has applied this by consulting, via WAFIC, fisheries that are assessed as having a potential for interaction in the Operational Area. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	Yes
West Coast Deep Sea Crustacean Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area, it has not been active in the Operational Area within the last 5 years. The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years. While Woodside assessed the fishery as relevant in the EMBA, WAFIC has advised there is no need to consult this fishery given the proposed activities. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	No
Specimen Shell Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		While Woodside assessed the fishery as relevant in the EMBA, WAFIC has advised there is no need to consult this fishery given the proposed activities. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	
Abalone Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years.	No
Pearl Oyster Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years.	No
Land Hermit Crab Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. While Woodside assessed the fishery as relevant in the Operational Area and EMBA, WAFIC has advised there is no need to consult this fishery given the proposed activities. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	No
Onslow Prawn Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. Woodside acknowledges WAFIC's consultation guidance and has applied this by consulting, via WAFIC, fisheries that are assessed as having a potential for interaction in the Operational Area.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	
Western Australian Sea Cucumber Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. While Woodside assessed the fishery as relevant in the Operational Area and EMBA, WAFIC has advised there is no need to consult this fishery given the proposed activities. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	No
Exmouth Gulf Prawn Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery does not overlap the Operational Area. The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years. While Woodside assessed the fishery as relevant in the EMBA, WAFIC has advised there is no need to consult this fishery given the proposed activities. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	No
Gascoyne Demersal Scalefish Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery does not overlap the Operational Area and EMBA.	No
West Coast Demersal Scalefish Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery does not overlap the Operational Area and EMBA.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
West Coast Rock Lobster Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery does not overlap the Operational Area. Although the fishery overlaps the EMBA, the fishery has not been active in the EMBA within the last 5 years. Woodside does not consider that the activity will present a risk to licence holders, given fishers are active south of Perth and from the beach (previous WAFIC advice). Further, no fishing occurs north of the Perth Metropolitan Area and therefore, no effort occurs within the Operational Area or EMBA.	No
Nickol Bay Prawn Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery does not overlap the Operational Area. The fishery overlaps the EMBA and has been active in the EMBA within the last 5 years. While Woodside assessed the fishery as relevant in the EMBA, WAFIC has advised there is no need to consult this fishery given the proposed activities. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	No
Exmouth Gulf Beach Seine and Mesh Net Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery does not overlap the Operational Area and EMBA.	No
WA North Coast Shark Managed Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. Although the fishery overlaps the Operational Area and EMBA, the fishery has not been active in the Operational Area or EMBA within the last 5 years. Woodside does not consider that the activity will present a risk to licence holders, given fishers are active south of Perth and from the beach (previous WAFIC advice). Further, no fishing occurs north of the Perth Metropolitan Area and therefore, no effort occurs within the Operational Area or EMBA.	No

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Demersal Scalefish Fishery: Pilbara Trawl Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. Woodside acknowledges WAFIC's consultation guidance and has applied this by consulting, via WAFIC, fisheries that are assessed as having a potential for interaction in the Operational Area. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	Yes
Pilbara Trap Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. While Woodside assessed the fishery as relevant in the Operational Area and EMBA, WAFIC has advised there is no need to consult this fishery given the proposed activities. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	No
Pilbara Line Fishery	State commercial fishery	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The fishery overlaps the Operational Area and EMBA and has been active in the Operational Area and EMBA within the last 5 years. Woodside acknowledges WAFIC's consultation guidance and has applied this by consulting, via WAFIC, fisheries that are assessed as having a potential for interaction in the Operational Area. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for Unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would however be undertaken only in the event of an unplanned emergency scenario.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Western Australian Fishing Industry Council (WAFIC)	Represents the interests of commercial fishers with licences in State waters.	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d) of the Environment Regulations. The West Australian Sea Cucumber Fishery, Hermit Crab Fishery, Mackerel Managed Fishery (area 2), Marine Aquarium Managed Fishery, Onslow Prawn Managed Fishery, Pilbara Crab Managed Fishery, Pilbara Trawl Managed Fishery, Pilbara Line Fishery and Specimen Shell Managed Fishery have been active in the Operational Area within the last 5 years. The Exmouth gulf Prawn Managed Fishery, West Australian Sea Cucumber Fishery, Hermit Crab Fishery, Mackerel Managed Fishery (Area 2), Marine Aquarium Fish Managed Fishery, Nickol Bay Prawn Managed Fishery, Onslow Prawn Managed Fishery, Pilbara Crab Managed Fishery, Pilbara Trawl Managed Fishery, Pilbara Line Fishery, Specimen Shell Managed Fishery and West Coast Deep Sea Crustacean Managed Fishery have been active in the EMBA within the last 5 years. WAFIC's functions may be relevant to the activity as the peak representative body for State fisheries. WAFIC issued consultation materials to relevant commercial fisheries licence holders. Woodside acknowledges WAFIC's consultation guidance and has applied this by consulting, via WAFIC, fisheries that are assessed as having a potential for interaction in the Operational Area. As per WAFIC's Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector and Consultation Approach for unplanned Events, consultation with State fisheries relevant to the EMBA of the proposed activity would be undertaken only in the event of an unplanned emergency scenario.	Yes
Western Rock Lobster Council	Represents the interests of the Western Rock Lobster Managed Fishery.	Woodside has applied its methodology for 'Commercial fisheries (Commonwealth and State) and peak representative bodies' under regulation 25(1)(d). The West Coast Rock Lobster Managed Fishery has been assessed as not relevant to the proposed activity. As the peak representative body for the West Coast Rock Lobster Managed Fishery, the Western Rock Lobster Council has also been assessed as not relevant.	No
Recreational marine users and representative bodies			
Gascoyne Recreational Marine Users	Gascoyne-based dive, tourism and charter operators	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 25(1)(d) of the Environment Regulations. Andro Maritime Services Australia, Aquatic Adventure Exmouth, Birds Eye View, Blue Horizon Charters, Blue Lightning Charters, Cape Immersion Tours, Coastal Adventure Tours, Coral Bay	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Ecotours, Cruise Ningaloo, Dampier Island Tourism, Dive Ningaloo, Evolution Fishing Charters, Exmouth adventure co., Exmouth Dive Centre, Indian Chief Charters, Innkeeper Sport Fishing, Innkeeper Sport Fishing Charter, Kings Ningaloo Reef Tours, Live Ningaloo, Mahi Mahi Fishing Charters, Montebello Island Safaris, Ningaloo Aviation, Ningaloo Blue, Ningaloo Coral Bay Boats, Ningaloo Discovery, Ningaloo Ecology Cruises, Ningaloo Fly Fishing, Ningaloo Marine Interaction, Ningaloo Reef Dive, Ningaloo Reef To Range Tours, Ningaloo Safari Tours, Ningaloo Sportfishing Charters, Ningaloo Whaleshark N Dive, Ningaloo Whaleshark Swim, Ocean Eco Adventures, Peak Sportfishing Charters, Pelican Charters, Sail Ningaloo, Sea Force Charters, Set The Hook, Three Islands, Top Gun Charters, Ultimate Watersports, Venture Ningaloo, View Ningaloo, Warrior Princess Charters, Yardi Creek Boat Tours, Aoa International Pty Ltd, Aspa Pastrikos, Austanley Pty Ltd, Blue Juice Tours Pty Ltd, Bondall Pty Ltd, C Emery Fishing Pty Ltd, Chapel Nominees Pty Ltd, D & N Nominees Pty Ltd, Eco-Abrolhos Pty Ltd, Fawesome Expeditions Pty Ltd, Fire Tiger Pty Ltd, G. C. Bass nominees pty ltd, Jostan Holdings Pty Ltd, Km Charters Pty Ltd, Kw Marine Pty Ltd, L & S Family Holdings Pty Ltd, Lulamanzi Investments Pty Ltd, Lyons Family Super Pty Ltd, Makalee Pty Ltd, Maritime Engineering Services Pty Ltd, Melkit Pty Ltd, Millennial Charters Pty Ltd, Monkey Mia Yacht Charters Pty Ltd, Monster Sportfishing Adventures Pty Ltd, Mr Corry E Wilson, North Star Cruises Australia Pty Ltd, On Strike Charters (Wa) Pty Ltd, Reel Force Charters Pty Ltd, Regalchoice Holdings Pty Ltd, Seafresh Holdings Pty Ltd, Sharkbay Charters Pty Ltd, Surefire Marine Services Pty Ltd, The Great Escape Charter Company Pty Ltd, W.A Maritime Investments Pty Ltd. Activities have the potential to impact Gascoyne-based dive, tourism and charter operator's functions, interests or activities due to the location of activities and there has been recorded charter effort in the EMBA in the past 5 years.	
Pilbara/Kimberley Recreational Marine Users	Pilbara/Kimberley-based dive, tourism and charter operators	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 25(1)(d) of the Environment Regulations. Marine Rescue Dampier, Port Walcott Volunteer Marine Rescue , West Pilbara Volunteer Sea Search and Rescue Group, Archipelago Adventures, Hampton Harbour Boat & Sailing Club, Port Walcott Yacht Club , Reef Seeker Charters, King Bay Game Fishing Club, Nickol Bay Sport Fishing Club, Bardina Pty Ltd, Down the Line Charters Pty Ltd, Mackerel Islands Pty Ltd, Ocean Charters Pty Ltd, Serenity Isles Trading Company Pty Ltd, Wyndham Fishing Tours Pty Ltd, Charter Travel Company Pty Ltd, Kw Marine Pty Ltd, Norbrick Pty Ltd, Sail Ningaloo Pty Ltd, Tiffom Pty Ltd, Aoa International Pty Ltd, Australian Port And Marine Services Pty Ltd, Bloor Street Investments Pty Ltd, Blue Juice Tours Pty Ltd, Bondall Pty Ltd, Brefjen Nominees Pty Ltd, Broome Chiropractic Pty	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
		Ltd, Broome Tours Pty Ltd, C Emery Fishing Pty Ltd, Chapel Nominees Pty Ltd, Charter Express Pty Ltd, CM Ventures Pty Ltd, Coastway Investments Pty Ltd, Coral Princess Cruises (Nq) Pty Ltd, Discovery Holiday Parks Pty Limited, Diversity Charter Company Wa Pty Ltd, Eco-Abrolhos Pty Ltd Fawesome Expeditions Pty Ltd, G. C. Bass nominees pty ltd, Hartley Motorcycles Pty Ltd, Hotel And Resort Investments Pty Ltd, Humbug Fishing Pty Ltd, Kcc Group Pty Ltd, Kimberley Getaway Cruises Pty Ltd, Kimberley Marine Pty Ltd, Kimberley Quest Adventures Pty Ltd, King Sound Resort Hotel Pty Ltd, Kw Marine Pty Ltd, L & S Family Holdings Pty Ltd, Lake Argyle Cruises Pty Ltd, Lombadina Aboriginal Corporationm, Lugger Enterprises Pty Ltd, Lulamanzi Investments Pty Ltd, Mackerel Islands Pty Ltd, Mal Miles Adventures Pty Ltd, Marine Agents Australia Pty Ltd, Maritime Engineering Services Pty Ltd, Melkit Pty Ltd, Millennial Charters Pty Ltd, Monster Sportfishing Adventures Pty Ltd, North Star Cruises Australia Pty Ltd, Ocean Charters Pty Ltd, RSTG Pty Limited, Sea 2 Pty Ltd, Sealife Charters Pty Ltd, Split Tide Pty Ltd, Steven Douglas Chambers, Super Yachts Perth Pty Ltd, The Great Escape Charter Company Pty Ltd, W.A Maritime Investments Pty Ltd, Willie Creek Pearl Farm Pty Ltd. Activities have the potential to impact Pilbara/Kimberley-based dive, tourism and charter operator's functions, interests or activities due to the location of activities and there has been recorded charter effort in the EMBA in the past 5 years.	
Recfishwest	Represents the interests of recreational fishers in WA.	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 25(1)(d) of the Environment Regulations. Activities have the potential to impact recreational fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years.	Yes
Marine Tourism WA	Represents the interests of marine tourism in WA.	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 25(1)(d) of the Environment Regulations. Activities have the potential to impact recreational fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years.	Yes
WA Game Fishing Association	Represents the interests of game fishers in WA.	Woodside has applied its methodology for 'Recreational marine users and representative bodies' under regulation 25(1)(d) of the Environment Regulations. Activities have the potential to impact game fishers' functions, interests or activities due to the location offshore and there has been recorded charter effort in the EMBA in the past 5 years.	Yes
Titleholders and Operators			

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Chevron Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Western Gas	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Exxon Mobil Australia Resources Company	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Shell Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
BP Developments Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Carnarvon Energy	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Osaka Gas Gorgon	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Tokyo Gas Gorgon	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
JERA Gorgon	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
PE Wheatstone	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Kyushu Electric Wheatstone	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Eni Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Finder Energy	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Jadestone Energy	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
KUFPEC Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Vermilion Oil & Gas	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Santos NA Energy Holdings / Santos Ltd / Santos WA Northwest / Santos Offshore / Santos WA Southwest / Santos (BOL) / Santos WA	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
PVG			
Coastal Oil and Gas / Fox Resources	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Bounty Oil and Gas	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
OMV Australia	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
KATO Energy / KATO Corowa	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
INPEX Alpha	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Beagle No. 1	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
JX Nippon O&G Exploration (Australia)	Titleholder or Operator	Woodside has applied its methodology for 'Titleholders and Operators' under regulation 25(1)(d) of the Environment Regulations. Titleholder or Operator's permit areas overlaps the EMBA.	Yes
Peak Industry Representative bodies			
Australian Energy Producers (AEP)	Represents the interests of oil and gas explorers and	Woodside has applied its methodology for 'Peak Industry Representative bodies' under regulation 25(1)(d) of the Environment Regulations.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
	producers in Australia.	AEP's responsibilities are identified as having an intersect with Woodside's planned activities in the EMBA.	
Traditional Custodians and nominated representative corporations			
Murujuga Aboriginal Corporation (MAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. MAC is the Nominated Representative Corporation under the Burrup and Maitland Industrial Estates Agreement (BMIEA), which is coastally adjacent to the EMBA. The EMBA does not overlap the Murujuga National Park. MAC was established to represent the members of competing Native Title claims over Murujuga, collectively known as the Ngarda Ngarli and comprising Mardudhunera, Ngarluma, Yaburara, Yindjibarndi and Wong-Goo-Tt-Oo people. The determination of the competing Native Title claims resulted in no native title being found over the lands subject to the BMIEA or below the low water mark. MAC also owns and co-manages the Murujuga National Park, is responsible for the Dampier Archipelago National Heritage Place and is progressing the World Heritage nomination of the Murujuga Cultural Landscape.	Yes
Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People native title claim, which the Baiyungu, Thalanyji and Yinggarda people are party to, overlaps the EMBA. The NTGAC and YAC are the Registered Native Title Bodies Corporate holding native title on behalf of the Baiyungu, Thalanyji and Yinggarda people. The NTGAC is also party, with the WA State Government, to the Ningaloo Conservation Estate Indigenous Land Use Agreement (the ILUA), which is coastally adjacent to the EMBA. The NTGAC is responsible for the joint management of the inner Ningaloo Marine Park (State Waters), the Cape Range National Park and new conservation areas extending along the Ningaloo Coast, which runs in parallel to the outer Ningaloo Marine Park in Commonwealth waters. The NTGAC's nominated representative is the Yamatji Marlpa Aboriginal Corporation (YMAC) and the NTGAC executive officer and contact officer pursuant to the Corporations (Aboriginal and Torres Strait Islander) Act 2006 is employed by YMAC. Woodside has therefore consulted the NTGAC, via YMAC.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Buurabalayji Thalanyji Aboriginal Corporation (BTAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Thalanyji native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, for which BTAC is the Registered Native Title Body Corporate. BTAC is also party to the Macedon ILUA which is coastally adjacent to the EMBA.	Yes
Yinggarda Aboriginal Corporation (YAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Gnulli, Gnulli #2 and Gnulli #3 - Yinggarda, Baiyungu and Thalanyji People native title claim, which the Baiyungu, Thalanyji and Yinggarda people are party to, overlaps the EMBA. The NTGAC and YAC are the Registered Native Title Bodies Corporate holding native title on behalf of the Baiyungu, Thalanyji and Yinggarda people. The Yinggarda Aboriginal Corporation's nominated representative is Gumala Aboriginal Corporation.	Yes
Kariyarra Aboriginal Corporation	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Kariyarra native title claim does not overlap the EMBA. The claim is coastally adjacent to the EMBA, for which the Kariyarra Aboriginal Corporation is the Registered Native Title Body Corporate. The Kariyarra Aboriginal Corporation is also party to the Kariyarra and State ILUA, which is coastally adjacent to the EMBA.	Yes
Wirrawandi Aboriginal Corporation (WAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Yaburara & Mardudhunera People native title claim, for which WAC is the Registered Native Title Body Corporate, overlaps the EMBA. WAC is party to the Cape Preston Project Deed (YM Mardie ILUA), which overlaps the EMBA.	Yes
Robe River Kuruma Aboriginal Corporation	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Robe River Kuruma Aboriginal Corporation is party to the Cape Preston West Export Facility ILUA and the RTIO Kuruma Marthudunera People ILUA, which are coastally adjacent to the EMBA.	Yes

Person or Organisation	Summary of responsibilities and/or functions, interests or activities	Assessment of relevance	Relevant person
Ngarluma Aboriginal Corporation (NAC)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Ngarluma/Yindjibarndi People native title claim, for which NAC and the Yindjibarndi Aboriginal Corporation are the Registered Native Title Bodies Corporate, overlaps the EMBA. NAC is also party to the Anketell Port, Infrastructure Corridor and Industrial Estates ILUA and the RTIO Ngarluma Indigenous Land Use Agreement (Body Corporate Agreement), which are coastally adjacent to the EMBA.	Yes
Yindjibarndi Aboriginal Corporation	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Ngarluma/Yindjibarndi People native title claim, for which NAC and the Yindjibarndi Aboriginal Corporation are the Registered Native Title Bodies Corporate, overlaps the EMBA.	Yes
Wanparta Aboriginal Corporation	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Ngarla and Ngarla #2 (Determination Area A) native title claim does not overlap and is not adjacent to the EMBA. Woodside has voluntarily consulted with Wanparta Aboriginal Corporation, which is the registered Native Title Body Corporate, under regulation 25(1)(e) of the Environment Regulations.	No
Native Title Representative Bodies			
Yamatji Marlpa Aboriginal Corporation (YMAC)	Native Title Representative Body	Woodside has applied its methodology for 'Native Title Representative Bodies' under regulation 25(1)(d) of the Environment Regulations. YMAC is the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia. As such, they are not a Prescribed or Registered Native Title Body Corporate but exist to assist native title claimants and holders. The NTGAC's nominated representative is YMAC. Woodside has therefore consulted the NTGAC via YMAC. Woodside contacted YMAC to seek guidance with respect to the appropriate Traditional Custodian group(s) to engage with respect to the proposed activity where this was not clear. YMAC's functions may be relevant to the proposed activity in relation to its facilitation and coordination function as a Native Title Representative Body under applicable federal legislation.	Yes

Self-identified First Nations groups			
Ngarluma Yindjibarndi Foundation Ltd (NYFL)	Representative Aboriginal Corporation	Woodside has applied its methodology for 'Traditional Custodians and Nominated Representative Corporations' under regulation 25(1)(d) of the Environment Regulations. The Ngarluma and Yindjibarndi People, the NWS JVs and Woodside entered into an agreement on 22 December 1998 (Agreement). NYFL was subsequently incorporated under the terms of the Agreement to act as trustee for the trust established to benefit the Ngarluma and Yindjibarndi People and the Roebourne Aboriginal Community. Subsequent to that, the Ngarluma people settled their native title claim and established their nominated representative corporation, the Ngarluma Aboriginal Corporation (PBC); and the Yindjibarndi people settled their native title claim and established their nominated representative corporation, the Yindjibarndi Aboriginal Corporation (PBC). The Ngarluma Aboriginal Corporation and the Yindjibarndi Aboriginal Corporation are the appropriate representative bodies for consultation in relation to cultural interests. NYFL's functions may be relevant to the proposed activity in relation to its functions under the Agreement.	Yes
Local government and community representative groups or organisations			
Shire of Exmouth	Local government governed by the *Local Government Act 1995* representing the suburbs and localities of Exmouth, Learmonth and North West Cape.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The Shire of Exmouth's area of responsibility overlaps the EMBA.	Yes
Shire of Ashburton	Local government governed by the *Local Government Act 1995* representing the suburbs and localities of Onslow, Pannawonica, Paraburdoo and Tom Price.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The Shire of Ashburton's area of responsibility overlaps the EMBA.	Yes
City of Karratha	Local government governed by the Local Government Act 1995 representing the suburbs and localities of Baynton, Baynton West,	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The City of Karratha's area of responsibility overlaps the EMBA.	Yes

	Bulgarra, Cossack, Dampier, Gap Ridge, Karratha, Karratha Industrial Estate, Jingarri, Madigan, Millars Well, Nickol, Pegs Creek, Point Samson, Roebourne, Whim Creek and Wickham.		
Town of Port Hedland	Local government governed by the Local Government Act 1995 representing the suburbs and localities of Cooke Point, Port Hedland, Pretty Pool, Redbank, South Hedland, Wedgefield and Yandeyarra.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The Town of Port Hedland's area of responsibility does not overlap the EMBA.	No
Shire of Shark Bay	Local government governed by the Local Government Act 1995 representing the suburbs and localities of Billabong, Denham, Monkey Mia, Nanga, Overlander, Useless Loop	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The Shire of Shark Bay's area of responsibility does not overlap the EMBA.	No
Exmouth Community Liaison Group (CLG)	The Exmouth CLG represents the interests of a range of local government, industry and community organisations in relation to oil and gas matters in the Exmouth region.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Base Marine, Bgahwan Marine, Cape Conservation Group Inc., DBCA, Department of Defence, Department of Transport, Exmouth Bus Charter, Exmouth Chamber of Commerce and Industry, Exmouth District High School, Exmouth Freight and Logistics, Exmouth Game Fishing Club, Exmouth Tackle and Camping Supplies, Exmouth Visitors Centre, Exmouth Volunteer Marine Rescue, Fat Marine, Gascoyne Development Commission, Gun Marine Services, Ningaloo Lodge, Offshore Unlimited, Shire of Exmouth, BHP Petroleum, Santos, Community Member The Exmouth CLG's area of responsibility under its terms of reference overlaps the EMBA.	Yes

Karratha Community Liaison Group (CLG)	The Karratha CLG is the recognised community group that represents the interests of a range of local government, industry and community organisations in relation to oil and gas matters in the Pilbara region.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The Karratha CLG's area of responsibility under its terms of reference does not overlap the EMBA. WA Police, Karratha Health Care, Development WA, Ngarluma Yindjibarndi Foundation Ltd (NYFL)*, Department of Education, Pilbara Ports Authority, Regional Development Australia, Pilbara Development Commission, Dampier Community Association, City of Karratha, Karratha & Districts Chamber of Commerce and Industry, Horizon Power, Murujuga Aboriginal Corporation (MAC)*, Department of Local Government, Sport and Cultural Industries **NFYL and MAC were consulted directly as described above.* The Karratha CLG's area of responsibility under its terms of reference overlaps the EMBA.	Yes
Onslow Chamber of Commerce and Industry	Independent not-for-profit organisation responsible for promoting the interests of its members in the business community in the town of Onslow and surrounding areas.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The Onslow Chamber of Commerce and Industry's interests have the potential to be impacted by the proposed activities.	Yes
Port Hedland Chamber of Commerce and Industry	Independent not-for-profit organisation responsible for promoting the interests of its members in the business community in the town of Port Hedland and surrounding areas.	Woodside has applied its methodology for 'Local government and community representative groups or organisations' under regulation 25(1)(d) of the Environment Regulations. The Port Hedland Chamber of Commerce and Industry's interests do not have the potential to be impacted by the proposed activities.	No
Other non-government groups or organisations			
Australian Conservation Foundation (ACF)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that ACF's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP). Woodside chose to contact ACF at its discretion in line with Section 5.3.7 of the EP.	No

Australian Marine Conservation Society (AMCS)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that AMCS's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP). Woodside chose to contact AMCS at its discretion in line with Section 5.3.7 of the EP.	No
Conservation Council of Western Australia (CCWA)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that CCWA's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP). Woodside chose to contact CCWA at its discretion in line with Section 5.3.7 of the EP.	No
Greenpeace Australia Pacific (GAP)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that GAP's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP). Woodside chose to contact GAP at its discretion in line with Section 5.3.7 of the EP.	No
350 Australia (350A)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that 350A's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP). Woodside chose to contact 350A at its discretion in line with Section 5.3.7 of the EP.	No
Australasian Centre for Corporate Responsibility (ACCR)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that ACCR's public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP). Woodside chose to contact ACCR at its discretion in line with Section 5.3.7 of the EP.	No
Friends of Australian Rock Art. Inc (FARA)	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations.	Yes

		Woodside has assessed that FARA's public website material demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP).	
Market Forces	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that Market Forces' public website material does not demonstrate an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.2 of the EP). Woodside chose to contact Market Forces at its discretion in line with Section 5.3.7 of the EP.	No
Telstra	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under Regulation 25(1)(d) of the Environment Regulations to determine Telstra's relevance for the proposed activity. There are known Telstra communication cables that intersect within the Operational Area.	Yes
Vocus	Non-government organisation	Woodside has applied its methodology for 'Other non-government groups or organisations' under Regulation 25(1)(d) of the Environment Regulations to determine Vocus' relevance for the proposed activity. There are known Vocus communication cables that intersect within the Operational Area.	Yes
Doctors for the Environment Australia (DEA)	Non-government organisation	During the course of preparing this EP, DEA self-identified, provided comment on another EP and requested to receive more information about the activities under this EP. Woodside has applied its methodology for 'Other non-government groups or organisations or individuals' under regulation 25(1)(d) of the Environment Regulations. Woodside has assessed that DEA's feedback demonstrates an interest with the potential risks and impacts associated with planned activities in accordance with the intended outcome of consultation (as set out in Section 5.3.4).	Yes
Research institutes and local conservation groups or organisations			
Cape Conservation Group (CCG)	Local conservation group focused on protecting the terrestrial and marine environment of the North West Cape	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d) of the Environment Regulations. CCG's conservation activities have the potential to intersect with the EMBA as the EMBA overlaps North West Cape.	Yes
Protect Ningaloo	Local conservation group focused on protecting the	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d) of the Environment Regulations.	Yes

	Exmouth Gulf and Ningaloo Reef and Cape Range	Protect Ningaloo's conservation activities have the potential to intersect with the EMBA as the EMBA overlaps North West Cape and Ningaloo Reef.	
University of Western Australia (UWA)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d). There is no known research being undertaken by UWA that intersects within the EMBA. Woodside chose to contact UWA at its discretion in line with Section 5.3.7 of the EP.	No
Curtin University	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d). There is no known research being undertaken by Curtin University that intersects within the EMBA. Woodside chose to contact Curtin University at its discretion in line with Section 5.3.7 of the EP.	No
Edith Cowan University (ECU)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d). There is no known research being undertaken by ECU that intersects within the EMBA. Woodside chose to contact ECU at its discretion in line with Section 5.3.7 of the EP.	No
Murdoch University	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d). There is no known research being undertaken by Murdoch University that intersects within the EMBA. Woodside chose to contact Murdoch University at its discretion in line with Section 5.3.7 of the EP.	No
Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d). There is no known research being undertaken by CSIRO that intersects within the EMBA. Woodside chose to contact CSIRO at its discretion in line with Section 5.3.7 of the EP.	No
Australian Institute of Marine Science (AIMS)	Research institute	Woodside has applied its methodology for 'Research institutes and local conservation groups or organisations' under regulation 25(1)(d). There is no known research being undertaken by AIMS that intersects within the EMBA. Woodside chose to contact AIMS at its discretion in line with Section 5.3.7 of the EP.	No
Other			
Save Our Songlines (SOS) and/ or [Individual 1]	Representatives of Non-Government Organisation	Woodside has applied its methodology for 'Traditional Custodians and nominated representative corporations' and 'Other non-government groups or organisations' under regulation 25(1)(d) to determine Save Our Songlines (SOS) and/ or [Individual 1] relevance for the proposed activity.	Yes

	Save Our Songlines and/ or [Individual 1]	Save Our Songlines and/ or [Individual 1] stated interest is to stop or pause Scarborough gas and to stop new industry on the Burrup; and oppose planned expansion of the Burrup Hub industry by Woodside, Perdaman and Yara. In addition, their stated interests also include the protection of Murujuga rock art. As Save Our Songlines have raised concerns relating to the processing of greenhouse gases on Murujuga, Woodside considers that Save Our Songlines and/ or [Individual 1] are relevant for this activity.	

CONSULTATION ACTIVITIES

Pluto Facility Operations EP Consultation Activities

Woodside has been conducting extensive consultation with relevant persons and other parties for this EP since February 2024 when consultation commenced with interested and affected stakeholders as part of a planned, integrated and consistent approach to stakeholder engagement for Woodside's proposed activities.

A broad consultation process has been undertaken with relevant persons for the Pluto Facility Operations EP. Consultation aims to be inclusive, transparent, voluntary, respectful and two-way. Consultation was undertaken by email, letter, phone calls (where required), meetings (where required), and through advertising.

Discharging Regulation 25 of the Environment Regulations

Woodside advertised the planned activities proposed for this EP in national, state and relevant local newspapers (see Record of Consultation, reference 4). Regional newspapers do not require subscription and are available (and in some cases delivered) directly to households. All communities within or adjacent to the EMBA had access to this information via this media. No direct comments or feedback were received from the advertisements.

Newspaper	Coverage	Publication dates
The Australian	National	28 February 2024
The West Australian	Regional (WA)	28 February 2024
Pilbara News	Local (WA)	28 February 2024
North West Telegraph	Local (WA)	28 February 2024
Koori Mail	Indigenous	28 February 2024
National Indigenous Times	Indigenous	26 February 2024

A Consultation Information Sheet was provided to relevant persons and persons Woodside chose to contact (see Section 5.3.7 in the EP), which included details such as an activity overview, maps, a summary of key risks and/or impacts and management measures (Record of Consultation, reference 1.1).

An updated Consultation Information Sheet was provided to relevant persons and persons Woodside chose to contact (see Section 5.3.7), which included an update regarding planned activities (Record of Consultation, reference 1.3).

Since the commencement of the initial consultation period in February 2024, the Consultation Information Sheet has been available on Woodside's website and the updated Consultation Information Sheet since March 2024. The Woodside Consultation Information Sheets include a toll-free 1800 phone number and Woodside's feedback email address (feedback@woodside.com.au).

The Woodside Consultation Activities webpage (that is accessible on the Consultation Information Sheet, via a QR code, banners at community events, and via social media content and advertisements) includes Consultation Information Sheets for the EPs on which Woodside is currently consulting, including this EP. The website page also features a subscribe field for EP-focussed communications from Woodside.

Additional targeted information was provided to relevant marine users including AHO and AMSA – Marine Safety (Record of Consultation, reference 2.4). This information included maps and additional information relevant to the specific category of persons. The relevant persons had a 30-day period in which to provide feedback.

Where appropriate, Woodside conducted phone calls and meetings with relevant persons.

Where appropriate, targeted follow-up emails were sent to relevant persons who had not provided a response prior to the close of the target feedback period.

Woodside considered relevant person responses and assessed the merits and relevance of objections and claims about the potential adverse impact of the proposed activity set out in the EP, in accordance with the intended outcome of consultation (see Section 5.2 in the EP).

Consultation activities undertaken with relevant persons are summarised at Appendix F, Table 2.

Engagement undertaken with persons or organisations Woodside assessed as not relevant but chose to contact (see Section 5.3.7 in the EP) or self-identified and Woodside assessed as not relevant are summarised at Appendix F, Table 3.

From February 2024, Woodside commenced a geotargeted sponsored social media campaign (Record of Consultation, reference 4.9) to various local government authorities within or coastally adjacent to the EMBA for the proposed activities. The campaign brought the proposed activity to the attention of persons who may be interested and advised persons or organisations on how they can find out about Woodside's proposed activities by visiting Woodside's website.

Proactive Consultation

Community engagement

From March 2024, Woodside held a number of Community information sessions where this EP Consultation Information Sheet was available and discussed. See tables in Record of Consultation, reference 5.1 and 5.2. Woodside published advertisements ahead of these sessions and events in relevant local newspapers and on social media to support attendance.

Date	Location	Event (if applicable)
22 March 2024	Roebourne Woodside office	Community Consultation Roadshow
23 March 2024	Karratha Shopping Centre	Community Consultation Roadshow
24 March 2024	Dampier	Dampier Beachside Markets
3 and 10 April 2024	North West Shelf Visitor Centre	Community Information Session
5 May 2024	Dampier	Dampier Beachside Markets
15 June 2024	Karratha	WA Day Festival
26 and 27 June 2024	Karratha	Pilbara Summit

Community Liaison Group Engagement

The Exmouth and Karratha Community Liaison Groups (CLGs) represent the interests of a range of local government, industry and community organisations in relation to oil and gas matters in the Exmouth and Karratha region. Woodside regularly meets with the two CLGs to discuss a range of issues including consultation of specific EPs.

Let's Talk – EP Newsletter

In March 2024, Woodside launched its first EP-focussed newsletter as a new communication avenue to reach existing and potential stakeholders. Woodside is building on its existing consultation approach, providing additional resources to inform relevant persons about its EP consultation. The newsletter aims to provide periodic updates to relevant persons about EP consultation activities, case studies on effective consultation with relevant persons and other EP focussed updates such as upcoming events where Woodside personnel will be consulting with the local community. It is distributed in a variety of locations as well as across digital platforms including on woodside.com, and social media platforms. People can also subscribe to receive it (Record of Consultation, reference 5.6).

Social Media Platform	Geotargeted Reach	Let's Talk Social Media Campaign Dates	Impact
Facebook and Instagram	18-70 year olds Pilbara – Karratha, Dampier, Roebourne Regional Fishing Marine users Traditional Custodians Local communities	18 March – 3 April 2024	Reach: 158,167 Frequency: 3.94 Impressions: 623,845 Link clicks: 854 CTR%: 0.14%

Let's Talk Newsletter – Social Media Campaign

Woodside also publishes the Karratha Community Update newsletter which includes a QR code and encourages people to go to the Woodside Consultation Activities webpage to subscribe and find information about EPs (Record of Consultation, reference 5.4).

Extended Consultation

In addition to the initial 30 day consultation period, Woodside continues to receive, assess and respond to feedback and comments from relevant persons during preparation of the EP.

For this EP, Woodside addressed and responded to relevant persons for a period of up to 5 months.

Self-Identification

Social media campaign - Are you a relevant person?

In October 2023 Woodside commenced a targeted social media campaign, both organic and sponsored, aimed at community members of key towns within the Kimberley, Pilbara, Gascoyne and Murchison regions. The campaign delivered targeted information to several profiled relevant person groups via story and feed content with text and a short accessible video (Record of Consultation, reference 4.10).

The campaign aims to support self-identification and provides information about Woodside's consultation with relevant persons when preparing EPs and encourages participation in the consultation process.

Six different videos with specific information to potential relevant persons groups were launched on Facebook and Instagram:

- Local communities – volunteering
- Local communities - apprentices/trainees
- Commercial fishing
- Recreational fishing
- Recreational marine users
- Traditional Owners.

Results as at April 2024 are as follows:

Categories	Reach	Frequency	Impressions	Clicks	Click-through rate %
Marine Users	389,383	4.37	1,701,418	2,298	0.14%
Commercial Fisheries Demersal	297,701	2.84	846,530	853	0.10%
Commercial Fisheries Crab	207,104	2.54	526,472	484	0.09%
Volunteering	172,750	2.11	364,635	373	0.10%
Apprentices & trainees	97,083	2.21	214,324	311	0.15%
Traditional Owner Groups	92,209	1.56	143,965	212	0.15%

Are you a Relevant Person campaign – October 2023 to March 2024

Categories	Reach	Frequency	Impressions	Clicks	Click-through rate %
Marine Users	251,096	3.48	873,689	1,342	0.15%
Commercial Fisheries Demersal	208,759	2.53	529,021	540	0.10%
Commercial Fisheries Crab	71,468	1.65	118,068	152	0.13%
Volunteering	46,354	1.54	71,335	114	0.16%
Apprentices & trainees	50,776	1.43	72,363	101	0.14%
Traditional Owner Groups	192,257	2.47	475,112	566	0.12%

Are you a Relevant Person campaign – March to April 2024

The commercial fisheries, recreational fisheries and Traditional Owners videos are available on the Woodside Consultation Activities webpage.

Traditional Custodian Specific Consultation

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

- Direct engagement with nominated representative bodies via the contact listed on the ORIC website, requesting advice on how they would like to be engaged and asking whether other members and/or individuals should be consulted. This has resulted in:
  - Meetings with directors, elders and any nominated representatives, on country or in Perth
  - Requests and offers of resourcing to enable and support consultation
  - Exchange of written feedback and correspondence
  - Summary Consultation Information Sheet, developed and reviewed by Indigenous representatives in collaboration with technical experts to ensure content is appropriate to the intended recipients, was provided to relevant Traditional Custodian groups (Record of Consultation, reference 1.2) and phone calls to provide context to the consultation made.

Ongoing efforts were made to engage and develop relationships with these bodies via a variety of means such as email, phone calls, alternative contacts, texts, social media and in some cases physical visits.

Consultation meetings with attendees decided by Traditional Custodian groups, supported by senior Woodside representatives, subject matter experts, First Nations Relations advisers with skills and experience in community engagement. Meetings are developed through a two-way consultation process to enable effective information sharing via:

- Mutually agreed agenda
- Encouraging Traditional Custodian attendees to control the pace of the meeting and pause at any time to ask questions, seek clarification or provide feedback
- Visual aids such as posters, presentations, simplified technical videos and real-world pictures and footage
- Emphasis on potential planned and unplanned risks and impacts of the activity
- Ample opportunity for questions and feedback
- Discussion about ongoing relationship development and opportunities
- Distribution of hard-copy Consultation Information Sheets (Record of Consultation, reference 1.1) and Summary Consultation Information Sheets (Record of Consultation, reference 1.2)
- Meeting all costs such as sitting fees, travel, legal support and executive support and other support required
- Advertising in Indigenous publications such as the National Indigenous Times and Koori Mail (Record of Consultation, reference 4.1 and 4.2).

Woodside ran a geotargeted sponsored social media campaign (Record of Consultation, reference 4.9) to various communities that are coastally adjacent to the EMBA for the proposed activities.

The wide-reaching campaign brought the proposed activity to the attention of persons who may be interested and advised persons or organisations how they can find out about Woodside's proposed activities by visiting Woodside's website, which details the intent of consultation with relevant persons under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth)*. The campaign reached more than two million people across various regions as shown in Record of Consultation, reference 4.9.

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

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

The black numbering **(N)** in Table 2 and Table 3 denotes an item raised by persons and organisations. The green numbering **(N)** denotes Woodside's response to that item.

Table 2: Consultation Report with Relevant Persons and Organisations

Commonwealth and WA State Government Departments or Agencies – Marine		
Australian Border Force (ABF)		
Summary of information provided and record of consultation for this EP: • On 26 February 2024, Woodside emailed ABF advising of the proposed activity (Record of Consultation, reference 2.1), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.* • On 18 March 2024, Woodside sent an email reminder to ABF, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website. • On 27 March 2024, Woodside provided an activity update to ABF regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).		
Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with ABF for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically: • Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024. • Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, The Pilbara News, The Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback. • Consultation Information provided to ABF on 26 February 2024 based on their functions, interests or activities. • Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.		

- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided ABF with the opportunity to provide feedback over a 5 month period.

Australian Communications and Media Authority (ACMA)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed ACMA advising of the proposed activity (Record of Consultation, reference 2.1), provided a Consultation Information Sheet, a map of the Submarine Communication Cables and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 27 February 2024, ACMA responded and thanked Woodside for the opportunity to comment on this EP (SI Report, reference 3.1) and:
  - **(1)** confirmed the operational areas are not in the vicinity of existing protection zones.
  - **(2)** noted Woodside is aware of submarine cables in the area operated by Telstra and recently installed cables operated by Vocus.
  - **(3)** recommended that Woodside contact the AHO for further assistance identifying submarine cables that may be impacted by the proposed activities.
  - **(4)** advised no additional consultation is required for this activity.
- On 29 February 2024, Woodside emailed ACMA (SI Report 3.2) and:
  - **(1)** acknowledged the advice regarding the protection zones.
  - **(2)** confirmed consultation information was provided to Telstra and Vocus.
  - **(3)** noted that AHO can be contacted for further assistance identifying submarine cables.
  - **(4)** noted that ACMA does not require additional consultation for this activity.
- On 27 March 2024, Woodside provided an activity update to ACMA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Operational areas are not in the vicinity of any existing protection zones.	**(1)** **Woodside assessment:** Woodside noted ACMA's confirmation that the operational areas was not in the vicinity of existing protection zones. **Woodside response:** Woodside acknowledged the advice regarding existing protection zones.	**(1)** Not required.
(2) Operational areas are in the vicinity of submarine cables.	**(2)** **Woodside assessment:** Woodside noted ACMA's advice that the operational areas was in the vicinity of submarine cables. **Woodside response:** Woodside confirmed it consulted with Telstra and Vocus.	**(2)** Not required.

(3) Contact the AHO for further assistance identifying cables.	**(3)** **Woodside assessment:** Woodside noted ACMA's recommendation to contact the AHO for further assistance identifying cables. **Woodside response:** Woodside confirmed that the AHO could be contacted should further assistance be required to identify submarine cables.	**(3)** Not required.
(4) No further consultation required for this activity.	**(4)** **Woodside assessment:** Woodside accepts that ACMA does not require further consultation. **Woodside response:** Woodside noted that ACMA does not require further consultation.	**(4)** Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with ACMA for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, The Pilbara News, The Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to ACMA on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to ACMA over a 5 month period.

Australian Fisheries Management Authority (AFMA)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed AFMA advising of the proposed activity (Record of Consultation, reference 2.3), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 4 March 2024, AFMA emailed to thank Woodside and:

- **(1)** Advised it had no specific comments on the proposal
- **(2)** Encouraged Woodside to consult directly with potentially impacted stakeholders: North West Slope Trawl Fishery, Western Deepwater Trawl Fishery, Commonwealth Fisheries Association (CFA) and Western Australia Fishing Industry Council (WAFIC) (SI Report, reference 1.1).

- **(1,2)** On 6 March 2024, Woodside responded thanking AFMA for its email and confirmed it had provided information to relevant fishery licence holders and representative organisations (SI Report, reference 1.2).
- On 6 March 2024, AFMA emailed to thank Woodside (SI Report, reference 1.3).
- On 27 March 2024, Woodside provided an activity update to AFMA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).

Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
(1) AFMA advised it had no specific comment on the proposal.	**(1)** **Woodside assessment:** Woodside noted AFMA had no comments on the proposal. **Woodside response:** Woodside thanked AFMA for its feedback.	**(1)** Not required.
(2) Woodside to consult directly with potentially impacted stakeholders.	**(2)** **Woodside assessment:** Woodside recognises AFMA's recommendation to consult with relevant fishing operators. **Woodside response:** Woodside confirmed it had consulted individual Commonwealth fishing operators in the area, as well as relevant representative bodies. Woodside has consulted AFMA, DAFF - Fisheries, CFA, Tuna Australia, ASBTIA, North West Slope Trawl Fishery and Western Deepwater Trawl Fishery individual licence holders.	**(2)** Woodside has assessed the potential for interaction with Commonwealth managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to AFMA, CFA, DAFF – Fisheries, and individual Commonwealth relevant fishery licence holders (see Table 7-7 of this EP) ten days before activity commences, and following completion of activities, as referenced as PS 1.10 of this EP.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with AFMA for the purpose of regulation 25 is

complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, The Pilbara News, The Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to AFMA on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to AFMA over a 5 month period.

Australian Hydrographic Office (AHO)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed AHO advising of the proposed activity (Record of Consultation, reference 2.4), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 18 March 2024, Woodside sent an email reminder to AHO, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to AHO regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside will notify the AHO no less than four working weeks before activities commence, as referenced as PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with AHO for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, The Pilbara News, The Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to AHO on 26 February 2024 based on their functions, interests or activities.

- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided AHO with the opportunity to provide feedback over a 5 month period.

Australian Maritime Safety Authority (AMSA) - Marine Safety

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed AMSA – Marine Safety advising of the proposed activity (Record of Consultation, reference 2.4), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to AMSA – Marine Safety, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to AMSA – Marine Safety regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- On 22 April 2024, AMSA – Marine Safety emailed Woodside (SI Report, reference 35.1) and:
  - **(1)** provided a map of vessel traffic plot for the area.
  - **(2)** requested Woodside notify AMSA's Response Centre (ARC) 24-48 hours before operations commence.
  - **(3)** reminded Woodside to contact the AHO no less than four working weeks before operations commence.
  - **(4)** reminded Woodside that vessels should exhibit appropriate lights and shapes to reflect the nature of operation.
  - **(5)** advised that Woodside should evaluate and implement adequate anti-collision measures, which may include but are not limited to:
    - additional warnings and/or lights to attract attention.
    - installation of Automatic Identification System (AIS) units.
    - offshore guard vessel/s that can monitor traffic, and take early action to alert a vessel approaching the area of operations.
  - **(1)** provided contact details to obtain shipping data.
- On 22 April 2024, Woodside thanked AMSA- Marine Safety for its feedback (SI Report, reference 35.2) and:
  - **(1)** noted the map provided and the contact details to obtain shipping data.
  - **(2)** confirmed it will notify AMSA's Response Centre (ARC) 24-48 hours before operations commence.
  - **(3)** it will notify the AHO no less than 4 weeks before operations commence.
  - **(4)** confirmed that vessels should exhibit appropriate lights and shapes to reflect the nature of operation.
  - **(5)** confirmed it will evaluate and implement adequate anti-collision measures.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan

(1) Provided a map of vessel traffic and contact details for obtaining shipping data.	**(1)** **Woodside assessment:** Woodside noted AMSA's spatial data gateway and the map provided. **Woodside response:** Woodside thanked AMSA for providing the map.	**(1)** Not required.
(2) Requested the ARC be notified 24-48 hours before operations commence.	**(2)** **Woodside assessment:** Woodside will provide notifications to relevant stakeholders as outlined in Table 7-7 of this EP. **Woodside response:** Woodside confirmed it will notify the ARC 24-48 hours before operations commence.	**(2)** Woodside will notify the ARC at least 24–48 hours before operations commence for each survey, as referenced as PS 1.11 in this EP.
(3) Requested the AHO be contacted no less than 4 weeks before operations commence.	**(3)** **Woodside assessment:** Woodside will provide notifications to relevant stakeholders as outlined in Table 7-7 of this EP. **Woodside response:** Woodside confirmed it will notify the AHO 4 weeks before operations commence.	**(3)** Woodside will notify the AHO no less than four working weeks before operations commence, as referenced as PS 1.10 in this EP.
(4) Vessels should exhibit appropriate lights and shapes to reflect nature of operations.	**(4)** **Woodside assessment:** Woodside complies with the International Rules for Preventing Collisions at Sea. **Woodside response:** Woodside confirmed vessels would 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.	**(4)** Section 6 of the EP contains a number of controls that address AMSA's feedback on lighting and compliance with the international rule for preventing collisions at sea, specifically safety zones are established, vessels are required to comply with marine orders and the facility's collision prevention system will be implemented.
(5) Woodside to evaluate and implement adequate anti-collision measures.	**(5)** **Woodside assessment:** Woodside complies with the International Rules for Preventing Collisions at Sea. **Woodside response:** Woodside confirmed vessels would 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.	**(5)** Section 6 of the EP contains a number of controls that address AMSA's feedback on lighting and compliance with the international rule for preventing collisions at sea, specifically safety zones are established, vessels are required to comply with marine orders and the facility's collision prevention system will be implemented.

While feedback was received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with AMSA – Marine Safety for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, The Pilbara News, The Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to AMSA – Marine Safety on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to AMSA – Marine Safety over a 5 month period.

Australian Maritime Safety Authority (AMSA) – Marine Pollution

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed AMSA – Marine Pollution advising of the proposed activity (Record of Consultation, reference 2.1), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 18 March 2024, Woodside sent an email reminder to AMSA – Marine Pollution, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to AMSA – Marine Pollution regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- On 3 May 2024, Woodside emailed AMSA – Marine Pollution and provided copies of the two oil Pollution First Strike Plans: the revised Pluto Facility Operations and the new Xena-03 Tie-Back (SI Report, reference 40.1). Woodside received an out of office message and forwarded the correspondence to the contact provided (SI Report, reference 40.2).
- On 5 May 2024, AMSA acknowledged the email and advised it will submit comments should it have any.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan

While feedback was received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has addressed oil pollution planning and response at Appendix H. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with AMSA – Marine Pollution for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, The Pilbara News, The Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to AMSA – Marine Pollution on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided AMSA – Marine Pollution with the opportunity to provide feedback over a 5 month period.

Department of Agriculture, Fisheries and Forestry (DAFF) – Fisheries

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DAFF - Fisheries advising of the proposed activity (Record of Consultation, reference 2.5), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to DAFF - Fisheries, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to DAFF - Fisheries regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with Commonwealth managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to AFMA, CFA, DAFF – Fisheries, and individual Commonwealth

		relevant fishery licence holders (see Table 7-7 of this EP) ten days before activity commences, and following completion of activities, as referenced as PS 1.10 of this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DAFF - Fisheries for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, The Pilbara News, The Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DAFF - Fisheries on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided DAFF – Fisheries with the opportunity to provide feedback over a 5 month period.

Department of Defence (DoD)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DoD advising of the proposed activity (Record of Consultation, reference 2.6), provided a Consultation Information Sheet, a map of the defence zones and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to DoD, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to DoD regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and	Woodside will notify the AHO no less than four working weeks before operations commence as referenced as PS 1.10 in the EP.

	Revision process (see Section 7.2.5 of this EP).	Where the activities overlap a defence area, DoD will be notified of the activity start date no less than five weeks before the scheduled commencement date, see PS 1.13 in the EP. Notifying the AHO provides DoD with information of the PAP through maritime safety information. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DoD for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DoD on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided DoD with the opportunity to provide feedback over a 5 month period.

Department of Primary Industries and Regional Development (DPIRD)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DPIRD advising of the proposed activity (Record of Consultation, reference 2.3), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to DPIRD, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to DPIRD regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- **(1)** On 28 March 2024, DPIRD thanked Woodside for the update (SI Report, reference 28.1).
- **(1)** On 2 April 2024, Woodside emailed DPIRD acknowledging their response (SI Report, reference 28.2).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) DPIRD thanked Woodside for the update provided.	**(1)** **Woodside assessment:** Woodside noted DPIRD received the consultation information and had no specific comment on the proposed activity. **Woodside response:** Woodside thanked DPIRD for its response.	**(1)** Not required.
While feedback has been received, there were no objections or claims.	Woodside has consulted DPIRD, WAFIC, and individual licence holders (via WAFIC). Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with State-managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to DPIRD and WAFIC (see Table 7-7 of this EP) prior to the commencement and at the completion of the activity, as referenced at PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DPIRD for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DPIRD on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to DPIRD over a 5 month period.

Department of Transport (DoT)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DoT advising of the proposed activity (Record of Consultation, reference 2.7), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*

- **(1)** On 6 March 2024, DoT responded thanking Woodside for the update (SI Report, reference 7.1).
- (1) On 6 March 2024, Woodside thanked DoT for their response (SI Report, reference 7.2).
- On 27 March 2024, Woodside provided an activity update to DoT regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).
- **(1)** On 15 April 2024, DoT responded, thanking Woodside for the update (SI Report, reference 7.3).
- On 3 May 2024, Woodside emailed DoT and provided copies of the two oil Pollution First Strike Plans: the revised Pluto Facility Operations and the new Xena-03 Tie-Back (SI Report, reference 7.4).
- **(2)** On 14 June 2024, DoT emailed Woodside regarding the First Strike Plans (FSP) and requested clarification regarding a mention of Pilbara Ports Authority (PPA) being the control agency in Dampier Port Limits (SI Report, reference 7.5).
- On 26 June 2024, Woodside responded thanking DoT for its review of the FSPs (SI Report, reference 7.6). Woodside:
  - (2) Advised that as the Pluto Operations trunkline hydrocarbon spill scenario arose at the State/Commonwealth boundary and therefore had the potential to contact port waters, Woodside would add PPA into the notifications table of the FSP and retain a mention of PPA being the control agency in Dampier Port Limits. However, the spill scenario was not applicable to the Xena-03 Tie-Back FSP, therefore Woodside would remove the mention for that FSP.
- **(2)** On 27 June 2024, DoT emailed to thank Woodside for the clarification and confirmed it had no further queries (SI Report, reference 7.7).
- (2) On 27 June 2024, Woodside emailed to thank DoT for confirming it was comfortable with the amendments (SI Report, reference 7.8).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) DoT thanked Woodside for the update.	**(1)** **Woodside assessment:** Woodside noted DoT's response. **Woodside response:** Woodside thanked DoT for its feedback.	**(1)** Not required.
(2) DoT asked for clarification regarding the control agency for Dampier Port Limits in the FSPs.	**(2)** **Woodside assessment:** Woodside acknowledged DoT's clarification request and amended the mention of PPA in relation to the Xena-03 Tie-Back FSP. **Woodside response:** Woodside advised it had removed mention of PPA as the control agency in Dampier Port Limits from the Xena-03 Tie-Back FSP and confirmed that DoT was comfortable with the amendment.	**(2)** Woodside has updated the Xena-03 Tie-Back Oil Pollution First Strike Plan (Appendix J).
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its	Woodside will consult DoT if there is a spill impacting State water from the proposed activity, as referenced in the OSPRMA

	Management of Change and Revision process (see Section 7.2.5 of this EP).	(Appendix H). Woodside will provide DoT with a copy of the accepted Oil Pollution First Strike Plan, as referenced in the OSPRMA (Appendix H). No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DoT for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DoT on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to DoT over a 5 month period.

Department of Planning, Lands and Heritage (DPLH)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DPLH advising of the proposed activity (Record of Consultation, reference 2.8), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 29 February 2024, Woodside emailed DLPH a list of the State Shipwrecks relevant to this activity (Record of Consultation, reference 2.8.1).
- **(1)** On 6 March 2024, DPLH emailed Woodside and confirmed the Land Use Management Division had no comments or feedback on the activities under this EP (SI Report, reference 6.1).
- **(1)** On 6 March 2024, Woodside thanked DPLH for its feedback and noted the Land Use Management Division had no comment on the activities under this EP (SI Report, reference 6.2).
- On 27 March 2024, Woodside provided an activity update to DPLH regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1)	**(1)**	**(1)**

The Land Use Management Division had no comments or feedback on the activities.	**Woodside assessment:** Woodside noted DPLH Land Use Management Division had no comment or feedback. **Woodside response:** Woodside thanked DPLH for its feedback and noted the Land Use Management Division had no comment.	Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	The EP demonstrates that there are no known underwater heritage sites or shipwrecks within the PAP and identifies that there are no credible impacts to the values of any underwater heritage or shipwrecks as a result of planned activities (Section 4.9.6 of this EP). While impacts to underwater heritage sites or shipwrecks are possible in the event of an unplanned hydrocarbon spill, Woodside considers it adopts appropriate controls to prevent a hydrocarbon spill and controls to respond in the highly unlikely event of a hydrocarbon spill, as demonstrated in Section 6.8.2 and Section 6.8.3 of this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DPLH for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DPLH on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to DPLH over a 5 month period.

Western Australian Museum

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed Western Australian Museum advising of the proposed activity (Record of Consultation, reference 2.9), provided a Consultation Information Sheet, a list of State Shipwrecks and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Western Australian Museum, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Western Australian Museum regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Western Australian Museum for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Western Australian Museum on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Western Australian Museum with the opportunity to provide feedback over a 5 month period.

Pilbara Ports Authority

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed Pilbara Ports Authority advising of the proposed activity (Record of Consultation, reference 2.1), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Pilbara Ports Authority, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 20 March 2024, Pilbara Ports Authority emailed Woodside (SI Report, reference 24.1) and:

- **(1)** confirmed it has no comment on this EP.
- **(2)** noted the EMBA encroaches on port waters at the Port of Dampier and is adjacent to port waters of Port of Ashburton, Port of Varanus Island, Port of Cape Preston East and Port of Cape Preston West.

- On 22 March 2024, Woodside thanked Pilbara Ports Authority for its response (SI Report, reference 24.2). and:
  - **(1)** noted that Pilbara Ports Authority has no comment on this EP
  - **(2)** confirmed the EMBA overlaps Port of Dampier and notes the advice from Pilbara Ports Authority regarding ports in waters adjacent to the EMBA.

- On 27 March 2024, Woodside provided an activity update to Pilbara Ports Authority regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).

Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
(1) Pilbara Ports Authority advised it had no comment on the activities.	**(1)** **Woodside assessment:** Woodside noted Pilbara Ports Authority had no comment. **Woodside response:** Woodside thanked Pilbara Ports Authority for its feedback and noted it had no comment.	**(1)** Not required.
(2) The EMBA overlaps Port Dampier port waters and is adjacent to other port waters.	**(2)** **Woodside assessment:** Woodside noted Pilbara Ports Authority's advice regarding port waters adjacent to the EMBA. **Woodside response:** Woodside confirmed the EMBA overlaps Port of Dampier and noted the advice from Pilbara Ports Authority regarding ports in waters adjacent to the EMBA.	**(2)** Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Pilbara Ports Authority for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the

North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to Pilbara Ports Authority on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to Pilbara Ports Authority over a 5 month period.

Commonwealth and WA State Government Departments or Agencies – Environment

Department of Agriculture, Fisheries and Forestry (DAFF) – Biosecurity (marine pests, vessels, aircraft and personnel)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DAFF - Biosecurity advising of the proposed activity (Record of Consultation, reference 2.5), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to DAFF - Biosecurity, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to DAFF - Biosecurity regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	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 (see Section 7.2.3). No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DAFF - Biosecurity for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DAFF - Biosecurity on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided DAFF - Biosecurity with the opportunity to provide feedback over a 5 month period.

Department of Climate Change, Energy, the Environment and Water (DCCEEW)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DCCEEW advising of the proposed activity (Record of Consultation, reference 2.10), provided a Consultation Information Sheet, a list of Commonwealth Shipwrecks and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to DCCEEW, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to DCCEEW regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DCCEEW for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to DCCEEW on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided DCCEEW with the opportunity to provide feedback over a 5 month period.

Director of National Parks (DNP)

Historical Engagement:

- On 17 March 2022, Woodside emailed DNP a copy of the Pluto Baseline Offshore Water Quality and Sediment Sampling Report, as per previous correspondence request (SI Report, reference 33.1).
- On 13 September 2022, Woodside emailed DNP requesting feedback on the report provided (SI Report, reference 33.2).
- On 9 November 2022, Woodside emailed DNP to follow up (SI Report, reference 33.3).
- On 30 November 2022, DNP emailed Woodside to organise a meeting to discuss the Offshore Water Quality and Sediment Sampling Report (SI Report, reference 33.4).
- On 13 December 2022, Woodside met virtually with Parks Australia Authorisation and Assessments team under the DNP and talked through the results of the Pluto Baseline Offshore Water Quality and Sediment Sampling Report (SI Report, reference 33.5)
- On 19 December 2022, Woodside emailed DNP following the meeting regarding the Pluto Baseline Offshore Water Quality and Sediment Sampling Report with a summary of the discussion. It also provided information about the 5 year revision of this EP and submission timeframes. Woodside acknowledged the revised guidance for consultation on activities within Marine Parks (SI Report, reference 33.6).

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DNP advising of the proposed activity (Record of Consultation, reference 2.11), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 18 March 2024, Woodside sent an email reminder to DNP, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to DNP regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- **(1)** On 13 July 2024, DNP emailed Woodside and confirmed the operational area overlaps the Montebello Marine Park (MP) but the well locations are outside of the MP (SI report, reference 33.7). DNP noted:
  - **(2)** To assist in the preparation of an EP for petroleum activities, NOPSEMA has worked closely with Parks Australia to develop and publish a guidance note that outlines what titleholders need to consider and evaluate. Titleholders should ensure the EP:
    - Identifies and manages all impacts and risks on Australian marine park values (including ecosystem values) and had considered all options to avoid or reduce them to as low as reasonably practicable.

- Clearly demonstrates the activity would not be inconsistent with the North-west Marine Parks Network Management Plan 2018.

- **(3)** Class approval for the Multiple Use Zone of the Montebello MP required an accepted EP.
- **(2)** The specific values for the Montebello MP.
- **(4)** The requirements for emergency responses .

- On 17 July 2024, Woodside responded thanking DNP for its email (SI Report, reference 33.8) and:
  - **(2)** Confirmed Woodside had taken into consideration the Petroleum Activities and Australian Marine Parks guidance note to ensure the EP:
    - Identified and managed all impacts and risks on AMP values (including ecosystem values) to an acceptable level.
    - Clearly demonstrated that the activities would not be inconsistent with the North-west Marine Parks Network Management Plan 2018.
  - **(1)** Confirmed a small portion of the Pluto facility operational area overlaps the Montebello MP and the wells are located outside of the MP.
  - **(3)** Noted the class approval for the Multiple Use Zone of the Montebello MP requires an accepted EP.
  - **(2)** Noted the specific values for the Montebello MP.
  - **(4)** Noted the emergency response requirements and confirmed it will notify DNP if details regarding the activities change.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) The operational area overlaps the Montebello MP.	**(1)** **Woodside assessment:** A small portion of the Pluto facility Operational Area overlaps the Montebello MP, and the export pipeline Operational Area is 13 km east of the Dampier MP. **Woodside response:** Woodside confirmed the overlap and the wells are located outside the Montebello MP.	**(1)** Not required.
(2) Ensure the EP identify and manage all impacts and risks on AMP values, and clearly demonstrate that activities will not be inconsistent with the management plan.	**(2)** **Woodside assessment:** The EP demonstrates how Woodside will identify and manage all impacts and risks on Australian marine park values. **Woodside response:** Woodside confirmed it had taken into consideration the Petroleum Activities and Marine Parks guidance note to ensure the EP identified and managed all risks on AMP values, and clearly demonstrated that activities will not be inconsistent with the management plan.	**(2)** The EP demonstrates how Woodside will identify and manage all impacts and risks on Australian marine park values (including ecosystem values) to an ALARP and acceptable level and that the activity is not inconsistent with the management plan (see Section 6.8 of the EP).
(3) The class approval requires an accepted	**(3)** **Woodside assessment:** Woodside is aware of its obligations under the class	**(3)** Not required.

EP.	approval for the Multiple Use Zone of the Montebello MP. **Woodside response:** Woodside noted the class approval requires an accepted EP.	
(4) Emergency response requirements.	**(4)** **Woodside assessment:** Woodside noted the requirements. **Woodside response:** Woodside will notify DNP if details regarding the activities change and noted the emergency response requirements.	**(4)** Woodside will provide notification of significant change, as appropriate, to relevant persons as referenced in Table 7-7 in the EP. 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).
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DNP for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DNP on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to DNP over a 5 month period.

Ningaloo Coast World Heritage Advisory Committee (NCWHAC)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed NCWHAC advising of the proposed activity (Record of Consultation, reference 2.12), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 19 March 2024, Woodside sent an email reminder to NCWHAC, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to

the Consultation Information Sheet on Woodside's website.

- On 27 March 2024, Woodside provided an activity update to NCWHAC regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with NCWHAC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to NCWHAC on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided NCWHAC with the opportunity to provide feedback over a 5 month period.

Department of Biodiversity, Conservation and Attractions (DBCA)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DBCA advising of the proposed activity (Record of Consultation, reference 2.12), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 1 March 2024, DBCA responded thanking Woodside for providing information on this EP (SI Report, reference 5.1). DBCA noted:
  - **(1)** the operations were in the vicinity of reserves managed by DBCA and given the ecological importance of areas potentially affected by a hydrocarbon release from the proposed activities, it was considered important that the baseline values and state of the potentially affected environment are appropriately understood and documented prior to operations commencing.
  - **(2)** it would like to have confidence that Woodside has established appropriate baseline survey data on the current state of areas supporting important ecological values and any current contamination if present within the area of potential impact of hydrocarbon releases.
  - **(3)** it undertakes monitoring in marine parks and reserves and published monitoring reports which are available on its website, however Woodside should be aware

this monitoring is targeted to inform DBCA's values and objectives and is not necessarily suitable to provide baseline information for oil spill risk assessment and management planning.
- **(4)** it recommends Woodside refer to the Department of Climate Change, Energy, the Environment and Water's *National Light Pollution Guidelines for Wildlife* as a best-practice industry standard for managing potential impacts of light pollution on marine fauna.
- **(5)** in the event of a hydrocarbon release, it is requested that Woodside notify DBCA's Pilbara regional office as soon as practicable on (08) 9182 2000.
- **(6)** it will not implement an oiled wildlife management response on behalf of a petroleum operator except as part of a whole of government response mandated by regulatory decision makers.
- **(7)** Woodside should refer to the Department of Transport's web content regarding marine pollution and the Offshore Petroleum Industry Guidance Note of 2020 titled *Marine Oil Pollution: Response and Consultation Arrangements*. **(7)** Not required. Woodside noted and referred to DoT's web content.

- On 14 March 2024, Woodside responded thanking DBCA for its feedback (SI Report, reference 5.2). Woodside:
  - **(1)** Confirmed it maintained knowledge and an understanding of areas of ecological importance within and adjacent to operational areas.
  - **(2,3)** Advised its oil spill scientific monitoring program would provide for a quantitative assessment of the overall environmental impacts in the event of an unplanned hydrocarbon release.
  - **(4)** Confirmed it had considered DCCEEW's National Light Pollution Guidelines with respect to vessel activities. The impact assessment determined that the impacts of lighting were as low as reasonably practicable.
  - **(5)** Advised it had incorporated the DBCA Pilbara regional office telephone number as part of the notifications listed in the Oil Pollution First Strike Plan.
  - **(6)** Noted that DBCA would not implement an oiled wildlife management response on behalf of a petroleum operator.

- On 27 March 2024, Woodside provided an activity update to DBCA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Baseline values are understood and documented prior to commencement of activities.	**(1)** **Woodside assessment:** Woodside determined that areas of ecological importance, including marine parks and island conservation reserves, would not be impacted by planned activities. **Woodside response:** Woodside reaffirmed that areas of ecological importance in the proximity of the EP Operational Areas would be not impacted by planned activities.	**(1)** The EP demonstrates that the proposed activities are outside the boundaries of a proclaimed State Marine Park and identifies that there are no credible impacts to the values of any State Marine Parks as a result of planned activities (Section 4.8 and Section 6.7 of the EP). While impacts to Commonwealth Marine Parks are possible in the event of an unplanned hydrocarbon spill, Woodside considers it adopts appropriate controls to prevent a hydrocarbon spill and

		controls to respond in the highly unlikely event of a hydrocarbon spill, as demonstrated in Sections 6.9 of the EP.
(2) Establish the appropriate baseline survey data on the current state of the areas.	**(2)** **Woodside assessment:** Woodside confirmed it maintained knowledge and an understanding of areas of ecological importance adjacent to Operational Areas and its oil spill scientific monitoring program provides for a quantitative assessment of overall impacts in the event of an unplanned hydrocarbon release. **Woodside response:** Woodside responded that it utilises an information system to track current existing environment knowledge that is regularly updated. Woodside advised its oil spill scientific monitoring program provides for a quantitative assessment of overall impacts in the event of an unplanned hydrocarbon release.	**(2)** Under the Oil Spill Scientific Monitoring Program preparedness, an annual review and update to environmental baseline studies database is completed and documented as described in this EP.
(3) Acquire the necessary information to implement a Before-After Control Impact (BACI) framework.	**(3)** **Woodside assessment:** Woodside reviewed the request about implementing a BACI framework and noted its oil spill scientific monitoring program (SMP) would provide for a quantitative assessment of the overall environmental impacts in the event of an unplanned hydrocarbon release. **Woodside response:** Woodside advised its oil spill scientific monitoring program (SMP) would provide for a quantitative assessment of the overall environmental impacts in the event of an unplanned hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors.	**(3)** Under the Oil Spill Scientific Monitoring Program preparedness, an annual review and update to environmental baseline studies database is completed and documented as described in this EP.
(4) Refer to DCCEEW's National Light Pollution Guidelines for Wildlife.	**(4)** **Woodside assessment:** Woodside noted DCCEEW's National Light Pollution Guidelines for Wildlife and that its impact assessment for light emissions is based on these recommendations. **Woodside response:** Woodside confirmed it had considered DCCEEW's National Light Pollution Guidelines for Wildlife and that lighting associated with this EP is required as a priority for safe operation.	**(4)** Woodside's impact assessment for light emissions is based on recommendations of the National Light Pollution Guidelines for Wildlife (see Section 6.7.11).
(5)	**(5)**	**(5)**

Notify DBCA's Pilbara office as soon as practicable in the event of a hydrocarbon release.	**Woodside assessment:** Woodside noted DBCA's 'Incidents and Emergency Response' process and need to include DBCA's Pilbara's contact information in Oil Pollution First Strike Plan. **Woodside response:** Woodside confirmed the DBCA Pilbara number had been incorporated as part of the Oil Pollution First Strike Plan.	DBCA's Pilbara phone number has been incorporated into the Oil Pollution First Strike Plan for this EP (see Appendix I).
(6) No oiled wildlife management response will be implemented except as part of a mandated government response.	**(6)** **Woodside assessment:** Woodside accepts that DBCA would not implement an oiled wildlife management response and notes its own Oiled Wildlife Response is included in the Oil Spill Preparedness and Response Mitigation Assessment for this EP. **Woodside response:** Woodside confirmed that DBCA would not implement an oiled wildlife management response on behalf of a petroleum operator.	**(6)** Woodside's Oiled Wildlife Response is included in the Oil Spill Preparedness and Response Mitigation Assessment for this EP (see Appendix H).
(7) Refer to the Department of Transport's guidance note: *Marine Oil Pollution: Response and Consultation Arrangements*.	**(7)** **Woodside assessment:** Woodside appreciated the recommendation to refer to DoT's web content regarding marine pollution and the Offshore Petroleum Industry Guidance Note of 2020 titled Marine Oil Pollution: Response and Consultation Arrangements. **Woodside response:** Woodside noted the DoT's web content regarding marine pollution and the Offshore Petroleum Industry Guidance Note of 2020 titled Marine Oil Pollution: Response and Consultation Arrangements.	**(7)** Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DBCA for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to DBCA on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to DBCA over a 5 month period.

Commonwealth and State Government Departments or Agencies – Industry

Department of Industry, Science and Resources (DISR)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed DISR advising of the proposed activity (Record of Consultation, reference 2.13), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to DISR, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to DISR regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DISR for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to DISR on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided DISR with the opportunity to provide feedback over a 5 month period.

Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)		
Summary of information provided and record of consultation for this EP: • On 26 February 2024, Woodside emailed DEMIRS advising of the proposed activity (Record of Consultation, reference 2.13), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.* • On 18 March 2024, Woodside sent an email reminder to DEMIRS, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website. • On 27 March 2024, Woodside provided an activity update to DEMIRS regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).		
Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DEMIRS for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically: • Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024. • Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback. • Consultation Information provided to DEMIRS on 26 February 2024 based on their functions, interests or activities. • Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community. • Woodside has sent a follow up email seeking feedback on the proposed activities. • Woodside has provided DEMIRS with the opportunity to provide feedback over a 5 month period.		
Commonwealth Commercial fisheries and representative bodies		
North West Slope and Trawl Fishery		
Summary of information provided and record of consultation for this EP: • On 26 February 2024, Woodside emailed North West Slope and Trawl Fishery individual licence holders advising of the proposed activity (Record of Consultation,		

reference 2.14), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*

- On 18 March 2024, Woodside sent an email reminder to North West Slope and Trawl Fishery individual licence holders, following up on the proposed activity (Record of Consultation, reference 3.2) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to North West Slope and Trawl Fishery individual licence holders regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside has consulted AFMA, DAFF - Fisheries, CFA, Tuna Australia, ASBTIA, North West Slope Trawl Fishery and Western Deepwater Trawl Fishery individual licence holders. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with Commonwealth managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to AFMA, CFA, DAFF – Fisheries, and individual Commonwealth relevant fishery licence holders (see Table 7-7 of this EP) ten days before activity commences, and following completion of activities, as referenced as PS 1.10 of this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with North West Slope and Trawl Fishery for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to North West Slope and Trawl Fishery on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided North West Slope and Trawl Fishery with the opportunity to provide feedback over a 5 month period.

Western Deepwater Trawl Fishery

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed Western Deepwater Trawl Fishery individual licence holders advising of the proposed activity (Record of Consultation, reference 2.14), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Western Deepwater Trawl Fishery individual licence holders, following up on the proposed activity (Record of Consultation, reference 3.2) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Western Deepwater Trawl Fishery individual licence holders regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside has consulted AFMA, DAFF - Fisheries, CFA, Tuna Australia, ASBTIA, North West Slope Trawl Fishery and Western Deepwater Trawl Fishery individual licence holders. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with Commonwealth managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to AFMA, CFA, DAFF – Fisheries, and individual Commonwealth relevant fishery licence holders (see Table 7-7 of this EP) ten days before activity commences, and following completion of activities, as referenced as PS 1.10 of this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Western Deepwater Trawl Fishery for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Western Deepwater Trawl Fishery on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.

- Woodside has provided Western Deepwater Trawl Fishery with the opportunity to provide feedback over a 5 month period.

Commonwealth Fisheries Association (CFA)

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside emailed CFA advising of the proposed activity (Record of Consultation, reference 2.14), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 18 March 2024, Woodside sent an email reminder to CFA, following up on the proposed activity (Record of Consultation, reference 3.2) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to CFA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside has consulted AFMA, DAFF - Fisheries, CFA, Tuna Australia, ASBTIA, North West Slope Trawl Fishery and Western Deepwater Trawl Fishery individual licence holders. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with Commonwealth managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to AFMA, CFA, DAFF – Fisheries, and individual Commonwealth relevant fishery licence holders (see Table 7-7 of this EP) ten days before activity commences, and following completion of activities, as referenced as PS 1.10 of this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with CFA for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to CFA on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.

- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided CFA with the opportunity to provide feedback over a 5 month period.

State Commercial fisheries and representative bodies

Mackerel Managed Fishery (Area 2)

Summary of information provided and record of consultation for this EP:

- On 29 February 2024, WAFIC, on behalf of Woodside, emailed Mackerel Managed Fishery (Area 2) individual licence holders advising of the proposed activity (SI Report, reference 12.3), and provided a Consultation Information Sheet.
- On 19 March 2024, Woodside emailed WAFIC following up on the proposed activities and noted WAFIC does not usually send consultation reminders to individual licence holders (SI Report, reference 12.5).
- On 28 March 2024, Woodside provided an activity update to WAFIC regarding wells location coordinates and included an updated Consultation Information Sheet (SI report, reference 12.6). Woodside enquired whether the update should be sent to relevant fisheries.
- On 2 April 2024, WAFIC emailed Woodside reporting that no feedback had been received for this activity and did not consider necessary to distribute the update (SI Report, reference 12.7).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received.	Woodside has consulted DPIRD, WAFIC and individual relevant licence holders via WAFIC. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with State-managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to DPIRD and WAFIC (see Table 7-7 of this EP) prior to the commencement and at the completion of the activity, as referenced at PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Mackerel Managed Fishery (Area 2) for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the

North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to Mackerel Managed Fishery (Area 2), via WAFIC, on 29 February 2024 based on their functions, interests or activities.
- Woodside has provided Mackerel Managed Fishery (Area 2), via WAFIC, with the opportunity to provide feedback over a 5 month period.

Pilbara Crab Managed Fishery

Summary of information provided and record of consultation for this EP:

- On 29 February 2024, WAFIC, on behalf of Woodside, emailed Pilbara Crab Managed Fishery individual licence holders advising of the proposed activity (SI Report, reference 12.3), and provided a Consultation Information Sheet.
- On 19 March 2024, Woodside emailed WAFIC following up on the proposed activities and noted WAFIC does not usually send consultation reminders to individual licence holders (SI Report, reference 12.5).
- On 28 March 2024, Woodside provided an activity update to WAFIC regarding wells location coordinates and included an updated Consultation Information Sheet (SI report, reference 12.6). Woodside enquired whether the update should be sent to relevant fisheries.
- On 2 April 2024, WAFIC emailed Woodside reporting that no feedback had been received for this activity and did not consider necessary to distribute the update (SI Report, reference 12.7).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received.	Woodside has consulted DPIRD, WAFIC and individual relevant licence holders via WAFIC. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with State-managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to DPIRD and WAFIC (see Table 7-7 of this EP) prior to the commencement and at the completion of the activity, as referenced at PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Pilbara Crab Managed Fishery for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to Pilbara Crab Managed Fishery, via WAFIC, on 29 February 2024 based on their functions, interests or activities.
- Woodside has provided Pilbara Crab Managed Fishery, via WAFIC, with the opportunity to provide feedback over a 5 month period.

Onslow Prawn Managed Fishery

Summary of information provided and record of consultation for this EP:

- On 29 February 2024, WAFIC, on behalf of Woodside, emailed Onslow Prawn Managed Fishery individual licence holders advising of the proposed activity (SI Report, reference 12.3), and provided a Consultation Information Sheet.
- On 19 March 2024, Woodside emailed WAFIC following up on the proposed activities and noted WAFIC does not usually send consultation reminders to individual licence holders (SI Report, reference 12.5).
- On 28 March 2024, Woodside provided an activity update to WAFIC regarding wells location coordinates and included an updated Consultation Information Sheet (SI report, reference 12.6). Woodside enquired whether the update should be sent to relevant fisheries.
- On 2 April 2024, WAFIC emailed Woodside reporting that no feedback had been received for this activity and did not consider necessary to distribute the update (SI Report, reference 12.7).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received.	Woodside has consulted DPIRD, WAFIC and individual relevant licence holders via WAFIC. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with State-managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to DPIRD and WAFIC (see Table 7-7 of this EP) prior to the commencement and at the completion of the activity, as referenced at PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Onslow Prawn Managed Fishery for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Onslow Prawn Managed Fishery, via WAFIC, on 29 February 2024 based on their functions, interests or activities.

- Woodside has provided Onslow Prawn Managed Fishery, via WAFIC, with the opportunity to provide feedback over a 5 month period.

Pilbara Trawl Fishery

Summary of information provided and record of consultation for this EP:

- On 29 February 2024, WAFIC, on behalf of Woodside, emailed Pilbara Trawl Managed Fishery individual licence holders advising of the proposed activity (SI Report, reference 12.3), and provided a Consultation Information Sheet.
- On 19 March 2024, Woodside emailed WAFIC following up on the proposed activities and noted WAFIC does not usually send consultation reminders to individual licence holders (SI Report, reference 12.5).
- On 28 March 2024, Woodside provided an activity update to WAFIC regarding wells location coordinates and included an updated Consultation Information Sheet (SI report, reference 12.6). Woodside enquired whether the update should be sent to relevant fisheries.
- On 2 April 2024, WAFIC emailed Woodside reporting that no feedback had been received for this activity and did not consider necessary to distribute the update (SI Report, reference 12.7).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received.	Woodside has consulted DPIRD, WAFIC and individual relevant licence holders via WAFIC. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with State-managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to DPIRD and WAFIC (see Table 7-7 of this EP) prior to the commencement and at the completion of the activity, as referenced at PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Pilbara Trawl Managed Fishery for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Pilbara Trawl Managed Fishery, via WAFIC, on 29 February 2024 based on their functions, interests or activities.
- Woodside has provided Pilbara Trawl Managed Fishery, via WAFIC, with the opportunity to provide feedback over a 5 month period.

Pilbara Line Fishery

Summary of information provided and record of consultation for this EP:

- On 29 February 2024, WAFIC, on behalf of Woodside, emailed Pilbara Line Managed Fishery individual licence holders advising of the proposed activity (SI Report, reference 12.3), and provided a Consultation Information Sheet.
- On 19 March 2024, Woodside emailed WAFIC following up on the proposed activities and noted WAFIC does not usually send consultation reminders to individual licence holders (SI Report, reference 12.5).
- On 28 March 2024, Woodside provided an activity update to WAFIC regarding wells location coordinates and included an updated Consultation Information Sheet (SI report, reference 12.6). Woodside enquired whether the update should be sent to relevant fisheries.
- On 2 April 2024, WAFIC emailed Woodside reporting that no feedback had been received for this activity and did not consider necessary to distribute the update (SI Report, reference 12.7).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received.	Woodside has consulted DPIRD, WAFIC and individual relevant licence holders via WAFIC. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with State-managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to DPIRD and WAFIC (see Table 7-7 of this EP) prior to the commencement and at the completion of the activity, as referenced at PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Pilbara Line Managed Fishery for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Pilbara Line Managed Fishery, via WAFIC, on 29 February 2024 based on their functions, interests or activities.
- Woodside has provided Pilbara Line Managed Fishery, via WAFIC, with the opportunity to provide feedback over a 5 month period.

Western Australian Fishing Industry Council (WAFIC)

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed WAFIC advising of the proposed activity (Record of Consultation, reference 2.15), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 28 February 2024, Woodside emailed WAFIC to initiate consultation with relevant individual licence holders for this activity (SI Report, reference 12.1).
- **(1)** On 28 February 2024, Woodside telephoned WAFIC to review the list of relevant fisheries identified by Woodside.
- (1) On 28 February 2024, Woodside emailed WAFIC with the agreed list of relevant fisheries for this activity and an updated consultation email for individual licence holders (SI Report, reference 12.2).
- **(1)** On 29 February 2024, WAFIC emailed Woodside advising the consultation information had been sent to five relevant fisheries and confirmed it will provide feedback after the consultation period closes (SI Report, reference 12.3).
- (1) On 29 February 2024, Woodside emailed WAFIC to acknowledge the distribution of information (SI Report, reference 12.4).
- On 19 March 2024, Woodside emailed WAFIC following up on the proposed activities and noted WAFIC does not usually send consultation reminders to individual licence holders (SI Report, reference 12.5).
- On 28 March 2024, Woodside provided an activity update to WAFIC regarding wells location coordinates and included an updated Consultation Information Sheet (SI report, reference 12.6). Woodside enquired whether the update should be sent to relevant fisheries.
- **(2)** On 2 April 2024, WAFIC emailed Woodside reporting that no feedback had been received for this activity and did not consider necessary to distribute the update (SI Report, reference 12.7).
- (2) On 3 April 2024, Woodside thanked WAFIC for the feedback and noted the advice regarding the update to relevant fisheries (SI Report, reference 12.8).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Consultation material delivered to relevant fisheries.	**(1)** **Woodside assessment:** Woodside reviewed WAFIC's update on outreach to relevant fisheries which gave them sufficient information to make an informed assessment of possible consequences of the activity on their functions, interests or activities per regulation 25 of the Environment Regulations. **Woodside response**: Woodside noted consultation information had been distributed to relevant fisheries via WAFIC.	**(1)** Not required.
(2) No feedback received from licence holders for this activity.	**(2)** **Woodside assessment:** Woodside accepted WAFIC's advice that there was no feedback on the activity and that it was not necessary to distribute the update to	**(2)** Not required.

	licence holders. **Woodside response:** Woodside noted WAFIC had no further comments and its advice regarding the update distribution.	
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the potential for interaction with State-managed fisheries in Section 4.10.1 of this EP. Woodside will provide notifications to DPIRD and WAFIC (see Table 7-7 of this EP) prior to the commencement and at the completion of the activity, as referenced at PS 1.10 in this EP. No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with WAFIC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to WAFIC on 28 February 2024 based on their functions, interests or activities.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to WAFIC over a 5 month period.

Recreational marine users and representative bodies

Gascoyne Recreational Marine Users

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside sent a letter to individual Gascoyne Recreational Marine Users advising of the proposed activity (Record of Consultation, reference 2.16), provided a Consultation Information Sheet, and a QR code to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 28 February 2024, Woodside emailed individual Gascoyne Recreational Marine Users advising of the proposed activity (Record of Consultation, reference 2.17),

provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*

- **(1)** On 28 February 2024, an individual Recreational Marine User emailed Woodside (SI Report, reference 13.1) and confirmed they would maintain safe distances as per their operations and AMSA regulations.
- On 18 March 2024, Woodside sent a letter reminder to individual Gascoyne Recreational Marine Users, following up on the proposed activity (Record of Consultation, reference 3.3) and included a QR code to the Consultation Information Sheet on Woodside's website.
- On 19 March 2024, Woodside sent an email reminder to individual Gascoyne Recreational Marine Users, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- **(1)** On 25 March 2024, Woodside emailed the individual Recreational Marine User confirming that exclusion zones would be communicated by AMSA and marine notices prior to activities commencing.
- On 27 March 2024, Woodside provided an activity update to Gascoyne Recreational Marine Users regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- On 28 March 2024, Woodside provided an activity update to Gascoyne Recreational Marine Users regarding wells location coordinates and included a QR code to the updated Consultation Information Sheet (Record of Consultation, reference 3.7).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) An individual Recreational Marine User advised they would maintain safe navigation as per AMSA regulations.	**(1)** **Woodside assessment:** Woodside acknowledges that the individual Recreational Marine User has the information it needs to maintain safe navigation. **Woodside response**: Woodside confirmed exclusion zones will be communicated by AMSA and marine notices prior to activities commencing.	**(1)** Woodside will notify AMSA at least 24–48 hours before activities commence, as referenced as PS 1.11 in this EP.
While feedback has been received, there were no objections or claims.	Woodside has consulted Recfishwest, Marine Tourism WA, WA Game Fishing Association and individual recreational marine users. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Gascoyne Recreational Marine Users for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Gascoyne Recreational Marine Users on 26 and 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up letter and email seeking feedback on the proposed activities.
- Woodside has provided Gascoyne Recreational Marine Users with the opportunity to provide feedback over a 5 month period.

Pilbara/Kimberley Recreational Marine Users

Summary of information provided and record of consultation for this EP:

- On 26 February 2024, Woodside sent a letter to individual Pilbara/Kimberley Recreational Marine Users advising of the proposed activity (Record of Consultation, reference 2.16), provided a Consultation Information Sheet, and a QR code to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent a letter reminder to individual Pilbara/Kimberley Recreational Marine Users, following up on the proposed activity (Record of Consultation, reference 3.3) and included a QR code to the Consultation Information Sheet on Woodside's website.
- On 28 March 2024, Woodside provided an activity update to Pilbara/Kimberley Recreational Marine Users regarding wells location coordinates and included a QR code to the updated Consultation Information Sheet (Record of Consultation, reference 3.7).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside has consulted Recfishwest, Marine Tourism WA, WA Game Fishing Association and individual recreational marine users. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Pilbara/Kimberley Recreational Marine Users for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to Pilbara/Kimberley Recreational Marine Users on 26 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up letter seeking feedback on the proposed activities.
- Woodside has provided Pilbara/Kimberley Recreational Marine Users with the opportunity to provide feedback over a 5 month period.

Recfishwest

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Recfishwest advising of the proposed activity (Record of Consultation, reference 2.17), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 19 March 2024, Woodside sent an email reminder to Recfishwest, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- **(1)** On 26 March 2024, Recfishwest emailed to thank Woodside for the consultation information (SI Report, reference 27.1) and requested to be kept informed as activities progress, given the proximity to areas accessed by the charter industry and recreational fishers.
- **(1)** On 27 March 2024, Woodside thanked Recfishwest for its response (SI Report, reference 27.2) and confirmed it will keep Recfishwest informed prior to and on completion of activities.
- On 27 March 2024, Woodside provided an activity update to Recfishwest regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).
- **(2)** On 28 March 2024, Recfishwest emailed Woodside and confirmed having no further comments following the update received (SI Report, reference 27.3).
- **(2)** On 2 April 2024, Woodside thanked Recfishwest for its feedback (SI Report, reference 27.4).
- On 15 April 2024, Woodside met with Recfishwest to provide an update on its activities. While the presentation was centred on decommissioning, it included information about this EP and Woodside's consultation approach (SI Report, reference 27.5). No feedback was provided on this EP.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Recfishwest requested to be kept informed as activities progress.	**(1)** **Woodside assessment:** Woodside acknowledges Recfishwest's request to be informed as activities progress and agrees to keep Recfishwest informed prior to and on completion of activities. **Woodside response**: Woodside confirmed it would keep Recfishwest informed prior to and on completion of activities, given that the areas surrounding the operation is accessed by recreational fishers and the charter industry.	**(1)** Woodside will provide notifications to Recfishwest (see Table 7-7 of this EP) ten days before activity commences, and following completion of activities, as referenced as PS 1.10 of this EP.

(2) Recfishwest confirmed having no further comments for this activity.	**(2)** **Woodside assessment:** Woodside noted Recfishwest had no further comments. **Woodside response**: Woodside thanked Recfishwest for its feedback.	**(2)** Not required.
While feedback has been received, there were no objections or claims.	Woodside has consulted Recfishwest, Marine Tourism WA, WA Game Fishing Association and individual recreational marine users. Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Recfishwest for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Recfishwest on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to Recfishwest over a 5 month period.

Marine Tourism WA

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Marine Tourism WA advising of the proposed activity (Record of Consultation, reference 2.17), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Marine Tourism WA, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Marine Tourism WA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside has consulted Recfishwest, Marine Tourism WA, WA Game Fishing Association and individual recreational marine users. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Marine Tourism WA for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Marine Tourism WA on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Marine Tourism WA with the opportunity to provide feedback over a 5 month period.

WA Game Fishing Association

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed WA Game Fishing Association advising of the proposed activity (Record of Consultation, reference 2.17), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to WA Game Fishing Association, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to WA Game Fishing Association regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims	Woodside has consulted Recfishwest, Marine Tourism WA, WA Game Fishing	No additional measures or controls are

received despite follow up.	Association and individual recreational marine users. Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with WA Game Fishing Association for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to WA Game Fishing Association on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided WA Game Fishing Association with the opportunity to provide feedback over a 5 month period.

Titleholders and Operators

Chevron Australia/ Osaka Gas Gorgon/ Tokyo Gas Gorgon/ JERA Gorgon

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Chevron Australia advising of the proposed activity (Record of Consultation, reference 2.18), provided a Consultation Information Sheet, GIS shape files and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.* Woodside asked that the consultation information be forwarded to Chevron's Joint Venture participants Osaka Gas Gorgon, Tokyo Gas Gorgon and Jera Gorgon for feedback.
- On 18 March 2024, Woodside sent an email reminder to Chevron Australia, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Chevron regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- On 9 April 2024, Chevron emailed Woodside (SI Report, reference 36.1) and:
  - **(1)** confirmed it has no issues with the planned activities.
  - **(2)** requested Woodside to provide additional information should the activities be undertaken during cyclone season, including cyclone anchor configuration, mooring design, anchor analysis and risk mitigation.

- On 2 May 2024, Woodside emailed Chevron (SI Report, reference 36.2) and:
  - **(1)** thanked Chevron for its feedback.
  - **(2)** advised drilling is not currently planned to occur in cyclone season.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Chevron confirmed it has no issues regarding the activities.	**(1)** **Woodside assessment:** Woodside noted Chevron had no issues with the activities. **Woodside response:** Woodside thanked Chevron for its feedback and confirming it has no issues with the activities.	**(1)** Not required.
(2) Requested further information should activities be undertaken during cyclone season	**(2)** **Woodside assessment:** Woodside noted that drilling is not currently planned to occur in cyclone season and will notify Chevron with mooring design information in the form of the mooring analysis if required. **Woodside response:** Woodside advised that should drilling occur with a moored MODU during cyclone season, it will provide Chevron with mooring design information.	**(2)** Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Chevron Australia for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Chevron Australia on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.

- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside addressed and responded to Chevron Australia over a 5 month period.

Western Gas

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Western Gas advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 18 March 2024, Woodside sent an email reminder to Western Gas, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Western Gas regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Western Gas for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Western Gas on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Western Gas with the opportunity to provide feedback over a 5 month period.

Exxon Mobil Australia Resources Company

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Exxon Mobil Australia advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Exxon Mobil Australia, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Exxon Mobil Australia regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Exxon Mobil Australia for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Exxon Mobil Australia on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Exxon Mobil Australia with the opportunity to provide feedback over a 5 month period.

Shell Australia

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Shell Australia advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Shell Australia, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Shell Australia regarding wells location coordinates and included an updated Consultation Information Sheet

(Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Shell Australia for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Shell Australia on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Shell Australia with the opportunity to provide feedback over a 5 month period.

BP Developments Australia

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed BP Developments Australia advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to BP Developments Australia, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to BP Developments Australia regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- **(1)** On 5 April 2024, BP Developments Australia emailed Woodside to acknowledge the consultation information received and confirmed it had no objections to the activities (SI Report, reference 31.1).
- **(1)** On 8 April 2024, Woodside thanked BP Developments Australia for its feedback and confirming it had no objections to the activities (SI Report, reference 31.2).

Summary of Feedback, Objection or	Assessment of Merits of Feedback, Objection or Claim and Woodside's	Inclusion in Environment Plan

Claim	Response	
(1) BP Developments Australia confirmed it had no objections to the activities.	**(1)** **Woodside assessment:** Woodside noted BP Developments Australia had no objections to this EP. **Woodside response:** Woodside thanked BP Developments Australia for its feedback.	**(1)** Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with BP Developments Australia for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to BP Developments Australia on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to BP Developments Australia over a 5 month period.

Carnarvon Energy

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Carnarvon Energy advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Carnarvon Energy, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Carnarvon Energy regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Carnarvon Energy for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Carnarvon Energy on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Carnarvon Energy with the opportunity to provide feedback over a 5 month period.

PE Wheatstone

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed PE Wheatstone advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 18 March 2024, Woodside sent an email reminder to PE Wheatstone, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to PE Wheatstone regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and	No additional measures or controls are required.

	Revision process (see Section 7.2.5 of this EP).	

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with PE Wheatstone for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to PE Wheatstone Gas on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided PE Wheatstone with the opportunity to provide feedback over a 5 month period.

Kyushu Electric Wheatstone

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Kyushu Electric Wheatstone advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Kyushu Electric Wheatstone, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Kyushu Electric Wheatstone regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Kyushu Electric Wheatstone for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Kyushu Electric Wheatstone on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Kyushu Electric Wheatstone with the opportunity to provide feedback over a 5 month period.

Eni Australia

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Eni Australia advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Eni Australia, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Eni Australia regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- **(1)** On 19 April 2024, Eni Australia emailed Woodside to advise it has no concerns regarding the activity (SI Report, reference 34.1).
- **(2)** Requested to be updated of any material changes (SI Report, reference 34.1).
- **(1,2)** On 22 April 2024, Woodside thanked Eni Australia for its feedback and confirmed it will provide Eni Australia with significant updates with respect to the proposed activities when relevant (SI Report, reference 34.2).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Eni Australia advised it no concerns regarding this activity.	**(1)** **Woodside assessment:** Woodside noted Eni Australia had no concerns regarding this activity. **Woodside response:** Woodside thanked Eni Australia for its feedback.	**(1)** Not required.
(2) Requested to be updated of any material changes.	**(2)** **Woodside assessment:** Woodside will provide notifications to Eni and relevant stakeholders as outlined in Table 7-7 of this EP. **Woodside response:** Woodside confirmed it will contact Eni Australia with activity updates when relevant.	**(2)** Woodside will provide notification of significant change, as appropriate, to Eni Australia, as referenced in Table 7-7 of the EP.

While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Eni Australia for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Eni Australia on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Eni Australia with the opportunity to provide feedback over a 5 month period.

Finder Energy

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Finder Energy advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- **(1)** On 1 March 2024, Finder Energy emailed Woodside and advised it had no objections or feedback for this activity (SI Report, reference 8.1).
- **(1)** On 6 March 2024, Woodside thanked Finder Energy for its feedback (SI Report, reference 8.2).
- On 27 March 2024, Woodside provided an activity update to Finder Energy regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).
- **(1)** On 28 March 2024, Finder Energy emailed Woodside and confirmed it had no objections or comments following the update received (SI Report, reference 8.3).
- **(1)** On 2 April 2024, Woodside thanked Finder Energy for its feedback (SI Report, reference 8.4).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Finder Energy advised it had no	**(1)** **Woodside assessment:** Woodside noted Finder Energy had no objections or	**(1)**

objections or feedback for this activity.	feedback for this activity. **Woodside response:** Woodside thanked Finder Energy for its feedback.	Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Finder Energy for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Finder Energy on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to Finder Energy over a 5 month period.

Jadestone Energy

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Jadestone Energy advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Jadestone Energy, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Jadestone Energy regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and	No additional measures or controls are required.

	Revision process (see Section 7.2.5 of this EP).	

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Western Gas for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Jadestone Energy on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Jadestone Energy with the opportunity to provide feedback over a 5 month period.

KUFPEC

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed KUFPEC advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to KUFPEC, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 26 March 2024, KUFPEC emailed Woodside (SI Report, reference 25.1) and:
  - **(1)** asked Woodside to confirm the location coordinates of Xena-03 well.
  - **(2)** requested to be kept informed of any planned offshore interactions.
- On 27 March 2024, Woodside emailed KUFPEC (SI Report, reference 25recfishwest.2) and:
  - **(1)** advised of an update to 4 well coordinates, including the Xena-03 well.
  - **(2)** confirmed it will inform KUFPEC prior to and on completion of activities.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) KUFPEC asked for confirmation on the Xena-03 well location.	**(1)** **Woodside assessment:** Woodside reviewed the information provided on the Consultation Information Sheet and the planned well locations to answer	**(1)** Not required.

	KUFPEC's question. **Woodside response:** Woodside provided KUFPEC with an update on 4 well locations, including Xena-03.	
(2) KUFPEC requested to be kept informed of offshore activities as part of this EP.	**(2)** **Woodside assessment:** Woodside will provide notifications to KUFPEC and relevant stakeholders as outlined in Table 7-7 of this EP. **Woodside response:** Woodside confirmed it will inform KUFPEC prior to and on completion of activities.	**(2)** Woodside will provide notifications to KUFPEC (see Table 7-7 of this EP) ten days before activity commences, and following completion of activities, as referenced as PS 1.10 of this EP.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with KUFPEC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to KUFPEC on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to KUFPEC over a 5 month period.

Santos NA Energy Holdings / Santos Ltd / Santos WA Northwest / Santos Offshore / Santos WA Southwest / Santos (BOL) / Santos WA PVG

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Santos advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- **(1)** On 8 March 2024, Santos emailed Woodside and advised it had no comments for this EP (SI Report, reference 9.1).
- **(1)** On 1 March 2024, Woodside thanked Santos for its feedback (SI Report, reference 9.2).

- On 27 March 2024, Woodside provided an activity update to Jadestone Energy regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Santos advised it had no comments on this EP.	**(1)** **Woodside assessment:** Woodside noted Santos had no comments for this EP. **Woodside response:** Woodside thanked Santos for its feedback.	**(1)** Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Santos for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Santos on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to Santos over a 5 month period.

Coastal Oil and Gas / Fox Resources

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Coastal Oil and Gas advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 29 February 2024, Woodside received a system generated email notification advising the email address used is not working. Woodside attempted to find new contact details for Coastal Oil and Gas.
- On 11 March 2024, Woodside emailed Fox Resources (Record of Consultation, reference 2.20) as the key Principal of Coastal Oil and Gas advising of the proposed activity, provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the*

community.

- On 18 March 2024, Woodside sent an email reminder to Fox Resources, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Fox Resources regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Coastal Oil and Gas / Fox Resources for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Coastal Oil and Gas / Fox Resources Australia on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Coastal Oil and Gas / Fox Resources with the opportunity to provide feedback over a 5 month period.

Bounty Oil and Gas

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Bounty Oil and Gas advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Bounty Oil and Gas, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Bounty Oil and Gas regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Bounty Oil and Gas for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Bounty Oil and Gas on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Bounty Oil and Gas with the opportunity to provide feedback over a 5 month period.

OMV Australia

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed OMV Australia advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- 2024, Woodside sent an email reminder to OMV Australia, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to OMV Australia regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and	No additional measures or controls are required.

	Revision process (see Section 7.2.5 of this EP).	

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with OMV Australia for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to OMV Australia on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided OMV Australia with the opportunity to provide feedback over a 5 month period.

KATO Energy / KATO Corowa

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed KATO advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to KATO, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to KATO regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with KATO for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to KATO on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided KATO with the opportunity to provide feedback over a 5 month period.

INPEX Alpha

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed INPEX Alpha advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to INPEX Alpha, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to INPEX Alpha regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with INPEX Alpha for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to INPEX Alpha on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.

- Woodside has provided INPEX Alpha with the opportunity to provide feedback over a 5 month period.

JX Nippon O&G Exploration (Australia)

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed JX Nippon O&G Exploration advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to JX Nippon O&G Exploration, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to JX Nippon O&G Exploration regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with JX Nippon O&G Exploration for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to JX Nippon O&G Exploration on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided JX Nippon O&G Exploration with the opportunity to provide feedback over a 5 month period.

Vermilion Oil & Gas

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Vermilion Oil & Gas advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation

Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*

- On 18 March 2024, Woodside sent an email reminder to Vermilion Oil & Gas, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Vermilion Oil & Gas regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Vermilion Oil & Gas for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Vermilion Oil & Gas on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Vermilion Oil & Gas with the opportunity to provide feedback over a 5 month period.

Beagle No.1

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Beagle No.1 advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 18 March 2024, Woodside sent an email reminder to Beagle No.1, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to beagle No.1 regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Beagle No.1 for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Beagle No.1 on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Beagle No.1 with the opportunity to provide feedback over a 5 month period.

JX Nippon O&G Exploration Australia

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed JX Nippon advising of the proposed activity (Record of Consultation, reference 2.19), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- On 18 March 2024, Woodside sent an email reminder to JX Nippon, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to JX Nippon regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and	No additional measures or controls are required.

	Revision process (see Section 7.2.5 of this EP).	

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with JX Nippon for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to JX Nippon on 28 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided JX Nippon with the opportunity to provide feedback over a 5 month period.

Peak Industry Representative bodies

Australian Energy Producers (AEP)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed AEP advising of the proposed activity (Record of Consultation, reference 2.21), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- On 18 March 2024, Woodside sent an email reminder to AEP, following up on the proposed activity (Record of Consultation, reference 3.1) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to AEP regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with AEP for the purpose of regulation 25 is

complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to AEP on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided AEP with the opportunity to provide feedback over a 5 month period.

Traditional Custodians and nominated representative corporations

Murujuga Aboriginal Corporation (MAC)

MAC is established under the Burrup and Maitland Industrial Estates Agreement and is the representative body for the Traditional Custodians for Murujuga being the Ngarluma, the Mardudhunera, the Yaburara, the Yindjibarndi and the Wong-Goo-Tt-Oo peoples (collectively Ngarda-Ngarli). MAC is the cultural authority for Murujuga and is responsible for the management and protection of its cultural values.

Historical Engagement:

- **(1)** On 1 September 2023, MAC emailed a letter to Woodside (SI Report, reference 14.1) noting the following:
  - The women in its Circle of Elders are the right people to consult with.
  - MAC notes that it would be extremely unusual for knowledge to be held by an individual without surrounding groups knowing about it.
  - The Circle of Elders represent the Ngarda-Ngarli; the collective term for the Traditional Custodians who look after Murujuga Country.
- **(1)** On 14 December 2023, Woodside met with the MAC Board, Circle of Elders and CEO in Karratha (SI Report, reference 14.2) to discuss accepted EPs as well as upcoming EPs being submitted in 2024. The meeting also reconfirmed MAC as the cultural authority over Murujuga and spoke to the specific authority of its senior law men and women.

Summary of information provided and record of consultation for this EP:

- On 1 March 2024, Woodside emailed MAC advising of the proposed activity (Record of Consultation, reference 2.27), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that MAC and its members may have within the EMBA, information on how MAC would like to engage, and requested that MAC provide information to other individuals as required.
- On 23 April 2024, Woodside emailed MAC to follow up on this activity, to offer further information, answer queries or attend a meeting if required (SI Report, reference 14.3).
- On 23 April 2024, MAC emailed Woodside indicating it did not recall seeing the original notification, acknowledging the lack of resources for the workload, and indicated it

would consider the matter and respond (SI Report, reference 14.4).

- On 23 April 2024, Woodside emailed MAC and offered assistance to make the process easier (SI Report, reference 14.5).
- On 23 April 2024, MAC emailed Woodside (SI Report, reference 14.6) and raised the following:
  - **(2)** The lack of broader-scale bathymetric information on the submerged landscape and the potential for impact on jinna (songlines).
  - **(3)** That MAC had no specific knowledge of tangible or intangible heritage that may be impacted.
  - **(4)** The size of the EMBA and management procedures in place to protect cultural values in addition to environmental values.
  - **(5)** That the EP capture a process for engaging with MAC to protect cultural, heritage and Outstanding Universal Values in the event of an incident.
  - **(6)** That it recommended Woodside also consult Ngarluma Aboriginal Corporation.
- On 26 April 2024, Woodside emailed MAC advising it would seek information to respond to MAC's feedback (SI Report, reference 14.7).
- On 8 May 2024, Woodside emailed MAC to provide further information including:
  - **(2)** Woodside's continued support to work with MAC to undertake mapping of areas significant to MAC.
  - **(2)** Woodside's continued support to undertake further ethnographic surveys focussed on jinna at MAC's convenience.
  - **(3)** That Woodside welcomed MAC's advice on identifying cultural features and values in the absence of information from further surveys and mapping.
  - **(4)** How the EMBA is determined.
  - **(5)** How Woodside uses modelling to develop response plans in the unlikely event of an incident, including notification requirements to Traditional Custodians.
  - **(6)** That Woodside has also consulted with Ngarluma Aboriginal Corporation on this activity.

Ongoing Relationship:

- Woodside has continued consultation with MAC on other activities unrelated to this EP.
- Woodside continues to pursue an ongoing two-way relationship with MAC on future opportunities to work together.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) On 1 September 2023, MAC advised that it was the appropriate body corporate and cultural authority over Murujuga.	**(1)** **Woodside assessment:** Woodside accepts and respects MAC's position as the appropriate body corporate and cultural authority over Murujuga. **Woodside response:** Woodside continues to consult and engage with MAC as the appropriate body corporate and cultural authority over Murujuga.	**(1)** Not required.
(2) On 23 April 2024, MAC raised that there was a lack of broader-scale bathymetric information for the trunkline area and the	**(2)** **Woodside Assessment:** Woodside acknowledges MAC's position that there is a lack of bathymetric information. Woodside notes that this EP is for continued operation of existing infrastructure. The EP includes the Unexpected Finds	**(2)** Cultural features and heritage values including jinna (songlines) are identified and assessed in Sections 4.9 and 6.11 of the EP.

impact on jinna (songlines).	Procedure (Section 7.6) which addresses the risk of discovery of potential underwater cultural material. **Woodside Response:** Woodside has previously proposed to MAC that MAC work to determine a scope of works to determine further bathymetric information on the area. This proposal is under consideration by MAC and Woodside remains supportive of undertaking this work. Woodside also remains supportive of conducting further ethnographic surveys with MAC, following the initial phase of works in 2020 which focussed on jinna and their connection from Murujuga to inland areas.	
(3) On 23 April 2024, MAC advised they have no specific knowledge of tangible or intangible heritage that might be impacted.	**(3)** **Woodside Assessment:** Woodside uses multiple sources of information including publicly available literature, heritage databases and feedback from consultation in order to identify tangible and intangible cultural features of the environment, as described in Sections 4.9 and 6.11. **Woodside Response:** Woodside recognises the difficulty MAC faces in identifying tangible and intangible heritage on the submerged continental shelf in the absence of bathymetric mapping and ethnographic assessment of the results. In June 2023 Woodside proposed a project to MAC that would undertake mapping of areas identified by MAC as a priority in understanding this landscape. MAC has not accepted this proposal and through several meetings with MAC between July 2023 and February 2024 Woodside understands that MAC intends to issue a modified proposal to conduct this work.	**(3)** Cultural features and heritage values are identified and assessed in Sections 4.9 and 6.11 of the EP.
(4) On 23 April 2024, MAC noted the size of the EMBA and management procedures in place to protect cultural values.	**(4)** **Woodside Assessment**: Woodside aligns with industry guidance in developing the EMBA. Many replicate model simulations are completed to understand the potential behaviour of the worst-case release under various wind, wave and current conditions and these are combined to create an overall EMBA. Woodside welcomes any advice MAC provides on identifying cultural features or heritage values within the EMBA. **Woodside Response:** The EMBA for this activity is determined by a highly unlikely release of marine diesel as the result of damage to the production facility or vessel collision. Woodside considers it adopts appropriate controls to prevent a hydrocarbon spill and controls to respond in the highly unlikely event	**(4)** Woodside has addressed oil spill preparedness and response strategy in Appendix H.

	of a hydrocarbon spill, as demonstrated in Sections 6.9 of the EP, and Appendix I.	
(5) On 23 April 2024, MAC advocated for a process for engagement to protect cultural heritage and Outstanding Universal values in the event of an incident.	**(5)** **Woodside Assessment:** Woodside accepts MAC's advice on the need for engagement in the event of an incident. **Woodside Response:** Consultation with relevant Traditional Custodian representatives, including MAC, in the event of an incident is already anticipated under our oil spill response plan.	**(5)** Woodside has addressed oil spill preparedness and response strategy in Appendix H.
(6) On 23 April 2024, MAC advised that Woodside should consult with Ngarluma Aboriginal Corporation.	**(5)** **Woodside Assessment:** Woodside accepts MAC's advice on the need to consult with NAC. **Woodside Response:** Woodside has consulted with NAC as a relevant person for this EP.	**(5)** Woodside has consulted with NAC as outlined in Appendix F.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with MAC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to MAC on 1 March 2024 based on their functions, interests or activities. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity in a digestible, plain English format.
- Woodside sought direction on MAC's preferred method of consultation.
- Woodside asked MAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. MAC identified Ngarluma Aboriginal Corporation (NAC) as a relevant group to consult. Woodside is already consulting with NAC on this EP.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided MAC with the opportunity to provide feedback over a 5-month period.

- Woodside engages with ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of the EP). Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on MAC's functions, interests or activities.

Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC)

NTGAC is established under the Native Title Act 1993 by the Baiyungu people to represent the Baiyungu people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- **(1)** On 17 July 2023, in response to consultation requests on activities not relevant to this EP, NTGAC/YMAC provided Woodside with a proposed consultation framework for PBC's to consult with oil and gas companies (SI Report, reference 15.1). It requested that Woodside run a strategic planning workshop with NTGAC to discuss the consultation framework and determine the best way to implement it.
- On 24 July 2023, Woodside replied to NTGAC/YMAC's email of 17 July 2023 confirming it supported the proposed workshop and suggested it be jointly run. Woodside requested a preparation meeting (SI Report, reference 15.2).
- **(1)** On 25 July 2023, Woodside emailed NTGAC/YMAC its planned Program of Ongoing Engagement with Traditional Custodians (SI Report, reference 15.3).
- **(1)** On 15 August 2023, Woodside presented to NTGAC/YMAC about several activities unrelated to this EP (SI Report reference 15.4). At the meeting, a proposed framework for consultation was discussed. It was proposed Woodside fund an independent consultant to write a general project report.
- **(1)** On 31 August 2023, Woodside emailed NTGAC/YMAC confirming outcomes of the meeting held on 15 August 2023, including that YMAC would provide a first draft of a consultation agreement (SI Report, reference 15.5).
- **(1)** On 14 December 2023, Woodside emailed YMAC a Program of Ongoing Consultation and advised that Woodside wanted to progress negotiations on consultation frameworks with groups represented by YMAC (including NTGAC) (SI Report, reference 15.6). Woodside proposed the protocol include (among other things):
  - The procedures Woodside will follow when a submission requires consultation.
  - Initial and ongoing consultation in relation to activities.
  - Agreement as to how Woodside will provide NTGAC with the information NTGAC requires to make free, prior and informed decisions about Woodside's EPs.
  - Agreement as to how NTGAC will provide feedback and how that can best be represented in EPs.
  - An agreed schedule of rates for NTGAC's participation in consultation.
  - How the outputs of the consultations will be managed.
- On 21 December 2023, Woodside emailed NTGAC/YMAC a list of upcoming activities, including this activity (SI Report, reference 15.7).
- **(1)** On 28 February 2024, Woodside emailed NTGAC/YMAC a letter (SI Report, reference 15.8) setting out the draft terms of an agreement between NTGAC and Woodside, the agreement (among other things) included the following topics:
  - Sufficient Information

- Reasonable Period
- Provision of Information
- Objection or claims
- Publications
- Cost and termination.

- On 29 February 2024, NTGAC/YMAC emailed Woodside acknowledging receipt of the information (SI Report, reference 15.9).

Summary of information provided and record of consultation for this EP:

- On 20 March 2024, Woodside emailed NTGAC via YMAC advising of the proposed activity (Record of Consultation, reference 2.28), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that NTGAC and its members may have within the EMBA, information on how NTGAC would like to engage, and requested that NTGAC provide information to other individuals as required.
- On 26 March 2024, NTGAC/YMAC emailed Woodside with an out of office message advising the recipient was on leave until 2 April 2024 and providing a contact for urgent queries (SI Report, reference 15.10).
- On 12 April 2024, Woodside emailed NTGAC/YMAC to offer further information and any assistance required including a meeting or discussion (SI Report, reference 15.11). No reply was received.
- On 16 May 2024, Woodside emailed NTGAC via YMAC to seek the availability of the Board to meet with Woodside to consult on Environment Plans (SI Report, reference 15.12).
- On 21 May 2024, NTGAC via YMAC emailed Woodside to confirm the Board would meet in July, that the agenda was quite full and they would update Woodside to confirm the Board's availability (SI Report, reference 15.13).
- On 21 May 2024, Woodside emailed NTGAC via YMAC to acknowledge their email and advise Woodside was keen to plan meeting requests around the Board's availability (SI Report, reference 15.14).
- On 21 May 2024, NTGAC via YMAC emailed Woodside with acknowledgement and thanks (SI Report, reference 15.15).
- On 19 June 2024, Woodside emailed NTGAC via YMAC to follow up on the opportunity to meet the Board and consult on Environment Plans (SI Report, reference 15.16). No response has been received.
- On 27 June 2024, Woodside emailed NTGAC via YMAC seeking an update on their review of the draft consultation agreement sent in February 2024 (SI Report 15.17).
- **(1)** On 28 June 2024, NTGAC via YMAC emailed Woodside (SI Report, reference 15.18) to advise:
  - NTGAC was keen to progress the Consultation Agreement and would revise the draft provided by Woodside.
  - A meeting date for the Board was being sought at which the Agreement and upcoming EPs could be discussed.
  - A cost estimate was provided.
- **(1)** On 1 July 2024 Woodside emailed NTGAC via YMAC to provide a Word copy of the draft agreement as requested and to offer further support if required (SI Report,

reference 15.19).

- On 10 July 2024, NTGAC via YMAC emailed Woodside confirming receipt of the draft agreement and confirming they would review the Agreement and provide a meeting date as soon as possible (SI Report, reference 15.20).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) NTGAC via YMAC to develop first draft of a Consultation Agreement.	**(1)** **Woodside assessment:** Woodside is supportive of a sustainable consultation framework and has a commitment to ongoing consultation with Traditional Custodians for the life of an EP. **Woodside response:** Separate from consultation for this activity under regulation 25 of the Environment Regulations, Woodside has sent a draft agreement to NTGAC via YMAC in February 2024. This would be used to frame ongoing consultation to occur as part of Woodside's commitment to consultation post regulation 25 of the Environment Regulations. The draft agreement is under review by NTGAC/YMAC.	**(1)** Woodside is implementing a program to actively support Traditional Custodians' capacity for ongoing engagement and consultation on EPs (Appendix G). This includes continued engagement regarding NTGAC and Woodside's proposed draft Consultation Agreement and potential opportunities for alignment with NTGAC's Strategic Plan. Although consultation for the purpose of regulation 25 of the Environment Regulations is complete, Woodside will continue to consult following acceptance of the EP, as required by the implementation strategy as set out in regulation 35(7) of the Environment Regulations.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with NTGAC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to NTGAC on 20 March 2024 based on their functions, interests or activities. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity in a digestible, plain English format.

- Woodside sought direction on NTGAC's preferred method of consultation.
- Woodside asked NTGAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided NTGAC with the opportunity to provide feedback over a 5 month period.
- Woodside engages with ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of the EP).
- Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on NTGAC's functions, interests or activities.

Buurabalayji Thalanyji Aboriginal Corporation (BTAC)

BTAC is established under the Native Title Act 1993 by the Thalanjyi people to represent the Thalanjyi people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- On 20 February 2023, BTAC emailed Woodside (SI Report reference 16.1) a letter in relation to another project but relevant to all Woodside activities, including the footprint of this activity. BTAC stated that the Thalanyi people:
  - **(1)** Had interests extending out to islands off the Pilbara coast such as the Montebello islands, Barrow Island and the Mackerel Islands.
  - **(2)** Had an enduring deep connection to sea country north of Onslow but needed support to articulate this in a format suitable for consultation.
  - **(3)** Required support from Woodside to obtain technical advice about risks to Sea Country.
  - **(4)** Requested Woodside support BTAC's ranger program to carry out response planning and management activities.
  - **(5)** Required a consultation or engagement framework with Woodside that included resourcing for BTAC's participation in consultation and management planning processes.
- **(2, 3)** On 17 March 2023, Woodside emailed BTAC a letter in relation to another EP. Among other things, Woodside offered to provide resources necessary for BTAC to obtain independent expert environmental management advice. Woodside also offered to support BTAC acquire anthropological advice (SI Report, reference 16.2).
- **(5)** On 19 June 2023, BTAC emailed Woodside on another activity and discussed draft consultation framework principles and consultation rates (SI Report reference 16.3).
- **(5)** On 10 July 2023, Woodside emailed BTAC acknowledging that Woodside commits to a program of ongoing consultation and will be governed by a framework agreement (SI Report reference 16.4).
- **(5)** On 26 July 2023, Woodside emailed BTAC Woodside's planned Program of Ongoing Engagement with Traditional Custodians (SI Report reference 16.5).
- On 28 July 2023, Woodside and BTAC met virtually. The outcomes of this meeting were captured in an email (SI Report, reference 16.6). Matters included:
  - **(5)** Woodside's agreement to prepare a draft framework agreement for consideration.

- **(5)** Funding for future engagement.
- **(2)** Cultural values mapping of offshore areas and capacity building.

- On 31 July 2023, Woodside emailed three letters to BTAC, two of which related to other Woodside activities (SI Report reference 16.7). The third letter outlined support for an ethnographic assessment to:
  - **(2)** Identify sea country values generally sufficient to inform all Woodside EPs.
  - **(1)** Support work necessary to clarify or define the offshore areas that are relevant to the Thalanyji People.
  - Propose the delivery of interim reports if this will enable prioritising matters considered most critical by BTAC.
  - **(2)** Confirm Woodside will be responsible for reasonable costs to complete the assessment.
  - Confirm BTAC retains intellectual property.

- **(5)** On 14 September 2023, BTAC emailed two letters to Woodside (SI Report, reference 16.8):
  - Support for ongoing engagement and consultation for Environment Plan through a consultation agreement.
  - Cost recovery to assist consultation for NOPSEMA-related matters.

- **(5)** On 20 September 2023, BTAC emailed Woodside, requesting a response from Woodside to its letter of 14 September 2023 and seeking an update on the status of the consultation agreement (SI Report reference 16.9).
- **(5)** On 22 September 2023, Woodside emailed BTAC a signed copy of its costs recovery letter, the list of activities for which Woodside has consulted BTAC, and advised that the draft consultation agreement was under review (SI Report reference 16.10).
- On 26 September 2023, BTAC responded to Woodside's email of 22 September 2023 and confirmed BTAC would be assisted by a legal representative (SI Report reference 16.11).
- **(5)** On 13 October 2023, BTAC's legal representative emailed Woodside and, among other things, advised BTAC required an indemnity clause in the proposed consultation agreement against any court action arising from its consultation on Woodside EPs (SI Report reference 16.12).
- **(5)** On 2 November 2023, Woodside emailed BTAC's legal representative noting it would not agree to the request to indemnify BTAC against any court proceedings resulting from consultation. Woodside re-iterated its wish to progress the consultation agreement and deliver on its commitment to map BTAC's sea country values (SI Report reference 16.13).
- **(5)** On 18 November 2023, in response to requests from BTAC's legal representative, Woodside provided further information about its response to BTAC'S indemnification request. Among other things, Woodside explained that it could harm genuine engagement. Woodside again noted its commitment to build an ongoing relationship with BTAC (SI Report reference 16.14).
- On 27 November 2023, Woodside attended and presented to the BTAC Common Law Holders meeting (SI Report, reference 16.15). Matters discussed included:
  - **(2)** Woodside's offer to fund Sea Country mapping, which BTAC had yet to take up.
  - **(5)** Progress of a consultation agreement between BTAC and Woodside.

- On 7 December 2023, Woodside emailed BTAC and attached correspondence sent to the previous CEO (SI Report, reference 16.16). The correspondence included

information about:

- **(2)** Woodside's support for articulating and understanding sea country values, including ethnographic/anthropological mapping.
- **(4)** Woodside's commitment to engage in ongoing consultation for the purpose of ongoing monitoring, management and emergency response.
- **(3)** Woodside's support for BTAC to obtain independent environmental management advice.
- **(1)** Information about BTAC's interest in archaeological sites on nearshore islands including the Montebello and Barrow Islands.

- **(2, 3)** On 7 December 2023, BTAC emailed Woodside accepting the offer to take up sea country mapping and research. BTAC requested a meeting in the week of 15 January 2024 to plan for upcoming activities (SI Report reference 16.17).
- On 8 December 2023, Woodside exchanged emails about financial matters relating to the consultation agreement. Woodside noted it required itemised estimates for services (SI Report, references 16.18, 16.19).
- On 17 January 2024, Woodside met with BTAC (SI Report reference 16.20) and discussed (among other things):
  - **(2)** Sea country mapping
  - BTAC prefer early notice on EPs, if possible.
  - **(4)** BTAC keen on employment/training opportunities and opportunities for rangers.
  - BTAC to form a committee for consultation on EPs.
- **(4)** On 17 January 2024, Woodside emailed BTAC information about training pathways as discussed at the meeting with BTAC on 17 January 2024 (SI Report reference 16.21.
- **(2)** On 8 February 2024, Woodside emailed BTAC following up on a quote for Woodside to support BTAC articulating sea country values (SI Report reference 16.22).
- **(5)** On 8 February 2024, BTAC emailed Woodside noting that they have a consultant generating a scope of work for articulating sea country values which will allow BTAC to understand costings (SI Report reference 16.23).
- On 8 February 2024, Woodside emailed BTAC acknowledging their response (SI Report reference 16.24).
- **(5)** On 28 February 2024, Woodside emailed BTAC with a letter (SI Report reference 16.25) setting out the draft terms of a consultation agreement between BTAC and Woodside. The agreement included topics such as: sufficient information, reasonable period, provision of information, objections or claims, publications, and cost and termination.
- On 28 February 2024, BTAC's legal representative emailed Woodside querying funding for legal advice for BTAC (SI Report reference 16.26).
- **(5)** On 28 February 2024, Woodside emailed BTAC's legal representative, noting that BTAC had been seeking a draft Framework Agreement from Woodside, apologising for the delay in providing the draft to BTAC, and that the rate for engagement could be set out in the agreement. In relation to legal advice, Woodside re-iterated that a cost estimate was required and noted that the legal representative's refusal to provide an estimate could be interfering with progressing matters with BTAC. (SI Report reference 16.27)

Summary of information provided and record of consultation for this EP:

- On 1 March 2024, Woodside emailed BTAC (via a legal representative) advising of the proposed activity (Record of Consultation, reference 2.29), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft

policy for managing gender-restricted information. The email requested information on the interests that BTAC and its members may have within the EMBA, information on how BTAC would like to engage, and requested that BTAC provide information to other individuals as required.

- On 5 March 2024, BTAC (via a legal representative) emailed Woodside to request a face-to-face meeting for consultation on this activity, that that no meaningful consultation would talk place until this occurred, and that BTAC would respond shortly to Woodside's email on 28 February 2024 which included a draft consultation agreement for BTAC's review (SI Report reference 16.28).
- On 6 March 2024, Woodside emailed BTAC via a legal representative to indicate its willingness to meet face-to-face and to request a suitable meeting date (SI Report reference 16.29).
- On 11 March 2024, BTAC via a legal representative emailed Woodside to advise it had appointed two liaison committees consisting of BTAC Board members, (a Woodside NOPSEMA Engagement Committee and Macedon ILUA Committee), and requested Woodside meet with the ILUA Committee in the first instance (SI Report reference 16.30).
- On 26 March 2024, Woodside emailed BTAC another notification of this activity and attached a summary information sheet (SI Report reference 16.31).
- On 27 March 2024, BTAC via a legal representative emailed Woodside in response to another activity but attaching the initial email and response from this activity, advising BTAC wished to consult in a face-to-face meeting (SI Report reference 16.32).
- On 27 March 2024, Woodside emailed BTAC via a legal representative thanking BTAC for its email and indicating it would await BTAC's advice on a suitable meeting date (SI Report, reference 16.33).
- Between 15 – 22 April 2024, BTAC and Woodside exchanged emails (SI Report, references 16.34, 16.35, 16.36, 16.37, 16.38) to confirm Woodside would attend a meeting with BTAC Directors on 22 May 2024.
- On 22 May 2024, Woodside and BTAC met for the purpose of consulting on EPs, including this activity (SI Report, reference 16.39). Matters discussed included:
  - An overview of the Pluto Operations activity including the EMBA and possible impacts. No questions were raised.
  - **(3)** BTAC queried support to engage a third-party independent expert to interpret EPs due to an internal lack of expertise.
  - **(2)** Woodside's ongoing commitment to support BTAC to articulate their sea country values. Woodside is awaiting BTAC's advice on their vision for this work.
  - Woodside's interest in understanding BTAC's thoughts on any additional steps for the management of heritage.
  - **(4)** BTAC's interest in training and employment opportunities, particularly for mature candidates. BTAC will provide a list of people seeking employment while Woodside committed to providing information on training opportunities.
- **(4)** On 27 May 2024, Woodside and BTAC exchanged emails on training and employment opportunities (SI Report, references 16.40, 16.41, 16.42).
- On 28 May 2024, BTAC's legal representative emailed Woodside advising he had been instructed to manage all future meetings between the BTAC Board and Woodside and seeking a meeting to discuss a matter unrelated to this EP (SI Report, reference 16.43).
- **(2)** On 13 June 2024, Woodside emailed BTAC to request an update on how Woodside can assist BTAC to articulate sea country values, and offering continued support for this work and an ethnographic survey (SI Report, reference 16.44).
- **(4)** On 18 June 2024, Woodside emailed BTAC with a contact for employment opportunities (SI Report, reference 16.45).
- **(2)** On 19 June 2024, BTAC emailed Woodside a letter in response to the offer to support work to articulate sea country values (SI Report, reference 16.46). The letter

outlined:

- A proposed cultural mapping program to translate cultural values associated with the Thalanyji Area of Interest and appropriately manage impacts to Country.
- That Thalanyji hold data sovereignty of the cultural mapping.
- A scope of works.
- A request that Woodside provide a draft agreement to formalise the cultural mapping program.

- **(2)** On 19 June 2024, Woodside emailed BTAC to provide a focal person for the work on sea country values and committed to engaging with BTAC on the Cultural Mapping Program (SI Report, reference 16.47).
- On 5 July 2024, BTAC emailed Woodside to follow-up on its email/letter of 19 June 2024 (SI Report, reference 16.48).
- On 5 July 2024, Woodside replied to BTAC's email and said it would respond to BTAC's email/letter of 19 June 2024 by the end of the month (SI Report, reference 16.49).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) BTAC stated that its interests include archaeological sites identified on nearshore islands including the Montebello Islands, Barrow Island and the Mackerel Islands.	**(1)** **Woodside Assessment:** Given the EMBA for this activity extends to nearshore areas coastally adjacent to the Thalanyji native title determination area, these values may be relevant in the event of an unplanned hydrocarbon release. Woodside will engage with Traditional Custodians whose interests may be affected in the event of a hydrocarbon release, as outlined in Appendix H. **Woodside Response:** Woodside has sought to engage BTAC in further assessments of sea country values. BTAC has not provided further detail regarding heritage value of places or cultural features of the Operational Area or the EMBA.	**(1)** Existing controls considered sufficient as described in Section 6.9 and Appendix H.
(2) BTAC has a cultural obligation to care for the environmental values of sea country but needed support to articulate these in a format suitable for consultation.	**(2)** **Woodside Assessment:** Woodside assessed BTAC's cultural obligation to care for the environmental values of sea country to represent potential cultural values. **Woodside Response:** Woodside updated relevant sections in the EP to record BTAC's interests and potential cultural values, assessed the potential impact on these and included controls. Woodside agreed to support the articulation and recording of sea country values. This offer has been taken up and progress has commenced towards the desired outcome. The draft Collaboration Agreement at	**(2)** Woodside updated Section 4.9 to record BTAC's interests and potential cultural values and assessed potential impact on these, including controls, in Section 6.11. The proposed Consultation Agreement **(5)** enables an ethnographic survey to be undertaken at a later date but is not required to discharge regulation 25 of the Environment Regulations requirements. Should feedback be

	(5) below includes support for recording and articulation of Sea Country values.	received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5).
(3) Requested Woodside supports BTAC in obtaining technical advice relating to proposed activities.	**(3)** **Woodside Assessment:** In February 2024, BTAC engaged a consultant who is completing a scope of work to inform BTAC of costings for articulating sea country values (see **(2)** above). Woodside considers it beneficial for Thalanyji to have technical advice to ensure the delivery of an outcome that does justice to the work involved to record the sea country values. **Woodside Response:** Woodside has offered financial support for technical advice and other support, which has been accepted. The draft Collaboration Agreement (see **(6)** below) includes technical support for recording of sea country values.	**(3)** Not required.
(4) Expressed desire to be involved in local emergency response capability, potentially via an Indigenous Ranger Program. Interested in opportunities for employment/training.	**(4)** **Woodside Assessment:** Woodside considers value in having rangers on the ground trained up in the highly unlikely event of an oil spill. It would be beneficial to an immediate response in an emergency situation. **Woodside Response:** Woodside has offered to support BTAC to engage in management and emergency response. In January 2024 Woodside provided BTAC with information about a training/employment program.	**(4)** The Program for Ongoing Engagement with Traditional Custodians (**Appendix G**) includes consideration of programs to support Indigenous Rangers, and support for Indigenous oil spill response capabilities.
(5) BTAC proposed a Consultation Agreement as an appropriate mechanism to provide ongoing feedback to Woodside regarding its activities. This would include cost recovery to assist consultation for NOPSEMA-related matters.	**(5)** **Woodside Assessment:** This aligns with Woodside's Program of Ongoing Engagement with Traditional Custodians and will frame ongoing consultation processes. **Woodside Response:** Separate from consultation under regulation 25 of the Environment Regulations, Woodside has drafted a consultation agreement between BTAC and Woodside. The agreement was sent to BTAC in February 2024. The agreement includes support for recording and articulation of Sea	**(5)** As identified in Section 7.10 of this EP, Woodside will continue to consult following acceptance of the EP, as required by the implementation strategy as set out in regulation 35(7) of the Environment Regulations. This includes continued engagement regarding the Collaboration Agreement that Woodside seeks with BTAC, a draft of which includes support for BTAC to define and articulate sea values,

	Country values. Woodside has signed a cost acceptance letter and has informed BTAC it will financially support consultation meetings. Information about costs is also contained in the draft consultation agreement.	provision of ongoing feedback and cost recovery.
Woodside has addressed objections and claims as noted above.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with BTAC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

Sufficient Information:

- Woodside sought direction on BTAC's preferred method of consultation. Woodside has offered to coordinate meetings at the location of BTAC's choosing, with BTAC nominated representatives. BTAC has exchanged multiple correspondence on a consultation agreement with Woodside and has nominated a May meeting date with the Board. As sufficient information and a reasonable period have been provided, any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Summary Sheets developed by Indigenous staff to BTAC. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.
- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the consultation and information sheets to be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that BTAC could request the particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Woodside has provided BTAC with the opportunity to provide feedback over a 4 month period, demonstrating a "reasonable period" of consultation. Woodside asked BTAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified. Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5.2 of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on BTAC's functions, interests or activities.

Yinggarda Aboriginal Corporation (YAC)

YAC is established under the Native Title Act 1993 by the Yinggarda people to represent the Yinggarda people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- On 19 July 2023, Woodside emailed YAC via GAC NOPSEMA's Consultation Guidelines, Consultation Brochure, and Draft Policy for Managing Gender-Restricted Information (SI Report, reference 17.1). This email also reiterated Woodside's request that YAC advise Woodside of any other Traditional Custodian groups or individuals with whom Woodside should consult.
- On 26 July 2023, Woodside emailed YAC via GAC Woodside's planned Program of Ongoing Engagement with Traditional Custodians (SI Report, reference 17.2).
- **(1, 2)** On 4 August 2023, YAC legal representative emailed Woodside requesting Woodside submit a consultation agreement for YAC's consideration and provide funding (SI Report, reference 17.3).
- **(2)** On 10 August 2023, YAC legal representative emailed Woodside (SI Report, reference 17.4) noting that the YAC Board had not had the opportunity to form a view of what feedback it wished to provide Woodside. The email requested appropriate resources and time, including legal advice, be approved by Woodside to allow YAC to consider NOPSEMA matters.
- On 11 August 2023, Woodside emailed YAC via its legal representative (SI Report, reference 17.5) outlining:
  - **(2)** the process required for funding approval
  - **(1)** that Woodside would shortly send through a Draft Consultation Agreement.
- **(1,2)** On 14 August 2023, YAC via its legal representative emailed Woodside stating it looked forward to receiving the consultation agreement for consideration and agreed to the arrangements for resourcing (SI Report, reference 17.6).
- **(1)** On 13 September 2023, YAC via legal representative emailed Woodside in response to another activity, advising that in the absence of a draft consultation agreement it was unable to respond in substance to matters raised (SI Report, reference 17.7).
- **(1)** On 14 September 2023, Woodside emailed YAC via its legal representative a proposed consultation framework (SI Report, reference 17.8).
- On 14 September 2023, YAC via its legal representative confirmed receipt of the consultation framework and advised it would seek direction from the YAC board (SI Report, reference 17.9).
- On 13 October 2023, YAC's legal representative emailed Woodside (SI Report, reference 17.10). Among other things, it noted, YAC required an indemnity and hold harmless clause be included in the Framework Agreement to protect against potential exposure to activist litigation.
- On 2 November 2023, Woodside emailed YAC's legal representative advising it did not agree to the request to indemnify YAC against activist litigation (SI Report, reference 17.11).
- On 2 November 2023, YAC via legal representative emailed Woodside requesting information on Woodside's position on indemnification in the consultation agreement

(SI Report, reference 17.12).

- On 18 November 2023, Woodside emailed YAC via legal representative with further information about why it would not indemnify YAC as requested in the 13 October 2023 email (SI Report, reference 17.13). Among other things, Woodside explained it could harm genuine engagement.
- **(1,2)** On 8 March 2024 Woodside emailed YAC via a legal representative (SI Report, reference 17.14) with a draft consultation agreement for consideration by YAC and an invitation for YAC to propose a schedule of rates and other details relating to engagement. The draft agreement included:
  - Aims of consultation.
  - Proposed consultation agreement details.
  - A consultation meeting framework.
- **(2)** On 12 March 2024, YAC via a legal representative emailed Woodside a proposed schedule of rates and indicated it would wait for a response before putting the consultation agreement before the YAC Board (SI Report, reference 17.15).

Summary of information provided and record of consultation for this EP:

- On 26 March 2024, Woodside emailed YAC via a legal representative advising of the proposed activity (Record of Consultation, reference 2.30), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that YAC and its members may have within the EMBA, information on how YAC would like to engage, and requested that YAC provide information to other individuals as required.
- **(2)** On 27 March 2024, YAC via a legal representative emailed Woodside confirming YAC wished to consult on the activity and required its proposed Schedule of Fees to be accepted before proceeding with consultation (SI Report, reference 17.16).
- On 27 March 2024, Woodside emailed YAC via a legal representative advising it would follow up the status of Woodside's response (SI Report, reference 17.17).
- **(2)** On 4 April 2024, Woodside emailed YAC via a legal representative advising that Woodside had reviewed the Proposed Schedule Rates and asked for the date of the next Board meeting. (SI Report, reference 17.18).
- **(2)** On 8 April 2024, YAC via its legal representative emailed Woodside (SI Report, reference 17.19) advising the next YAC Board meeting would be held on 9 May 2024. The legal representative asked if Woodside would fund the cost of the meeting, how much time Woodside would require and asked for a list of matters for discussion to enable the preparation of a cost estimate for legal fees.
- **(2)** On 10 May 2024, Woodside emailed YAC via its legal representative (SI Report, reference 17.20) a request to meet with Yinggarda either during or outside of a Board meeting, for 3 hours at YAC's preferred location. Woodside agreed to fund the meeting and requested a cost estimate. Proposed matters for discussion included:
  - EP consultation: overview and EPs current at the time of meeting.
  - Upcoming consultation.
  - Matters Yinggarda would like to discuss.
  - Actions arising and next steps.
- On 20 June 2024, Woodside emailed YAC via legal representative, following up on the 10 May email and an email on another activity, to ask if the YAC Board would like to meet with Woodside for the purpose of consultation (SI Report, reference 17.21).

- On 20 June 2024, YAC via legal representative emailed Woodside to confirm approval to proceed with a meeting between Woodside and the YAC Board (SI Report, reference 17.22).
- On 20 June 2024, Woodside emailed YAC via legal representative to acknowledge the upcoming meeting (SI Report, reference 17.23).
- On 12 July 2024, Woodside emailed YAC offering support for the YAC Board meeting (SI Report, reference 17.24).
- On 15 July 2024, YAC phoned Woodside to enquiry about availability to attend its Board meeting on 18 July 2023 (SI Report, reference 17.25).
- On 16 July 2024, YAC confirmed details about its meeting and provided details about costs (SI Report, reference 17.26).
- On 16 July 2024, Woodside replied to YAC's email regarding details for the meeting on 18 July 2024 (SI Report, reference 17.27).
- On 18 July 2024, Woodside met with the YAC Board (SI Report, reference 17.28). Matters discussed relating to this EP included:
  - **(3)** Support for education and training including ranger programs.
  - **(1)** Possibility of setting up workshops to discuss the formalisation of an agreement between Woodside and YAC.
- **(3)** On 26 July 2024, Woodside emailed YAC. Among other things, Woodside said it would keep YAC informed about ranger initiatives (SI Report, reference 17.29)

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) YAC requested a consultation agreement with Woodside and stated that it was unable to respond substantially until Woodside has provided a draft Consultation Framework Agreement.	**(1)** **Woodside assessment:** An agreement with YAC aligns with Woodside's Program of Ongoing Engagement with Traditional Custodians and will frame ongoing consultation processes. **Woodside response:** Woodside will finalise an agreement with YAC, although Woodside does not consider YAC's request for a consultation agreement as a pre-requisite for consultation under regulation 25 of the Environment Regulations. Sufficient information to allow informed assessment has already been provided by other means, including summary sheets developed by Indigenous staff. Woodside has also provided a reasonable period and opportunity for consultation. The draft agreement sent to YAC in September 2023, will be used to frame ongoing consultation during the life of the EP. Woodside are waiting on a response from YAC.	**(1)** Woodside's program to actively support Traditional Custodians' capacity for ongoing engagement and consultation on EPs is currently being implemented, the draft agreement with YAC (among other things) will set out the process for ongoing engagement. This is described further in the Program of Ongoing Engagement with Traditional Custodians (Appendix G).
(2) YAC requested resourcing to engage in ongoing consultation.	**(2)** **Woodside assessment:** Woodside supports reasonable requests for resourcing. **Woodside response:** Woodside will cover agreed costs for the purpose of	**(2)** The Consultation Agreement will support any reasonable requests for funding for the purposes of consultation.

	meeting for consultation on EPs. The proposed agreement outlined in **(1)**, would be an effective mechanism to address resourcing for ongoing consultation.	
(3) YAC has enquired about support for education and training including ranger programs.	**(3)** **Woodside assessment:** Woodside considers value in having rangers on the ground trained up in the highly unlikely event of an oil spill. It would be beneficial to an immediate response in an emergency situation. **Woodside response:** Woodside looks forward to hearing about YAC's plans for a ranger program and will keep YAC informed about Woodside's consideration of ranger initiatives.	**(3)** The Program for Ongoing Engagement with Traditional Custodians (**Appendix G**) includes consideration of programs to support Indigenous Rangers, and support for Indigenous oil spill response capabilities.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with YAC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

Sufficient Information:

- Woodside sought direction on YAC's preferred method of consultation. Woodside has offered to coordinate meetings at the location of YAC's choosing, with YAC nominated representatives. YAC has exchanged multiple correspondence on a consultation agreement with Woodside and has nominated a May meeting date with the Board. As sufficient information and a reasonable period have been provided, any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Summary Sheets developed by Indigenous staff to YAC. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.
- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the consultation and information sheets to be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that YAC could request the particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Woodside has provided YAC with the opportunity to provide feedback over a 4 month period, demonstrating a "reasonable period" of consultation.

Woodside asked YAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.

Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5. of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on YAC's functions, interests or activities.

Kariyarra Aboriginal Corporation (Kariyarra)

Kariyarra is established under the Native Title Act 1993 by Kariyarra people to represent the Kariyarra people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- **(1)** On 31 August 2023, KAC via legal representative emailed Woodside (SI Report, reference 37.1) about an unrelated EP and indicated it required Woodside to meet costs for:
  - Engagement with KAC for consultation purposes
  - The preparation of an engagement protocol.
- **(1)** Between 10 – 13 September 2023, Woodside and KAC via legal representative exchanged emails (SI Report, references 37.2, 37.3, 37.4, 37.5) in relation to consultation costs and advised that:
  - **(2)** Kariyarra has sea rights referenced in its native title evidence.
- On 28 September 2023, KAC's legal representative emailed Woodside (SI Report, reference 37.6) and provided a single figure non-itemised quote. The email included a letter dated 22 September, referring to another activity more broadly setting out:
  - **(1)** Proposed negotiations for a consultation protocol and co-management agreement.
  - **(2)** Values and interests in sea country.
  - **(2)** Traditional fishing and gathering rights in the ocean.
  - **(3)** Presence of mythic snakes.
- **(1)** Between 20 -26 October 2023, several emails were exchanged (SI Report, references 37.7 – 37.13) relating to costs. KAC's legal representative stated Woodside's proposed cost structure was inadequate and would confer with the EDO.

- On 14 November 2023, KAC's legal representative stated it had taken its concerns to the EDO (SI Report, reference 37.14).
- On 22 November 2023, Woodside emailed KAC (SI Report, reference 37.15) on an unrelated activity, and noted it was keen to progress the consultation protocol and to meet with KAC. Woodside offered to fund the consultation protocol and a full day meeting but required a breakdown of reasonable costs for the work required.
- **(1)** On 23 November 2023, KAC via legal representative emailed Woodside (SI Report, reference 37.16) requesting a draft consultation protocol and suggesting several dates for a meeting between KAC and Woodside.
- **(1)** On 23 November 2023, KAC via legal representative emailed Woodside seeking payment for costs already incurred by KAC (SI Report, reference 37.17).
- **(1)** On 29 November 2024, KAC and Woodside communicated via email and phone regarding details for the upcoming meeting (SI Report references 37.18 – 37.21). During the exchange, Woodside confirmed it would not pay legal costs incurred prior to the meeting and requested information about the agenda.
- On 5 December 2023, Woodside and KAC met in Port Hedland (SI Report, reference 37.22). It was agreed that KAC and Woodside would hold a workshop in early 2024 to consult on current EPs and would finalise a framework agreement for ongoing consultation and partnership. At the meeting Woodside:
  - **(1)** Discussed an Engagement Protocol.
  - Spoke about consultation on EPs including the regulatory context, EMBA, controls and measures to protect the environment, and ongoing consultation.
  - Provided information about what it was seeking to understand from KAC.
  - **(4)** KAC asked how Woodside maintains the validity of controls over periods of time, sighting turtles as an example in terms of whether current controls would be sufficient in the future.
  - **(4)** Woodside noted that there is ongoing monitoring and it would apply its Management of Change and Revision process to address controls.
  - **(4)** Noted which EPs were the subject of ongoing consultation, including this EP.
  - **(4)** Spoke about planned and unplanned risks.
  - KAC gave a presentation to Woodside on its sea country rights and duties:
  - **(2)** Accessing sea country for fishing, trapping, crabbing catching turtle, hunting dugong, using stingray barbs for spears and collecting shellfish.
  - **(2)** Visiting offshore islands at low tide.
  - Passing on traditional knowledge to children.
  - **(3)** Totems.
  - **(2, 7)** Intangible heritage including the Yinta (associated with Sea Country).
  - **(2)** Having duties to look after and protect all KAC's sea country.

  KAC outlined its consultation requirements to Woodside:
  - **(2)** Co-designed and co-managed approach to protecting sea country.
  - On-going input into EPs.
  - **(1)** An agreement with Woodside.
  - **(5)** Funding for sea rangers.
  - A positive and collaborative relationship.
  - **(1)** The need for an agreement that addresses resourcing issues.

  (1,2, 3, 5) Woodside acknowledged KAC's views on consultation requirements.

- **(1)** On 13 December 2023, KAC via legal representative emailed Woodside (SI Report, reference 37.23) the outcomes of the 5 December meeting, confirming availability for a workshop in March 2024 and that KAC and Woodside aim to reach agreement on an engagement protocol by mid-2024.
- On 20 December 2023, Woodside phoned KAC (SI Report, reference 37.24) to follow up on the 5 December 2023 meeting and ask if there was any other information, it could provide KAC. KAC asked if it could receive more information about how cultural values are recorded in an EP. KAC also asked if Woodside could resend the Program of Ongoing Engagement document. Woodside responded it would send an email with the requested information.
- **(2, 3)** On 20 December 2023, Woodside emailed KAC via its legal representative (SI Report, reference 37.25) following up on the 5 December 2023 meeting outcomes and phone call discussion that day. The email included details on how Woodside records and manages all cultural information and values provided by KAC.
- On 20 December 2023, KAC emailed Woodside via legal representative (SI Report, reference 37.26). KAC asked Woodside to note its:
  - **(6)** cultural interest in coastal landforms and coastal native vegetation. **(6)** Woodside has assessed impacts and risks to coastal landforms and coastal native vegetation in the EP.
  - **(7)** cultural interest in cultural heritage sites and intangible cultural heritage associated with the coast and the ocean. **(7)** Woodside avoids disturbance to cultural heritage sites and values. Heritage values, risks and mitigation measures are recorded in the EP.
- **(1)** On 13 January 2024, KAC via legal representative emailed Woodside a letter (SI Report, reference 37.27) outlining proposed costs to settle an agreement with the KAC Board.
- **(1)** On 21 February 2024, Woodside emailed KAC via legal representative (SI Report, reference 37.28) discussing costings and attached a letter with the terms of a draft agreement noting:
  - Level of information to satisfy KAC to make informed decisions on the proposed activities.
  - Reasonable period for consultation.
  - How information would be provided.
  - Feedback, objections, and claims ad how KAC would provide these.
  - Reasonable costs and expenses to be agreed.
  - How the agreement would be terminated.

Summary of information provided and record of consultation for this EP:

- On 6 March 2024, Woodside emailed Kariyarra via a legal representative advising of the proposed activity (Record of Consultation, reference 2.31), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that Kariyarra and its members may have within the EMBA, information on how Kariyarra would like to engage, and requested that Kariyarra provide information to other individuals as required.
- **(1)** On 10 March 2024, KAC via legal representative emailed Woodside (SI Report, reference 37.29) a draft consultation agreement for Woodside to review.
- **(1)** On 12 March 2024, Woodside emailed KAC via its legal representative (SI Report, reference 37.30) to acknowledge receipt of the draft agreement and note it would review and return to KAC in the future.

- **(1)** On 4 April 2024, Woodside emailed KAC via its legal representative advising Woodside had reviewed the draft agreement and provided some amendments for KAC's consideration (SI Report 37.31).
- **(1)** On 4 April 2024, KAC via legal representative emailed Woodside advising the amendments were not acceptable (SI Report, reference 37.32). Woodside is reviewing this.
- On 5 April 2024, Woodside emailed KAC via legal representative with a reminder of consultation for this activity and notification of an unrelated activity (SI Report, reference 37.33).
- On 26 June 2024, Woodside emailed KAC via legal representative to ask if there were further instructions from KAC on the draft agreement and proposed amendments (SI Report, reference 37.34).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) KAC have requested a consultation agreement with Woodside that includes Woodside meeting consultation costs.	**(1)** **Woodside assessment:** A consultation agreement with KAC aligns with Woodside's Program of Ongoing Engagement with Traditional Custodians and would be effective mechanism to address resourcing. **Woodside response:** Woodside will finalise the draft agreement with KAC which was sent to KAC in February 2024. It will be used to frame ongoing consultation during the life of the EP	**(1)** Woodside's program to actively support Traditional Custodians' capacity for ongoing engagement and consultation on EPs is currently being implemented. The draft agreement with KAC (among other things) will set out the process for ongoing engagement. This is described further in the Program of Ongoing Engagement with Traditional Custodians, (Appendix G). Woodside will continue to consult following acceptance of the EP, as set out in Section 7.10 of the EP.
(2) KAC has outlined its Sea Country rights and duties, including: Looking after and protecting sea country, mentioning fishing, trapping, crabbing, catching turtle, hunting dugong, and using stingray barbs for spears and collecting shellfish.	**(2)** **Woodside assessment:** Woodside recognises that KAC may have Sea Country values within the EMBA for this EP. **Woodside response:** Woodside understands cultural and environmental values are intrinsically linked; in addition to the specific controls for cultural features and heritage values outlined in Section 6.11, the controls and performance standards in Section 6.7, 6.8 and 6.9 will ensure impacts to cultural features and heritage values, including marine species and habitats, are acceptable and ALARP.	**(2)** Woodside recognises KAC's connection to Sea Country (Section 4.9.4). Potential impacts on Cultural Features and Heritage Values are assessed in Section 6.11 of the EP.

(3) At a face-to-face meeting on 5 December 2023, KAC gave a presentation about its sea country rights and duties, including its cultural obligation to look after and protect sea country and secret habitat totems such as mythic snakes.	**(3)** **Woodside assessment:** Woodside respects KAC's position that it has cultural obligations to look after country and cultural knowledge about sea country including totems. **Woodside response:** Woodside has noted KAC's values and interests in Sea Country in Section 4.9.4.	**(3)** Woodside recognises KAC's connection to Sea Country (Section 4.9.4).
(4) At a face-to-face meeting on 5 December 2023, KAC: Asked how the validity of current controls are maintained.	**(4)** **Woodside assessment:** Management of changes are in accordance with regulations 38 and 39 of the Environment Regulations. Appropriate controls and currency of those controls remain valid through applying new advice from external stakeholders and understanding changes in the environment. **Woodside response:** Woodside applies its Management of Change and Revision process to address controls.	**(4)** Management of Change and Revision process (refer to Section 7.2.5. of this EP).
(5) At a face-to-face meeting on 5 December 2023, KAC noted it was interested in funding for ranger programs.	**(5)** **Woodside Assessment:** Woodside is supportive of ongoing engagement with Traditional Custodians through ranger programs. **Woodside Response:** Woodside's Program of Ongoing Engagement is the appropriate framework to address ongoing engagement through opportunities such as a Ranger Program.	**(5)** Opportunities for ongoing engagement with Traditional Owners is able to be addressed under Woodside's Program of Ongoing Engagement (Appendix G).
(6) On 20 December 2023, KAC mentioned: Impacts on coastal landforms and coastal native vegetation.	**(6)** **Woodside assessment:** Woodside accepts that KAC has an interest in the impacts on coastal landforms and coastal native vegetation. **Woodside response:** Assessment of the impacts and risks associated with coastal landforms and coastal native vegetation have been captured in Section 4.9 and Section 6.11.	**(6)** Woodside recognises KAC's connection to Sea Country (Section 4.9). Potential impacts on Cultural Features and Heritage Values are assessed in Section 6.11 of the EP.
(7) On 20 December 2023, KAC mentioned:	**(7)** **Woodside assessment:** Woodside seeks to avoid damage or disturbance to	**(7)** Woodside recognises KAC's connection to Sea

Tangible and intangible heritage associated with the coast and the ocean.	cultural heritage (including intangible heritage) and assesses cultural heritage impacts, including both direct and indirect impacts and risks associated with PAPs. Mitigation can include any measure or control aimed at ensuring the viability of the intangible cultural heritage and its intergenerational transmission. **Woodside response:** Woodside understands cultural and environmental values are intrinsically linked; in addition to the specific controls for cultural features and heritage values, the controls and performance standards in section 6 will reduce impacts to cultural features and heritage values, including marine species and habitats.	Country (Section 4.9). Potential impacts on Cultural Features and Heritage Values are assessed in Section 6.11 of the EP.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with KAC for the purposes of regulation 25 is complete. Sufficient information and reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

Sufficient information:

- Woodside sought direction on KAC's preferred method of consultation. Woodside has offered to coordinate meetings at the location of KAC's choosing, with KAC nominated representatives. KAC has exchanged correspondence with Woodside on a consultation agreement and a draft agreement is with KAC for their consideration. As sufficient information and a reasonable period have been provided, any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Summary Sheets developed by Indigenous staff to KAC. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.
- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the consultation and information sheets to be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that KAC could request the particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the

North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Woodside has provided KAC with the opportunity to provide feedback over a 4 month period, demonstrating a "reasonable period" of consultation.

Woodside asked KAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.

Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5.2 of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on KAC's functions, interests or activities.

Wirrawandi Aboriginal Corporation (WAC)

WAC is established under the Native Title Act 1993 by the Mardudhunera and Yaburara people to represent the Mardudhunera and Yaburara people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- **(1)** On 19 July 2023, Woodside met with WAC on activities unrelated to this activity. During the meeting WAC queried the use of rangers in the event of an incident (SI Report, reference 18.1).
- (1) On 20 July 2023, Woodside emailed WAC and confirmed its support for a ranger program and further discussions regarding opportunities for ongoing engagement (SI Report, reference 18.2).
- On 26 July 2023, Woodside emailed WAC Woodside's planned Program of Ongoing Engagement with Traditional Custodians (SI Report, reference 18.3).
- **(2)** On 31 August 2023, WAC emailed a letter to Woodside proposing a framework agreement to provide a streamlined, formalised approach to consultation between WAC and Woodside (SI Report, reference 18.4), and indicated interest in a ranger program.
- **(2)** On 11 September 2023, WAC emailed Woodside a copy of its letter of 31 August, and requested Woodside and WAC enter into a framework agreement to provide for ongoing meaningful consultation (SI Report, reference 18.5).
- (2) On 20 October 2023, Woodside met with WAC to discuss unrelated EPs. During the meeting Woodside reiterated that WAC could consult on any EP in which it had a cultural interest. Woodside acknowledged WAC was in the process of a corporate restructure which may impact WAC's response times (SI Report, reference 18.6).
- On 28 February 2024, Woodside emailed WAC seeking the contact point for WAC (SI Report, reference 18.7).

Summary of information provided and record of consultation for this EP:

- On 5 March 2024, Woodside emailed WAC advising of the proposed activity (Record of Consultation, reference 2.32), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that WAC and its members may have within the EMBA, information on how WAC would like to engage, and requested that WAC provide information to other individuals as required.
- (2) On 6 March 2024, Woodside emailed WAC (SI Report, reference 18.8) with a letter setting out the draft terms of an agreement between WAC and Woodside, the

agreement (among other things) included the following topics:

- Sufficient Information.
- Reasonable Period.
- Provision of Information.
- Objection or claims.
- Publications.
- Cost and termination.

- **(2)** On 6 March 2024, WAC emailed Woodside requesting a word copy of the draft terms of agreement sent 6 March 2024 (SI Report, reference 18.9).
- On 6 March 2024, Woodside emailed WAC a word copy of the draft terms of agreement (SI Report, reference 18.10).
- On 5 April 2024, Woodside emailed WAC to follow up on whether WAC required more information, and to offer a meeting or a discussion on this activity and another activity (SI Report, reference 18.11).
- On 18 April 2024, Woodside emailed WAC to follow up on an unrelated activity and to offer to meet with WAC via their preferred method of consultation to discuss EPs (SI Report, reference 18.12). No response has been received to date.

Ongoing Engagement

- WAC attended Woodside's Quarterly Heritage Meeting held in July.
- Woodside continues to engage with WAC on other activities.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) WAC has expressed an interest in social investment opportunities including a Ranger Program.	**(1)** **Woodside Assessment:** Woodside is supportive of ranger programs and progressing opportunities for ongoing engagement. **Woodside Response:** Woodside's Program of Ongoing Engagement is the appropriate framework to address ongoing engagement through opportunities such as a Ranger Program.	**(1)** Support for a ranger program is able to be addressed as part of Woodside's Program of Ongoing Engagement (Appendix G).
(2) WAC has requested that Woodside and WAC enter into a framework agreement to provide for ongoing meaningful	**(2)** **Woodside Assessment:** Woodside has confirmed and accepts that WAC is seeking to establish a framework agreement for the purposes of ongoing consultation with Woodside.	**(2)** Although consultation for the purpose of regulations 25 of the Environment Regulations is complete, Woodside will continue to engage

consultation a desire for ongoing engagement and partnership through a Framework Agreement.	**Woodside Response:** Separate from consultation under regulation 25 of the Environment Regulations, Woodside has sent a draft consultation agreement in March 2024 and will work with WAC to finalise the agreement.	with WAC through ongoing engagement and continue to progress the consultation agreement as part of Woodside's Program of Ongoing Engagement (Appendix G).
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with WAC for the purposes of regulation 25 is complete. Sufficient information and reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

Sufficient information:

- Woodside sought direction on WAC's preferred method of consultation. Woodside has offered to coordinate meetings at the location of WAC's choosing, with WAC nominated representatives. WAC has exchanged correspondence with Woodside on a consultation agreement and a draft agreement is with WAC for their consideration. As sufficient information and a reasonable period have been provided, any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Summary Sheets developed by Indigenous staff to WAC. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.
- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the consultation and information sheets to be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that WAC could request the particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Woodside has provided WAC with the opportunity to provide feedback over a 4 month period, demonstrating a "reasonable period" of consultation.

Woodside asked WAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.

Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received

after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on WAC's functions, interests or activities.

Robe River Kuruma Aboriginal Corporation (RRKAC)

RRKAC is established under the Native Title Act 1993 by the Robe River Kuruma people to represent the Robe River Kuruma people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- **(1)** On 11 August 2023, RRKAC emailed Woodside in response to another matter and in addition requested ongoing consultation and training opportunities for rangers to prepare rangers for caring for sea and coastal country (SI Report, reference 19.1).
- **(1)** On 14 August 2023, Woodside emailed RRKAC and requested a meeting to discuss training opportunities for rangers (SI Report, reference 19.2).
- **(1)** On 10 September 2023, Woodside emailed RRKAC's ranger focal point to organise a meeting to discuss training opportunities for rangers. Woodside also offered financial support to fund a marine scientist for another activity unrelated to this EP (SI Report, reference 19.3).
- On 10 September 2023, RRKAC and Woodside exchanged emails on an October date, time and location for a ranger meeting (SI Report, references 19.4, 19.5).
- **(2)** On 15 September 2023, RRKAC emailed Woodside in relation to another activity and advised it would require Woodside to fund additional resources (SI Report, reference 19.6).
- **(2)** On 18 September 2023, Woodside sent two emails to RRKAC clarifying that Woodside could provide funding for consultation activities and requested RRKAC provide quotes. The emails included a Proposed Program of Ongoing Engagement with Traditional Custodians and information about Woodside's vendor onboarding process. (SI Report, references 19.7, 19.8).
- **(1)** On 3 October 2023, Woodside met with RRKAC to discuss opportunities for Woodside to support ranger programs (SI Report, reference 19.9).
- On 14 November 2023, Woodside emailed RRKAC offering to meet and discuss support for RRKAC to engage in consultation (SI Report, reference 19.10).
- On 19 December 2023, Woodside emailed RRKAC reiterating that Woodside is available if RRKAC required further information on any Woodside project (SI Report, reference 19.11).
- On 11 January 2024, Woodside and RRKAC (SI Report, reference 19.12) discussed these matters during a telephone call:
  - RRKAC had recently employed new personnel, and once these people had settled in would be happy to consult with Woodside on relevant EPs.
  - **(3)** RRKAC noted that some RRKAC country is on the coast (and would be affected by an oil spill or another such environmental incident) but felt the EMBAs were too broad and covered areas too big and unfeasible.

Summary of information provided and record of consultation for this EP:

- On 5 March 2024, Woodside emailed RRKAC advising of the proposed activity (Record of Consultation, reference 2.33), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing

gender-restricted information. The email requested information on the interests that RRKAC and its members may have within the EMBA, information on how RRKAC would like to engage, and requested that RRKAC provide information to other individuals as required.

- On 5 March 2024, RRKAC emailed Woodside responding to another activity, noting it expected to fill a team position that would enable it to respond to EP matters (SI Report, reference 19.13).
- On 5 March 2024, Woodside emailed RRKAC to acknowledge the email (SI Report, reference 19.14).
- On 18 March 2024, Woodside emailed RRKAC to follow up on proposed activities including this one, and asking if there was an opportunity to meet with the Board and interested members (SI Report, reference 19.15).
- **(1,2)** On 20 March 2024, Woodside and RRKAC held an online meeting. Woodside outlined the purpose of engagement with Traditional Owner groups and PBC's, consultation on Environment Plans, feedback on heritage and cultural values, opportunities for engagement programs such as rangers and opportunities for future meetings (SI Report, reference 19.16).
- **(3)** On 26 March 2024, Woodside emailed RRKAC (SI Report, reference 19.17) to follow up on the meeting, and to outline the upcoming activities for consultation, that reasonable financial support is available for meetings for the purpose of consultation, to ask for guidance on its preferred next steps, and to provide Woodside's Program of Ongoing Engagement.
- On 26 March 2024, Woodside emailed RRKAC (SI Report, reference 19.18) to resend the initial consultation email about this activity and included the Summary Information Sheet.
- On 5 April 2024, Woodside emailed RRKAC to follow up on previous emails on this activity and to ask if RRKAC required more information (SI Report, reference 19.19). No response has been received.
- On 5 July 2024, RRKAC emailed Woodside (SI Report, reference 19.20) in response to another activity and raised:
  - **(2)** its lack of resourcing as an issue for consultation
  - **(4)** the potential for a bathymetric survey of the coastal shelf as a large-scale project with all affected groups
- **(4)** On 5 July 2024, Woodside emailed RRKAC and said it would enquire within Woodside about the potential of a bathymetric surveying project (SI report, reference 19.21).
- **(4)** On 29 July 2024, Woodside emailed RRKAC regarding bathymetric surveys and suggested that RRKAC and Woodside meet to discuss opportunities to use publicly available data to assist in generating information that might be useful to RRKAC (SI Report, reference 19.22)

Ongoing Engagement

- Woodside continues to engage RRKAC on other activities.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) RRKAC is interested in training	**(1)** **Woodside Assessment:** Woodside supports ongoing engagement with	**(1)** Ongoing interest in a ranger program is able to be addressed under Woodside's Program of

opportunities for rangers.	Traditional Custodians through their Program of Ongoing Engagement. **Woodside Response:** Separate from consultation under regulation 25 of the Environment regulations, Woodside has responded to RRKAC's interest with information on ranger programs.	Ongoing Engagement (Appendix G).
(2) RRKAC noted it is insufficiently resourced to fully engage and respond regarding EPs.	**(2)** **Woodside assessment:** Woodside supports ongoing engagement for the life of an EP. **Woodside response:** Woodside supports reasonable requests for resourcing and has provided support for meetings for the purpose of consultation.	**(2)** Woodside is implementing a program to actively support Traditional Custodians' capacity for ongoing engagement and consultation on environment plans. This is described further in the Program of Ongoing Engagement with Traditional Custodians, (Appendix G).
(3) RRKAC noted that some RRKAC country is on the coast (and would be affected by an oil spill or another such environmental incident), it felt that that the EMBAs are too broad and cover areas too big and unfeasible.	**(3)** **Woodside assessment:** Woodside aligns with industry guidance in developing the EMBA. Many replicate model simulations are completed to understand the potential behaviour of the worst-case release under various wind, wave and current conditions and these are combined to create an overall EMBA. **Woodside response:** Woodside considers it adopts appropriate controls, as demonstrated in Sections 6.8 and 6.9 of the EP, and Appendix H.	**(3)** Woodside has addressed oil spill response in Appendix H.
(4) RRKAC raised the potential of a bathymetric survey of the coastline, working with all relevant coastal groups.	**(4)** **Woodside Assessment:** Woodside does not have plans to conduct regional bathymetric surveys but there are publicly available datasets covering coastal regions. **Woodside Response:** Woodside is seeking a meeting with RRKAC to find ways to interpret existing data sets to generate information which may be useful to RRKAC.	**(4)** Not required.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.
Outcomes of Consultation		
Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with RRKAC for the purposes of regulation 25		

is complete. Sufficient information and reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

Sufficient information:

- Woodside sought direction on RRKAC's preferred method of consultation. Woodside has offered to coordinate meetings at the location of RRKAC's choosing, with RRKAC nominated representatives. As sufficient information and a reasonable period have been provided, any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Summary Sheets developed by Indigenous staff to RRKAC. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.
- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the consultation and information sheets to be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that RRKAC could request the particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Woodside has provided RRKAC with the opportunity to provide feedback over a 4 month period, demonstrating a "reasonable period" of consultation.

Woodside asked RRKAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.

Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5.2 of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on RRKAC's functions, interests or activities.

Ngarluma Aboriginal Corporation (NAC)

NAC is established under the Native Title Act 1993 by the Ngarluma people to represent the Ngarluma people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- On 18 July 2023, Woodside emailed NAC NOPSEMA's Consultation Guidelines, Consultation Brochure, and Draft Policy for Managing Gender-Restricted Information. This email also requested NAC advise Woodside of any other Traditional Custodian groups or individuals with whom Woodside should consult. No response was received to this email. (SI Report, reference 38.1)

- On 26 July 2023, Woodside emailed NAC Woodside's planned Program of Ongoing Engagement with Traditional Custodians (SI Report, reference 38.2).
- **(1)** On 3 November 2024, NAC emailed Woodside with a draft consultation protocol (SI Report, reference 38.3).

Summary of information provided and record of consultation for this EP:

- On 1 March 2024, Woodside emailed NAC advising of the proposed activity (Record of Consultation, reference 2.34), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that NAC and its members may have within the EMBA, information on how NAC would like to engage, and requested that NAC provide information to other individuals as required.
- **(1)** On 1 March 2024, Woodside emailed NAC a draft consultation agreement for review (SI Report, reference 38.4). NAC did not respond.
- **(1)** On 26 April 2024, Woodside emailed NAC to follow up on the draft consultation agreement and asked for an update from NAC on its review of the agreement (SI Report, reference 38.5).
- On 20 May 2024, Woodside emailed NAC to follow up on the status of the consultation agreement, to request feedback and offered to meet to discuss EPs. NAC did not reply (SI Report, reference 38.6).

Ongoing Engagement

Woodside continues to engage NAC on other activities.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) NAC is seeking to establish a draft consultation protocol with Woodside.	**(1)** **Woodside assessment:** A consultation agreement with NAC aligns with Woodside's Program of Ongoing Engagement with Traditional Custodians **Woodside response:** In March 2024, Woodside emailed NAC a draft consultation agreement for review. Woodside has followed up with NAC since then but is yet to receive a response.	**(1)** Woodside's program to actively support Traditional Custodians' capacity for ongoing engagement and consultation on EPs is currently being implemented. The draft agreement with NAC (among other things) will set out the process for ongoing engagement. This is described further in the Program of Ongoing Engagement with Traditional Custodians, (Appendix G). Woodside will continue to consult following acceptance of the EP, as set out in **Section 7.10** of the EP.
While feedback was received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with NAC for the purposes of regulation 25 is complete. Sufficient information and reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

Sufficient information:

- Woodside sought direction on NAC's preferred method of consultation. Woodside has offered to coordinate meetings at the location of NAC's choosing, with NAC nominated representatives. As sufficient information and a reasonable period have been provided, any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Summary Sheets developed by Indigenous staff to NAC. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.
- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the consultation and information sheets to be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that NAC could request the particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Woodside has provided NAC with the opportunity to provide feedback over a 4 month period, demonstrating a "reasonable period" of consultation.
- Woodside asked NAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.

Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5. of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on NAC's functions, interests or activities.

Yindjibarndi Aboriginal Corporation

YAC is established under the Native Title Act 1993 by the Yindjibarndi people to represent the Yindjibarndi people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- On 18 July 2023, Woodside emailed Yindjibarndi NOPSEMA's Consultation Guidelines, Consultation Brochure, and Draft Policy for Managing Gender-Restricted Information. This email also reiterated Woodside's request that Yindjibarndi advise Woodside of any other Traditional Custodian groups or individuals with whom Woodside should consult. No response was received to this email (SI Report, reference 20.1).
- On 26 July 2023, Woodside emailed Yindjibarndi Woodside's planned Program of Ongoing Engagement with Traditional Custodians (SI Report, reference 20.2).
- **(1)** On 1 August 2023, Yindjibarndi emailed Woodside advising Ngarluma Yindjibarndi Foundation Ltd (NYFL) would manage oil and gas matters on its behalf. (SI Report, reference 20.3).

Summary of information provided and record of consultation for this EP:

- On 6 March 2024, Woodside emailed Yindjibarndi via NYFL advising of the proposed activity (Record of Consultation, reference 2.35), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that Yindjibarndi and its members may have within the EMBA, information on how Yindjibarndi would like to engage, and requested that Yindjibarndi provide information to other individuals as required.

See NYFL on behalf of Yindjibarndi below for record of further engagement.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Yindjibarndi has instructed Woodside that it will be represented by NYFL in ongoing discussion about EPs.	**(1)** **Woodside assessment:** Woodside accepts Yindjibarndi's right to be represented at their own choosing. **Woodside response:** Woodside will engage with NYFL on behalf of Yindjibarndi for ongoing consultation related to this activity.	**(1)** Ongoing consultation will be undertaken as set out in Section 7.10 of the EP.
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional controls or measure required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Yindjibarndi for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:

Sufficient Information:

- Woodside sought direction on Yindjibarndi's preferred method of consultation. As sufficient information and a reasonable period have been provided (see below), any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Information Sheet and Consultation Summary Sheets developed by Indigenous staff to Yindjibarndi. These set out details of the proposed activity,

the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.

- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the information and request for feedback be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that Yindjibarndi can request that particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Woodside commenced consultation with Yindjibarndi in March 2024.
- Woodside has responded to Yindjibarndi over 4 months, demonstrating a "reasonable period" of consultation.
- Woodside asked Yindjibarndi if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.

Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5. of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on Yindjibarndi functions, interests or activities.

Native Title Representative Bodies

Yamatji Marlpa Aboriginal Corporation (YMAC)

YMAC is the Native Title Representative Body for the Yamatji and Pilbara regions of Western Australia. As such, they are not a Prescribed or Registered Native Title Body Corporate but exist to assist native title claimants and holders.

Historical Engagement:

YMAC is the Native Title Representative Body (NTRB) for the Yamatji and Pilbara regions. NTRBs exist to provide assistance to native title claimants and holders in regard to their native title rights. No native title has been recognised over the EMBA, however YMAC is identified in the North West Marine Parks Network Management Plan as the contact for identifying cultural values in nearby Australian Marine Parks.

- On 13 March 2023, Woodside emailed YMAC an enquired whether YMAC considers itself a 'relevant person' under regulation 25(1) of the Environment Regulations for the purposes of consultation on EPs and, if so, whether that relevance is limited to a facilitation function in its capacity as a representative of Traditional Owner groups/corporations that overlap or adjacent to the environment that may be affected (EMBA) of a particular activity (SI Report, reference 22.1).

- **(1)** On 20 March 2023, YMAC replied to confirm that in its view it is a 'relevant person' under regulation 25(1) of the Environment Regulations for the purposes of consultation on EPs only in relation to its facilitation and coordination function as a Native Title Representative Body under applicable federal legislation. YMAC does not intend to provide substantive comment on the content of EPs (SI Report, reference 22.2.)
- **(1)** On 20 March 2023, Woodside emailed YMAC to thank it for its reply and to advise that this would be included in Woodside's EPs (SI Report, reference 22.3).
- On 20 March 2023, YMAC emailed Woodside confirming it agreed to being included in reporting (SI Report, reference 22.4)
- **(2)** On 12 June 2023, YMAC emailed Woodside on behalf of itself and its clients (SI Report, reference 22.5). The email included a draft consultation framework and a proposal to fund in-house expertise to support consultations and administration of the consultation framework.
- On 12 June 2023, Woodside emailed YMAC, thanking it for the documents and informing it that Woodside would respond shortly (SI Report, reference 22.6).
- On 25 July 2023, Woodside emailed YMAC: (SI Report, reference 22.7)
  - **(2)** Agreeing in principle to the draft consultation framework and funding proposal but seeking further discussion on details.
  - **(2)** Stating that Woodside is open to considering an industry funded position at YMAC to support the work they are facilitating.
  - Attaching Woodside's Program for Ongoing Engagement with Traditional Custodians.
  - Seeking a meeting with YMAC in relation to the draft consultation framework at YMAC's earliest convenience.
- On 14 December 2023, Woodside emailed YMAC following up on the consultation framework and providing suggestions for content to be included (SI Report, reference 22.8).
- On 21 December 2023, Woodside emailed YMAC providing a list of upcoming activities including this activity, as requested by YMAC (SI Report, reference 22.9).
- **(2)** On 28 February 2024, Woodside emailed YMAC with a letter setting out the draft terms of an agreement between NTGAC and Woodside (SI Report, reference 22.10). The agreement (among other things) included the following topics:
  - Sufficient Information.
  - Reasonable Period.
  - Provision of Information.
  - Objection or claims.
  - Publications
  - Cost and termination.
- On 29 February 2024, YMAC emailed Woodside acknowledging receipt of the information (SI Report, reference 22.11).
- On 11 March 2024, Woodside emailed NTGAC via YMAC requesting the appropriate person to send correspondence regarding this activity and attached the Summary Information Sheet (SI Report, reference 22.12).
- On 11 March 2024, Woodside emailed NTGAC via YMAC to ask if a previous contact provided was still current for NTGAC (SI Report, reference 22.13).
- On 13 March 2024, Woodside emailed NTGAC via YMAC to resend correspondence asking for a relevant contact for this activity after a previous email bounced back (SI Report, reference 22.14).

Summary of information provided and record of consultation for this EP:

- On 20 March 2024, Woodside emailed YMAC as the representative for NTGAC, advising of the proposed activity (Record of Consultation, reference 2.37), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that NTGAC and its members may have within the EMBA, information on how NTGAC would like to engage, and requested that NTGAC provide information to other individuals as required.
- On 26 March 2024, NTGAC/YMAC emailed Woodside with an out of office message advising the recipient was on leave until 2 April 2023 and providing a contact for urgent queries (SI Report, reference 22.15).
- On 12 April, Woodside emailed NTGAC/YMAC to offer further information and any assistance required including a meeting or discussion (SI Report, reference 22.16).
- On 16 May 2024, Woodside emailed NTGAC/YMAC to seek the availability of the Board to meet with Woodside to consult on Environment Plans (SI Report, reference 22.17).
- On 21 May 2024, NTGAC/YMAC emailed Woodside to confirm the Board would meet in July, that the agenda was quite full and they would update Woodside to confirm the Board's availability (SI Report, reference 22.18).
- On 21 May 2024, Woodside emailed NTGAC/YMAC to acknowledge its email and advise Woodside was keen to plan meeting requests around the Board's availability (SI Report, reference 22.19).
- On 21 May 2024, NTGAC/YMAC emailed Woodside with acknowledgement and thanks (SI Report, reference 22.20).
- On 19 June 2024, Woodside emailed NTGAC via YMAC to follow up on the opportunity to meet the Board and consult on Environment Plans (SI Report, reference 22.21).
- **(2)** On 27 June 2024, Woodside emailed NTGAC via YMAC seeking an update on its review of the draft consultation agreement sent in February 2024 (SI Report 22.22).
- **(2)** On 28 June 2024, NTGAC via YMAC emailed Woodside (SI Report, reference 22.23) to advise:
  - NTGAC was keen to progress the Consultation Agreement and would revise the draft provided by Woodside
  - A meeting date for the Board was being sought at which the Agreement and upcoming EPs could be discussed
  - A cost estimate was provided.
- On 1 July 2024 Woodside emailed NTGAC via YMAC to provide a Word copy of the draft agreement as requested and to offer further support if required (SI Report, reference 22.24).
- On 10 July 2024, NTGAC via YMAC emailed Woodside confirming receipt of the draft agreement and confirming it would review the Agreement and provide a meeting date as soon as possible (SI Report, reference 22.25).

Ongoing Engagement

Woodside continues to engage NTGAC/YMAC on other activities.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan

(1) YMAC has provided feedback that in its view it is a 'relevant person' under regulation 25 of the Environment Regulations for the purposes of consultation on EPs only in relation to its facilitation and coordination function as a Native Title Representative Body under applicable federal legislation and does not intend to provide substantive comment on the content of EPs.	**(1)** **Woodside assessment:** Woodside accepts YMAC's feedback that it is a relevant person only in relations to its facilitation and coordination function as a representative body. **Woodside response:** Woodside has consulted with YMAC in relation to its facilitation and coordination as a Native Title Representative Body under applicable federal legislation and has accepted YMAC's advice that it does not intend to provide substantive comment on the content of EPs.	**(1)** Not required
(2) YMAC has provided feedback that it is seeking an industry funded position to support consultations for this and other activities. YMAC has provided a draft consultation framework to assist the consultation process.	**(2)** **Woodside assessment:** Woodside has assessed that its Program of Ongoing Engagement with Traditional Custodians will support ongoing consultation with YMAC and/or the groups its represents. **Woodside response:** In February 2024, Woodside sent a draft framework agreement to YMAC as the representative of NTGAC and two other groups. The agreement would frame ongoing consultation, address appropriate support for resourcing, separate from consultation under regulation 25 of the Environment Regulations.	**(2)** Woodside will continue to engage with YMAC in relation to its request for an industry funded position and put a proposal to YMAC in December 2023 for a Framework Agreement, and in February 2024 sent the draft terms of agreement between NTGAC and two other groups represented by YMAC and Woodside. This is described further in the Program of Ongoing Engagement with Traditional Custodians, Appendix G.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with YMAC for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to YMAC on behalf of NTGAC on 20 March 2024 based on their functions, interests or activities. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity in a digestible, plain English format.
- Woodside sought direction on YMAC's preferred method of consultation.
- Woodside asked YMAC if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided YMAC with the opportunity to provide feedback over a 4 month period.
- Woodside engages with ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5.2 of the EP). Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on YMAC's functions, interests or activities.

Self-identified First Nations Groups

Ngarluma Yindjibarndi Foundation Ltd (NYFL)

NYFL was created to act as Trustee for the Trust under the Northwest Shelf Agreement 1998 struck between the Ngarluma and Yindjibarndi registered native title claimants, the NWS JVs and Woodside, prior to the resolution of the Ngarluma and Yindjibarndi native title claim. Its purpose is to carry on the business of enterprise development, investment and social welfare.

In 1999 the Ngarluma and Yindjibarndi native title claim was settled with the Federal Court appointing, at the request of the common law native title holders, the Ngarluma Aboriginal Corporation (NAC) as PBC to represent the communal interests of the Ngarluma people and the Yindjibarndi Aboriginal Corporation (YAC) as PBC to represent the communal interests of the Yindjibarndi people. Woodside consulted both NAC and YAC as relevant persons in the course of preparing this EP.

NYFL self-identified and has advised it is relevant for this EP.

Historical Engagement:

- On 19 July 2023, Woodside emailed NYFL NOPSEMA's Consultation Guideline, Consultation Brochure, and Draft Policy for Managing Gender-Restricted Information. This email also requested that NYFL advise Woodside of any other Traditional Custodian groups or individuals with whom Woodside should consult. NYFL did not respond (SI Report, reference 23.1).
- On 26 July 2023, Woodside emailed NYFL Woodside's planned Program of Ongoing Engagement with Traditional Custodians (SI Report, reference 23.2)
- **(1)** On 26 July 2023, NYFL emailed Woodside in response to Woodside's planned Program of Ongoing Engagement with Traditional Custodians, noting it was a good start particularly with the inclusion of Traditional Owner feedback. **(2)** NYFL indicated it required assistance with resourcing (SI Report, reference 23.3).

Summary of information provided and record of consultation for this EP:

- On 6 March 2024, Woodside emailed NYFL advising of the proposed activity (Record of Consultation, reference 2.38), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-

restricted information. The email requested information on the interests that NYFL and its members may have within the EMBA, information on how NYFL would like to engage, and requested that NYFL provide information to other individuals as required.

- **(1, 2)** On 6 March 2024, NYFL emailed Woodside with a letter (SI Report, reference 23.4) setting out the terms on which NYFL consults with industry on EPs. Noting it required resourcing.
- (1,2) On 6 March 2024, Woodside emailed NYFL with a letter (SI Report, reference 23.5) setting out the draft terms of an agreement between NYFL and Woodside, the agreement (among other things) included the following topics:
  - Sufficient Information
  - Reasonable Period.
  - Provision of Information.
  - Objection or claims.
  - Publications
  - Cost and termination.
- **(1)** On 14 March 2024, NYFL emailed Woodside acknowledging receipt of the proposed agreement (SI Report, reference 23.6).
- **(2)** On 19 March 2024, NYFL emailed Woodside attaching a quote to review the agreement sent on 6 March 2024 (SI Report, reference 23.7).
- On 5 April 2024, Woodside emailed NYFL following up on the initial notification sent to NYFL relating to this EP (SI Report, reference 23.8).
- **(2)** On 5 April 2024, NYFL emailed Woodside noting it had previously responded to Woodside on 6 March 2024 and noted that Woodside had not responded to its quote to progress a consultation agreement (SI Report, reference 23.9).
- On 5 April 2024, Woodside replied to NYFL's email and said it would review the information (SI Report, reference 23.10).
- **(1)** On 12 April 2024, NYFL emailed Woodside requesting a response about EP consultation going forward (SI Report, reference 23.11).
- On 12 April 2024, Woodside emailed NYFL acknowledging it had not responded and would respond to NYFL within the week (SI Report, reference 23.12).
- On 17 April 2024, NYFL emailed Woodside noting it was attending to sorry business and as per cultural protocols would require time within the community and engagement would be delayed until appropriate to re-commence (SI Report, reference 23.13).
- **(2)** On 10 May 2024, Woodside emailed NYFL a response to its request for funding to review Woodside's draft consultation agreement. Woodside declined the amount quoted but reiterated its commitment to covering reasonable costs for EP consultation (SI Report, reference 23.14).
- On 17 June 2024, Woodside emailed NYFL information about an unrelated EP (SI Report, reference 23.15).
- **(1,2)** On 17 June 2024, NYFL emailed Woodside a letter responding to an unrelated EP (SI Report, reference 23.16). In the letter NYFL noted:
  - Woodside had declined to provide funding requested by NYFL to review a proposed consultation agreement.
  - That NYFL maintained that an interim Consultation Agreement remained the appropriate mechanism for consultation between Woodside and NYFL.
- (2) On 3 July 2024, Woodside emailed NYFL and offered to meet to discuss how Woodside could reasonably ensure NYFL was adequately resourced for consultation (SI Report, reference 23.17).

- **(2)** On 3 July 2024, NYFL emailed Woodside noting that it had provided Woodside with an estimate of costs to review and progress a consultation agreement but Woodside had declined to cover this. NYFL asked Woodside to advise if there had been a shift in position and it would set up a time to meet (SI Report, reference 23.18).

Ongoing Engagement

Woodside continues to engage NYFL on other activities.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
NYFL self-identified and advised Woodside they are a relevant person for activities.	**Woodside assessment:** NYFL was created to act as Trustee for the Northwest Shelf Agreement 1998. NYFL's membership is made up of Ngarluma people and Yindjibarndi people, membership is not open to any person who is not accepted as Ngarluma or Yindjibarndi. Woodside has also consulted with Ngarluma and Yindjibarndi Aboriginal Corporations individually. Ngarluma and Yindjibarndi Aboriginal Corporations were appointed by the Federal Court, at the request of the Ngarluma and Yindjibarndi common law native title holders as PBCs to represent the communal interests of the Ngarluma and Yindjibarndi people respectively. Ngarluma and Yindjibarndi Aboriginal Corporations are representative of all Ngarluma and Yindjibarndi people regardless of membership. **Woodside response:** Woodside has responded to NYFL's self-identification and consulted with them as a relevant person.	NYFL has been consulted with in accordance with the methodology described in Section 5 of the EP.
(1) NYFL supports a consultation agreement with Woodside.	**(1)** **Woodside assessment:** Separate from consultation under regulation 25 of the Environment Regulations, Woodside is open to engaging with a joint First Nations framework for consultation, however, notes that this is not required to undertake and/or complete consultation in the course of preparing this EP. Sufficient information to allow informed assessment has already been provided by other means, including summary sheets developed by Indigenous staff. Woodside has an existing engagement framework in place with NYFL which enables regular (quarterly) communication about Woodside activities. Woodside supports reasonable requests for resourcing. A consultation agreement would be an effective mechanism to address resourcing. **Woodside response:** In March, Woodside sent a draft consultation framework to NYFL.	**(1)** Woodside is implementing a program to actively support Traditional Custodians' capacity for ongoing engagement and consultation on environment plans. This is described further in the Program of Ongoing Engagement with Traditional Custodians, (Appendix G). This includes continued engagement regarding the proposed Framework Agreement which would be applied to ongoing consultation for this activity. Woodside will continue to consult following acceptance of the EP, as set out in Section 7.10 of the EP.

(2) NYFL has stated that it requires resourcing for expert advice. It has also provided Woodside with a quote for costs relating to reviewing Woodside's draft consultation agreement. a	**(2)** **Woodside assessment** The draft consultation agreement (See Point **(1)** above), would be an effective mechanism to address resourcing for expert advice as agreed between NYFL and Woodside. Woodside supports reasonable requests for resourcing to support consultation. Woodside has reviewed a quote provided by NYFL to review the draft consultation agreement and believes it is excessive. **Woodside response:** Woodside supports reasonable requests to engage experts. Woodside has sought a meeting with NYFL to discuss how Woodside can reasonably ensure NYFL is adequately resourced for consultation. So far NYFL has declined this invitation.	**(2)** See point **(1)** above. The proposed agreement may address any reasonable requests for funding.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Based on the engagement to date, no additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with NYFL for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to NYFL and on behalf of Yindjibarndi on 6 March 2024 based on their functions, interests or activities. These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity in a digestible, plain English format.
- Woodside sought direction on NYFL's preferred method of consultation.
- Woodside asked NYFL if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided NYFL with the opportunity to provide feedback over a 4 month period.
- Woodside engages with ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5.2 of the EP). Woodside considers the measures and controls described in this EP address the potential

impact from the proposed activity on NYFL's functions, interests or activities.

Local government and community representative groups or organisations

Shire of Exmouth

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Shire of Exmouth advising of the proposed activity (Record of Consultation, reference 2.22), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Shire of Exmouth, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Shire of Exmouth regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Shire of Exmouth for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Shire of Exmouth on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Shire of Exmouth with the opportunity to provide feedback over a 5 month period.

City of Karratha

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed City of Karratha advising of the proposed activity (Record of Consultation, reference 2.22), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 19 March 2024, Woodside sent an email reminder to City of Karratha, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to City of Karratha regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with City of Karratha for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to City of Karratha on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided City of Karratha with the opportunity to provide feedback over a 5 month period.

Exmouth Community Liaison Group (CLG)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Exmouth CLG individual members advising of the proposed activity (Record of Consultation, reference 2.22), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Exmouth CLG, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.

- On 6 March 2024, Woodside presented to the Exmouth CLG on Woodside activities, including this EP. Woodside presented a slide that listed Environment Plans on which the CLG members had recently been consulted and Environment Plans currently under consultation (SI report, reference 32.1). No feedback was provided on this EP. 12 individuals attended the meeting representing:
  - Exmouth Volunteer Marine Rescue
  - Gascoyne Development Commission
  - Shire of Exmouth
  - PHI Helicopters
  - Exmouth Freight and Logistics
  - Exmouth Chamber of Commerce and Industry
  - Ningaloo Coast World Heritage Advisory Council
  - WA Country Health Service
  - Santos.
- On 27 March 2024, Woodside provided an activity update to Exmouth CLG regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- On 2 April 2024, Woodside's presentation was emailed to all Exmouth CLG members, regardless of their attendance at the meeting.

Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Exmouth CLG for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Exmouth CLG on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.

- Woodside has provided Exmouth CLG with the opportunity to provide feedback over a 5 month period.

Karratha Community Liaison Group (CLG)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Karratha CLG individual members advising of the proposed activity (Record of Consultation, reference 2.22), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Karratha CLG, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 22 March 2024, Woodside presented to the Karratha CLG on Woodside activities, including this EP. Woodside presented slides which listed Environment Plans on which the CLG members had recently been consulted and Environment Plans currently under consultation (SI report, reference 32.1). Woodside also presented on how Woodside consults relevant persons in the course of preparing our EPs and provided information on relevant persons and EMBAs. The slides included a QR and URL to Consultation Activities page of the Woodside website, and upcoming consultation opportunities in Roebourne, Karratha and Dampier from the 22 March to 24 March 2024. No feedback was provided on this EP. Seven Karratha CLG members attended the meeting representing:
  - City of Karratha
  - Dampier Community Association
  - Department of Education
  - Murujuga Aboriginal Corporation
  - Karratha and Districts Chamber of Commerce and Industry
  - Karratha Central Health.
- On 27 March 2024, Woodside provided an activity update to Karratha CLG regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Karratha CLG for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Karratha CLG on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Karratha CLG with the opportunity to provide feedback over a 5 month period.

Onslow Chamber of Commerce and Industry (CCI)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Onslow CCI advising of the proposed activity (Record of Consultation, reference 2.22), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Onslow CCI, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Onslow CCI regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Onslow CCI for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Onslow CCI on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.

- Woodside has provided Onslow CCI with the opportunity to provide feedback over a 5 month period.

Shire of Ashburton

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Shire of Ashburton advising of the proposed activity (Record of Consultation, reference 2.23), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Shire of Ashburton, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Shire of Ashburton regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- On 28 March 2024, Shire of Ashburton emailed Woodside its standard response letter (SI Report, reference 30.1) and:
  - **(1)** confirmed it has no objections to the activities under this EP.
  - **(2)** the Shire expects that Woodside will identify, manage and mitigate all possible impacts and risks in line with relevant regulatory frameworks.
  - **(3)** the Shire requires Woodside to brief the Shire's Local and District Emergency Management Committees on its planned responses to such events before any activities commence.
  - **(4)** asked that Woodside has communicated with appropriate emergency management agencies at either/or National, State, District and Local levels on potential hazards and risks around the activity; collaboration and/or cooperation on risk mitigation; considered impacted areas response capacity and capability and sustainability of response activities and escalation triggers.
  - **(5)** the Shire anticipates that Woodside has undertaken their own emergency management planning to mitigate risk and recover from a risk related incident, has engaged with external emergency management agencies to ensure emergency management plans are aligned with outcomes to respond and/or recovery from the incident.
  - **(6)** the Shire anticipates that Woodside has engaged with the community regarding what may happen in areas that are affected by the proposed activities.
  - **(7)** asked that Woodside considers the Shire operated Pilbara Regional Waste Management Facility (PRWMF) for its decommissioning, recycling and waste disposal purposes.
  - **(8)** the Shire appreciates the opportunity to comment on the proposed activities and requests that Woodside provide the Shire with further updates as the proposal progresses.
- On 2 April 2024, Woodside responded thanking the Shire of Ashburton for its comments (SI Report, reference 30.2) and noted:
  - **(1)** the Shire raised no objections to the proposed activities.
  - **(2)** Woodside is required to manage environmental impacts and risks to the environment that may be affected (EMBA) by its proposed activities to As Low As Reasonably Practicable (ALARP) and to an acceptable level, as required by the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023, through the implementation of the EP. Woodside's proposed EP will be submitted to the National Offshore Petroleum Safety Environmental Management Authority (NOPSEMA) for assessment and acceptance.
  - **(3)** Woodside confirmed it will provide notifications to relevant stakeholders as required as per its oil spill response arrangements.

- **(4,5)** Woodside has an Oil Pollution First Strike Plan in place for all EPs which details potential impacts, notifications and response mitigations that may be executed to manage an emergency event.
- **(6)** Woodside consults relevant persons in the course of preparing an EP, and as per Woodside's ongoing consultation approach, feedback and comments from relevant persons continue to be assessed and responded to, as required, throughout the life of an EP.
- **(7)** the Shire's interest in ongoing local content opportunities.
- **(8)** Woodside will continue to provide the Shire with updates on the proposed activities when relevant.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) The Shire confirmed it has no objections to the activities.	**(1)** **Woodside assessment:** Woodside noted the Shire of Ashburton has no objections to the activities covered under this EP. **Woodside response:** Woodside thanked the Shire of Ashburton and acknowledged its feedback.	**(1)** Not required.
(2) Identify, manage and mitigate all possible impacts and risks.	**(2)** **Woodside assessment:** Woodside is required to manage environmental impacts and risks in accordance with the Environment Regulations. **Woodside response:** Woodside confirmed it is required to manage environmental impacts and risks to the environment by the proposed activities to ALARP, as per the Environment Regulations.	**(2)** Existing controls considered sufficient as described in Section 6 of this EP.
(3) Brief the Shire's Local and District Emergency Management Committee.	**(3)** **Woodside assessment:** Woodside briefed the Shire's Local and District Emergency Management Committee on 21 November 2023. **Woodside response:** Woodside confirmed it will provide notifications to relevant stakeholders as required as per its oil spill response arrangements.	**(3)** Not required.
(4) Communicate with appropriate national and state emergency management agencies.	**(4)** **Woodside assessment:** Woodside had undertaken emergency management planning and consults with relevant emergency management agencies to ensure alignment of its emergency management plans. **Woodside response:** Woodside has an Oil Pollution First Strike Plan in place for this EP which details potential impacts, notifications and response mitigations that may be executed to manage an emergency event.	**(4)** In the course of developing this EP, Woodside has developed oil spill preparedness and response positions (see Appendix H of this EP).

(5) Undertake emergency management planning.	**(5)** **Woodside assessment:** Woodside has considered emergency planning for EPs. **Woodside response:** Woodside develops oil spill preparedness and response positions tailored for individual projects. Woodside consults with the relevant external management agencies to ensure all emergency management plans are aligned with effective outcomes.	**(5)** In the course of developing this EP, Woodside has developed oil spill preparedness and response positions (see Appendix H of this EP).
(6) Engage with the community.	**(6)** **Woodside assessment:** Woodside consults relevant persons in the course of preparing an EP, as required by the Environment Regulations. **Woodside response:** Woodside consults relevant persons in the course of preparing an EP, and as per Woodside's ongoing consultation approach, feedback and comments from relevant persons continue to be assessed and responded to, as required, throughout the life of an EP.	**(6)** Woodside consults relevant persons in the course of developing an EP as described in Section 5.3 of this EP.
(7) Consider the PRWMF for future decommissioning works.	**(7)** **Woodside assessment:** Woodside noted the Shire's interest in ongoing local content opportunities. **Woodside response:** Woodside noted the Shire's interest in ongoing local content opportunities.	**(7)** Not required.
(8) Provide updates as proposal progresses.	**(8)** **Woodside assessment:** Woodside will provide the Shire of Ashburton with updates on the activities. **Woodside response:** Woodside will continue to provide the Shire with updates on the proposed activities when relevant.	**(8)** Woodside engages in ongoing consultation and will provide notifications of significant change, as appropriate, to relevant persons as referenced at Section 7 in this EP.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.
Outcomes of Consultation		
Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Shire of Ashburton for the purpose of		

regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Shire of Ashburton on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to Shire of Ashburton over a 5 month period.

Other non-government groups or organisations

Friends of Australian Rock Art Inc. (FARA)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed FARA advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to FARA, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to FARA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- On 29 March 2024, FARA emailed a letter to Woodside referencing 19 March 2024 correspondence (Record of Consultation, reference 2.40) and noted:
  - **(1)** receipt of correspondence on 19 March 2024 regarding this EP with response needed by 29 March 2024.
  - **(2)** its functions, interests and activities including the protection and preservation of rock art and the impacts of industrial development and climate change on this and physical and cultural heritage landscape.
  - **(3)** its current objectives and activities include support of the Murujuga Aboriginal Corporation Cultural Management Plan to protect the cultural heritage landscape and reduce the industrial footprint on Murujuga and secure a World Heritage Listing for the Burrup; and ongoing gas production counters its objectives.
  - **(4)** the gas processed on the Burrup Peninsula is the primary cause of industrial air emissions which harms Murujuga rock art, disrupts the cultural heritage landscape and contributes to climate change.
  - **(5)** Woodside is required to address the indirect consequences of the operations in the EP, according to the Environment Regulations and the EPBC Act Indirect Consequences Policy.
  - **(1,2)** its functions, interests and activities are affected by the indirect consequences, therefore, is a relevant person for this EP.
  - **(1)** Woodside is required to provide sufficient information and a reasonable period for consultation.
  - **(1)** Woodside only provided a 10-day consultation period which does not meet the requirements.

- **(4,5)** the Consultation Information Sheet does not address the impacts, risks and consequences of processing gas or indirect consequences, nor does it evaluate these.
- **(6)** it has a list of information required to assess possible consequences of activity related to Pluto Operations EP, including:
  - **(4, 5)** the impacts on Murujuga rock art and what Woodside determines as ALARP and acceptable level of impact.
  - **(7)** how Woodside is meeting its statutory obligations under the WA Aboriginal Heritage Act.
  - **(4)** disclosure of rock art monitoring or studies commissioned by Woodside to investigate the impact of industrial pollution on rock art.
  - **(4)** evidence of Woodside's engagement with peer-reviewed scientific research provided by FARA and consultation with experts tied to this research.
  - **(4)** what actions Woodside will take if scientific monitoring shows industrial pollution, including Pluto gas processing, is damaging rock art.
  - **(4)** if regulatory regimes for Pluto and North West Shelf LNG facilities will include measures that prevent impacts on the Burrup.
  - **(8)** information on climate scenarios expected to occur if Pluto operations continue.
  - **(9)** what Woodside considers to be acceptable climate impact scenarios and measures it will take to ensure impacts are ALARP.
  - **(10)** what other stakeholders with interests similar to FARA have been consulted and how their matters have been considered and addressed.
  - **(11)** how Traditional Owners and Custodians have had opportunities to exercise rights to Free Prior and Informed Consent related to Pluto Operations.
  - **(4,5)** the impact on the Murujuga cultural heritage landscape due to the processing of Pluto gas.
  - **(12)** how FARA's prior concerns and requests have been addressed by Woodside and what changes have been considered.
- **(4,5)** it needs the information on the impacts that may occur on Murujuga rock art and broader Burrup landscape and what Woodside has determined as ALARP.
- **(13)** it wants to know how Woodside made determinations and how it will manage operations as required by the Regulations.
- **(14)** FARA requires additional consultation time to engage qualified experts to review EP and advise it.
- **(15)** the peer-reviewed scientific reports previously provided to Woodside demonstrate the impact of atmospheric pollution on rock art and are relevant for this EP as Pluto Operations will extend the duration of pollution and potentially increase the intensity.
- **(16)** it has not received a satisfactory response on information previously provided to Woodside and there is an expectation that it will be addressed in EP and made publicly available to support transparency.
- **(17)** FARA wants further consultation prior to another EP submission along with the expectation that feedback in this email and previous submissions is included in the public section of the EP.
- **(1,2)** it looks forward to Woodside providing sufficient information and time for FARA to assess consequences as part of relevant person consultation process.

- On 14 May 2024, Woodside sent an email to thank FARA for consulting on the Pluto Facility Operations EP and provided response to its claims, objections and additional information request (SI Report, reference 39.1).
  - Woodside acknowledged FARA specifically requested information on climate scenarios related to Pluto operations and noted current correspondence is undated and received on 29 March 2024.
  - **(1)** affirmed that initial consultation information and Consultation Information Sheet was sent to FARA on 27 February 2024 with follow-up on 19 March 2024 and activity update on 27 March 2024. Feedback was requested to be provided by 29 March 2024.
  - **(2)** noted FARA's assessment of its functions, interests and activities but also recognised the statement provided is broader than FARA's published statement: "FARA works to protect, preserve and promote Australian rock art in general, and in particular the petroglyphs found in the Dampier Archipelago (including Murujuga/Burrup Peninsula) in the Pilbara region of Western Australia" (FARA website, FARA - Friends of Australian Rock Art - FARA | Friends of Australian Rock Art accessed May

2024).

- **(3)** noted FARA's statement on its current objectives and activities, and shared that some of the statements appear to be broader than those on FARA's website, some lack specificity and not all have been accurately verified.
- **(4)** provided that the statutory regime related to offshore emissions includes both State and Commonwealth legislation which is applied to the relevant proponents for onshore processing facilities.
    - atmospheric emissions tied to onshore processing and nearby domestic gas users are managed under requirements of the *WA Environmental Protection Act 1986,* State and Federal Aboriginal Heritage legislation and the Federal EPBC Act.
    - for Pluto LNG Gas Plant, approvals include Ministerial Conditions and associated management plans addressing greenhouse gas emissions, air quality and cultural heritage which are approved by EPA or Minister of Environment on EPA's advice.
    - approvals related to the Pluto LNG Gas Plant and Karratha Gas Plant publicly report compliance against those approvals.
    - approval documents for the aforementioned plants are generally available and existing, so they are not new for this 5 yearly Operations EP review.
    - Woodside is involved with the monitoring of industrial emissions and strategies related to Murujuga rock art and supports the Murujuga Rock Art Strategy through membership of the Murujuga Rock Art Reference Group and funding for Murujuga Rock Art Monitoring Program.
    - it supports the establishment of and coordinated approach for an atmospheric deposition monitoring program under the Strategy and provides data to the effort from the Woodside Atmospheric and Ambient Air Quality Monitoring Programs.
    - expects findings of the Murujuga Rock Art Strategy to be implemented if required by appropriate regulatory measures.
    - there is State and Federal legislation to manage onshore processing facilities, including environment and cultural heritage.
    - noted that climate change impacts cannot be attributed to any one activity or one project, as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started.
- **(5)** Indirect impacts from the petroleum activities program are considered and addressed in the Pluto Operations EP which will be publicly available on NOPSEMA website during assessment.
- **(6)** Noted FARA's request for additional information to assess gas processing activities on its functions, interests or activities.
- **(7)** referred FARA to Woodside website for its approach to Aboriginal cultural heritage management, including the pluto-construction-phase-cultural-heritage-management-plan.pdf (woodside.com).
- **(8)** for climate scenario tied to Pluto Operations, Woodside referred FARA to its Woodside's Climate Transition Action Plan and 2023 Progress Report noting pages 44 and 45 regarding global demand for oil and gas, pages 46 and 47 for the evolving role of natural gas in domestic and international markets and pages 52 and 53 for scenario analysis of Woodside's portfolio.
- **(9)** for acceptable climate impact scenarios, Woodside referred to Climate Transition Action Plan and 2023 Progress Report to provide information on Decarbonisation Strategy (pages 13-41), and specifically page 24 to 25 regarding large scale abatement and the vision for Pluto net zero.
- **(10)** noted undertaking a relevancy assessment for every EP to determine who is a relevant person and provided additional consultation activities including the advertising of the Operations EP and consultation opportunities in The Australian, The West Australian, regional newspapers and Indigenous newspapers as well as a social media campaign across Facebook and Instagram.
- **(11)** confirmed that Woodside consulted with First National relevant persons for Pluto Operations, including Traditional Custodians of Murujuga.
- **(12)** recognised there is previous correspondence between Woodside and FARA and referred FARA to previous responses.
- **(13)** noted that the Operations EP and relevant appendices including relevant person consultation, reports, analyses and modelling, will be public on NOPSEMA

website after submission and assessment.
- **(14)** confirmed that feedback can continue to be provided during the life of an EP, including after consultation has closed on the EP, during EP assessment, and after an EP has been accepted by NOPSEMA. Woodside continues to receive, assess and respond to feedback and comments from relevant persons throughout the life of the EP.
- **(15)** noted that emissions associated with Operations EP relate to the existing Pluto LNG Gas Plant approvals and referred back to first reference of **(4)** for review of Ministerial conditions and commitments and assessment of indirect impacts to rock art and cultural heritage values. Research to date on impacts of industrial emissions on rock art is inconclusive and additional research is underway by the Murujuga Aboriginal Corporation and Western Australian Department of Water and Environmental Regulation. Woodside is a member of the Murujuga Rock Art Stakeholder Reference Group and noted it expects findings of Murujuga Rock Art Strategy to be implemented if required via appropriate regulatory measures. It also provided a link to Woodside's consideration of publications related to Murujuga rock art, referencing section 4, page 311 Appendices - North West Shelf Project Extension Environmental Review Document (woodside.com)
- **(16)** confirmed peer-reviewed scientific reports related to potential emission impacts on Murujuga's rock art have been considered and referred back to points covered above in first reference to **(4)** and **(5)**. The Operations EP will be made available on NOPSEMA website during assessment.
- **(17)** noted assumption that reference to another EP was a typo and that FARA was consulted with for the Pluto Facility Operations EP in line with Regulation 25. Per FARA's request, Woodside will publish FARA's feedback in full in the Operations EP.

- On 24 May 2024, Woodside received an email, letter and paper from FARA in relation to this EP and another EP (SI Report, reference 39.2). The letter reiterated points raised in previous letters including:
  - **(1, 2)** FARA is a relevant person and has raised concerns regarding indirect impacts of this EP on Murujuga rock art as a result of LNG processing and gas use on the Burrup Peninsula.
  - **(6)** Woodside has not yet provided sufficient information to FARA to make an informed assessment.
  - **(15)** Attached the April 2024 report entitled The Effects of Acidic Pollution on the Rock Art of Murujuga by Benjamin Smith and the Murujuga Rock Art Conservation Project which contains an analysis of the MRAMP campaign. Combined with other reports and studies it shows that atmospheric emissions are causing conditions which are harmful to rock art and increased emissions will increase harmful levels. FARA looks forward to Woodside's response. A lack of scientific certainty should not prevent the adoption of precautionary avoidance and mitigation measures.
  - FARA reiterates its opposition to the proposed activities.

- **(1, 16)** On 28 May 2024, Woodside emailed FARA thanking it for the new information and stating it would assess it (SI Report, reference 39.3). Furthermore, it stated:
  - FARA has been assessed as being a relevant person for both this EP and another EP. Woodside has consulted with FARA in accordance with section 25 of the Regulations and FARA has been provided with consultation information for both EPs.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Consultation information received on the 19 March 2024.	**(1)** **Woodside assessment:** Woodside confirms initial consultation information and Consultation Information Sheet was sent to FARA on 27 February 2024 with	**(1)** FARA has been given sufficient information and a reasonable period in which to make an

	follow-up on 19 March 2024 and activity update on 27 March 2024. **Woodside response:** Woodside provided FARA with background dates to demonstrate 30-day consultation period was provided. FARA has been provided with sufficient information and a reasonable period for consultation.	informed assessment of the possible consequences of the activity on its functions, interests or activities, as described in Section 5.4 of the EP.
(2) Dedicated to protection and preservation of rock art and impact caused by industrial development.	**(2)** **Woodside assessment:** Woodside is aware of FARA's work to preserve rock art and physical and cultural heritage landscape but notes the FARA-provided statement is broader than its published statement. **Woodside response:** Woodside noted FARA's functions, interests and activities and issues of concern, but also recognised its statement tied to these is broader than its published statement.	**(2)** Not required.
(3) Supports plan to protect cultural heritage from industry as part of objectives and activities and continued gas processing counters this.	**(3)** **Woodside assessment:** Woodside noted FARA's current objectives and activities, but also recognised some statements are broader than what is covered on FARA's website, some lack specificity and not all have been verified as accurate. **Woodside response:** Woodside notes FARA's statement on its current objectives and activities, but also notes use of broader statements compared to the FARA website and that some statements lack specificity and not all have been verified as accurate.	**(3)** Not required.
(4) Gas processing at Pluto LNG facility harms rock art, cultural heritage landscape and affects climate change.	**(4)** **Woodside assessment:** Woodside cited State and Commonwealth legislation that to applied to onshore processing facilities and manage atmospheric emissions tied to onshore processing and address greenhouse gas emissions, air quality and cultural heritage. It also acknowledges its involvement with monitoring of industrial emissions and the Murujuga Rock Art Strategy as a member of the Murujuga Rock Art Reference Group and funder of the Murujuga Rock Art Monitoring Program. **Woodside response:** Woodside referenced existing State and Commonwealth legislation that manages atmospheric emissions tied to onshore processing and approvals related to Pluto LNG Gas Plant. This includes Ministerial Conditions and associated management plans addressing greenhouse gas emissions, air quality and cultural heritage which are approved by the EPA or Minister of	**(4)** Not required.

	Environment. It also noted its historic and present work to support the Murujuga Rock Art Strategy and monitor industrial emissions. Climate change impacts cannot be attributed to any one activity or one project, as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started.	
(5) Indirect consequences of Pluto operations must be addressed in the EP.	**(5)** **Woodside assessment:** Woodside considers and addresses indirect consequences in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* (Cth) (the Regulations). **Woodside response:** Indirect consequences will be considered and addressed in the Operations EP, which will be publicly available on the NOPSEMA website during assessment.	**(5)** Consideration of indirect emissions associated with the activity is described in Section 6.7.10 of the EP.
(6) Requires additional information to assess consequences of Pluto Operations activity.	**(6)** **Woodside assessment:** Woodside reviewed FARA's request for additional information to assess gas processing activities on its functions, interests or activities. **Woodside response:** Woodside provided a response to each information request.	**(6)** FARA has been given sufficient information and a reasonable period in which to make an informed assessment of the possible consequences of the activity on its functions, interests or activities, as described in Section 5.4 of the EP.
(7) Wants to know how Woodside meets statutory requirements under WA Aboriginal Heritage Act.	**(7)** **Woodside assessment:** Woodside has information about its approach to Aboriginal cultural heritage management on Woodside.com. **Woodside response**. Woodside provided FARA with link to the Cultural Heritage Management Plan for Pluto LNG.	**(7)** Not required.
(8) What are climate scenarios tied to continuing Pluto Operations.	**(8)** **Woodside assessment:** Woodside noted its Climate Transition Action Plan and 2023 Progress Report provides information. **Woodside response:** Woodside referred to its Climate Transition Action Plan and 2023 Progress Report to address global demand for oil and gas (pages 44-45), evolving role of natural gas (pages 46-47) and scenario analysis of its portfolio (pages 52-53).	**(8)** Not required.

(9) What are acceptable climate impact scenarios and measures for ALARP impact.	**(9)** **Woodside assessment:** Woodside's recognises its Climate Transaction Action Plan and 2023 Progress Report covers climate impact scenarios. **Woodside response:** Woodside referred to its Climate Transition Action Plan and 2023 Progress Report to provide information on Decarbonisation Strategy (pages 13-41), and specifically page 24 to 25 regarding large scale abatement and the vision for Pluto net zero.	**(9)** Not required.
(10) Request for information on dealings with similar-interest stakeholders.	**(10)** **Woodside assessment:** Woodside conducts a relevancy assessment for every EP to determine who is a relevant person and has a planned outreach effort to contact relevant persons and organisations. **Woodside response:** Woodside confirmed that beyond directly contracting relevant persons and organisations, including FARA, it advertised this EP and consultation opportunities in The Australian, The West Australian, regional newspapers and Indigenous newspapers and ran a social media campaign across Facebook and Instagram. Matters raised during consultation are addressed in this EP.	**(10)** Assessment of relevant persons is described in Appendix F, Table 1 of the EP.
(11) How Traditional Owners and Custodians exercise rights related to Pluto Operations.	**(11)** **Woodside assessment:** Woodside consults with First Nations relevant persons for all EPs. **Woodside response:** Woodside confirmed it has consulted with First Nations relevant persons for Pluto Operations, including Traditional Custodians of Murujuga and in the broader environment that may be affected by the EP activity to understand their functions, interests or actions. Woodside also noted that under the *United Nations Declaration on the Rights of Indigenous Persons* that cultural heritage and other communal rights of Indigenous people must be managed through consultation with representative institutions. Direct consultation with individual First Nations persons outside of this process has the potential to undermine the cultural authority of recognised elders and democratically elected representatives. This process of understanding communally held beliefs has recently been confirmed by the Federal Court in the *Munkara v Santos* matter.	**(11)** Consultation with Traditional Custodians of Murujuga is described in Appendix F, Table 2 of the EP.

(12) How its past concern and requests have been addressed.	**(12)** **Woodside assessment:** Woodside recognises there is previous correspondence with FARA for reference. **Woodside response:** Woodside referred FARA to its previous responses to FARA's previous correspondence.	**(12)** FARA has been given sufficient information and a reasonable period in which to make an informed assessment of the possible consequences of the activity on its functions, interests or activities, as described in Section 5.4 of the EP.
(13) Requires information on what Woodside considers ALARP and its management.	**(13)** **Woodside assessment:** Woodside recognises that this EP and relevant appendices will be public on NOPSEMA website after submission and assessment. **Woodside response:** Woodside noted that this EP and relevant appendices, including relevant person consultation, reports, analyses and modelling, will be public on NOPSEMA website after submission and assessment. It also referred WR (4) and (5).	**(13)** FARA has been given sufficient information and a reasonable period in which to make an informed assessment of the possible consequences of the activity on its functions, interests or activities, as described in Section 5.4 of the EP.
(14) Requests additional consultation time to engage qualified experts.	**(14)** **Woodside assessment:** Woodside notes that feedback can be provided throughout the life of an EP, including after consultation period has closed. **Woodside response:** Woodside advised that feedback can continue to be provided during the life of an EP, including after consultation has closed on the EP, during EP assessment, and after an EP has been accepted by NOPSEMA. Woodside continues to receive, assess and respond to feedback and comments from relevant persons throughout the life of the EP. Should feedback be received following the acceptance of an EP that identifies a measure or control that requires implementation or updates to meet the intended outcome of consultation, Woodside will apply its Management of Change and Review process as appropriate.	**(14)** FARA has been given sufficient information and a reasonable period in which to make an informed assessment of the possible consequences of the activity on its functions, interests or activities, as described in Section 5.4 of the EP. Woodside engages in ongoing consultation with stakeholders, as described in Section 7.10 of the EP.
(15) Peer-reviewed scientific reports show impact of atmospheric pollution on rock art.	**(15)** **Woodside assessment:** Woodside notes that research to date on industrial emissions impacts on rock art has not been conclusive, but further research is being led by the Murujuga Aboriginal Corporation and Western Australian Department of Water and Environmental Regulation. It expects future findings of the Murujuga Rock Art Strategy will be implemented if required via appropriate	**(15)** Consideration of indirect emissions associated with the activity is described in Section 6.7.10 of the EP.

	regulatory measures. **Woodside response:** Woodside responded that emissions tied to the Operations EP relate to emissions within the scope and duration of existing Pluto LNG Gas Plant approval and the Ministerial conditions and commitments in place are included in point **(4)** above in correspondence summary. It noted that research to date on industrial emissions impacts on rock art has not been conclusive, but further research is being led by the Murujuga Aboriginal Corporation and Western Australian Department of Water and Environmental Regulation. As a member of the Murujuga Rock Art Stakeholder Reference Group, it expects future findings of the Murujuga Rock Art Strategy will be implemented if required via appropriate regulatory measures. For additional information on Woodside's consideration of publications relating to Murujuga rock art, it recommended page 311 Appendices - North West Shelf Project Extension Environmental Review Document (woodside.com)	
(16) Expects a satisfactory response on information provided and wants it addressed publicly in EP.	**(16)** **Woodside assessment:** Woodside noted consideration of peer-reviewed scientific reports related to potential emission impacts on Murujuga's rock art. **Woodside response:** Woodside confirmed that peer-reviewed scientific reports of which it is aware relating to potential emissions impacts on Murujuga's rock art have been considered in Woodside's assessments for the Operations EP. The Operations EP which is currently being prepared and which will be made available on the NOPSEMA website during assessment. It also referred back to first references of points **(4)** and **(5)** in email summary above.	**(16)** Not required.
(17) Expects further consultation and FARA feedback to be included in public section of EP.	**(17)** **Woodside assessment:** Woodside complies with Regulation 25 of the Environment Regulations and consulted FARA in accordance with that. **Woodside response:** For the Operations EP, Woodside has complied with Regulation 25 of the Environment Regulations in its consultation with FARA and Woodside will publish FARA's feedback in the EP.	**(17)** Woodside engages in ongoing consultation with stakeholders as described in Section 7.10 of the EP.
Woodside has addressed objections and claims as noted above.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should feedback be received after the EP has been accepted, it	Woodside considers the measures and controls in the EP are appropriate.

	will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with FARA for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to FARA on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has addressed and responded to FARA over a 5 month period.

Telstra

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Telstra advising of the proposed activity (Record of Consultation, reference 2.25), provided a Consultation Information Sheet, a map of the Submarine Communications Cables and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 12 March 2024, Telstra emailed Woodside requesting to be contacted regarding an email received (SI Report, reference 10.1).
- On 12 March 2024, Woodside asked Telstra to confirm which activity its email related to (SI Report, reference 10.2).
- On 13 March 2024, Telstra confirmed contacting Woodside in relation to this EP (SI Report, reference 10.3).
- On 13 March 2024, Woodside enquired about Telstra's request (SI Report, reference 10.4).
- **(1)** On 14 March 2024, Telstra requested to be contacted to understand the impact of the activities on its network (SI Report, reference 10.5).
- **(1)** On 25 March 2024, Woodside advised the North West Shelf cable operated by Telstra is in the vicinity of the operational area and the new activities are located approximately 12km from the nearest cable (SI Report, reference 10.6). A map of the Submarine Communications Cables was attached, as previously provided to Telstra.
- **(2)** On 2 April 2024, Telstra forwarded its Duty of Care brochure and requested Woodside contact Telstra should the network be impacted by the activities (SI Report, reference 10.7).
- **(2)** On 3 April 2024, Woodside confirmed it will contact Telstra should the network be impacted by the activities covered under this EP (SI Report, reference 10.8).

- On 27 March 2024, Woodside provided an activity update to Telstra regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Impact of activities on Telstra's network.	**(1)** **Woodside assessment:** Woodside reviewed the map of the Submarine Communications Cables to provide a detailed response. **Woodside response:** Woodside provided another copy of the map and advised the North West Shelf cable operated by Telstra is in the vicinity of the operational area and the new activities are located approximately 12km from the nearest cable.	**(1)** Not required.
(2) Telstra requested to be notified.	**(2)** **Woodside assessment:** Woodside will provide notifications to relevant stakeholders as outlined in Table 7-7 of this EP. **Woodside response:** Woodside confirmed it will contact Telstra should the network be impacted by the activities.	**(2)** Woodside will provide notification of significant change, as appropriate, to Telstra, as referenced in Table 7-7 of the EP.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Telstra for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Telstra on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has addressed and responded to Telstra over a 5 month period.

Vocus

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Vocus advising of the proposed activity (Record of Consultation, reference 2.25), provided a Consultation Information Sheet, a map of the Submarine Communications Cables and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Vocus, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Vocus regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Vocus for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to Vocus on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Vocus with the opportunity to provide feedback over a 5 month period.

Doctors for the Environment Australia (DEA)

Summary of information provided and record of consultation for this EP:

- On 24 April 2024, during the course of preparing the EP, DEA self-identified by emailing NOPSEMA and including a feedback letter addressed to Woodside regarding this EP (SI Report, reference 41.1) and:

- **(1)** referred to another EP and Woodside's intention to seek 5-year extension to Pluto Facility Operations EP.
- **(2)** understood Woodside was undertaking consultation with relevant persons for both EPs under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth) prior to NOPSEMA assessment.
- **(2)** considered itself to be a relevant person and Woodside is required to consult it.
- **(3)** noted that Woodside is required by regulations 11A(2) and (3) of the environment regulations to provide relevant persons with "sufficient information" to assess the possible consequences of the activities on its functions, interests or activities and provide "reasonable period" for consultation.
- **(4)** DEA provided statements related to its interests, functions, activities and resources including:
    - background on DEA as an independent, non-government organisation of medical doctors and students in Australian States and Territories that has a voice in the sphere of environmental health.
    - reference to annual reports that articulate its strategy and impact goals to reducing fossil fuel combustion and cutting global greenhouse gas emissions this decade.
    - resources including health reports, fact sheets and submissions.
    - consultation-relevant fact sheets "How Climate Change Affects Your Health: The Facts, How Climate Change Affects Mental Health in Australia" and "Asthma and Indoor Gas Appliances."
    - submissions including the Senate Inquiry Duty of Care Intergenerational Equity Bill and Protecting the Spirit of Sea Country Bill 2023.
    - support of phasing-out gas in households and policies and programs to phase out use of Gas in Australia.
    - Support of global emissions reduction aligned with the Paris Agreement with DEA arguments found in its Future Gas Strategy consultation paper.
- **(5)** understands a range of different pathways and energy scenarios may be considered to align with globally agreed temperature goals and each has different levels of certainty, risk profiles and public health outcomes, so DEA supports position of the United Nations, IEA and other authorities that there should be no new fossil fuel resource developments that are not already under production. It considers that Woodside projects are not consistent with findings and wants more information to understand and evaluate health implications.
- **(6)** noted the consultation helps the proponent and environment in improving an EP's content and it looks forward to receiving more information and opportunity to comment.
- **(3,6)** noted that consultation required under regulation 11A of the Environment Regulations, a proponent is required to provide DEA with "sufficient information" to make an informed assessment and provide a "reasonable period" for consultation.
- **(7)** referenced NOPSEMA's "Guidance Note: Environment Plan content requirements" dated September 2020 (EP Content Guidance) and "Guideline: Consultation in the course of preparing an environment plan" dated 12 May 2023 (Consultation Guideline) state that consultation in relation to any EP for development activities should assist the proponent to understand the external context, define "acceptable levels" of environmental impact and risk, and inform appropriate control measures.
- **(8)** did not feel that Woodside's published consultation material for another EP or this EP provided "sufficient information" as it did not address indirect impacts related to greenhouse gas emissions, climate change impacts and health impacts associated with gas usage. Nor did it sufficiently address local air pollution impacts from Woodside's gas processing facilities.
- **(5,8)** cited Woodside's estimate of total lifecycle emissions from the development – 878m tonnes – and that indirect consequences on climate change and health impacts of air pollution from fuel combustion are significant.
- **(4)** described itself as an environmental organisation and provided background on how its functions, interests and activities are directed:

  - protecting the natural environment so that human health may be protected
  - understanding the intimate relationship between health of the environment and human health
  - drawing attention to health impacts of global warming from GHG emissions, air pollution from fossil fuel combustion as well as direct health impacts associated with use of gas in household and industrial settings.
- **(5)** believed its interests and objective would be impacted by the Operation EP in at least the following ways:
  - health impacts in Australia and elsewhere as a consequence of climate change
  - health impacts for workers and the local community as a result of Woodside's LNG processing operations
  - health and wellbeing impacts for Aboriginal peoples who experience impacts to cultural heritage and Sea Country as a result of Woodside's gas processing operations and climate change and ocean acidification more generally
  - health and wellbeing impacts associated with the use of gas in domestic and commercial settings, both in Western Australia and elsewhere where the gas is exported
  - health considerations arising from carbon pollution mitigation options such as the use of offsets, carbon capture and storage, direct mitigation, or other abatement methods
  - impacts and implications for healthcare professionals and health care systems arising from the health impacts mentioned above.
- **(5,6,8)** noted that regulation 11A of the Environment Regulations requires proponents to provide DEA with sufficient information to make informed assessment of the project and possible negative consequences to the above interests and activities.
- noted indirect impacts from GHG emissions from another activity and climate change and air pollution from burning fossil fuels were not considered or provided.
- **(9)** noted that climate change impacts, including from Scope 3 emissions that will result from another activity, fall under the scope of indirect consequences which must be assessed in accord with the approved NOPSEMA Program under the EPBC Act, and separately, as part of the broader environment that must be considered by NOPSEMA in accordance with the Environment Regulations.
- **(3,5,8)** considered that Woodside has not provided DEA with sufficient information to make an informed assessment of consequences on its functions, interests and activities.
- **(10)** provided examples of information DEA requires to make an assessment including:
  - Woodside's analysis of impacts
  - Woodside's analysis of impacts including independent health impact assessments, baseline health studies or other analysis including:
  - health impacts from use of gas produced by Australian and overseas projects
  - health impacts arising from climate impacts that are attributable to emissions from these projects
  - health impacts from climate change and other effects
  - identification of groups or communities disproportionately affected by impacts
  - health and wellbeing effects of both direct and indirect impacts of the projects to sea country and cultural heritage
  - health and wellbeing impacts for the local community and others who may be exposed to, or impacted by airborne emissions and other effects of Woodside's gas processing and export facilities, or other infrastructure associated with the projects
  - health impact on workers involved in the construction and production phase of the projects and the gas processing facilities over the period they will be utilised for these projects
  - Information regarding mitigation measures

  - Information about what mitigation measures are proposed (if any) by Woodside to address impacts that have been identified, including what effects these mitigation measures are likely to have, how they will be implemented
  - Details the implementation strategy and monitoring, recording and reporting arrangements in relation to the described indirect and direct environmental impacts and risks of the activities, including how they will be reviewed and evaluated.
  - Details on how the proposed mitigation measures and implementation strategy will be subject to enforceable regulatory requirements or otherwise regulated.
  - Information about what other mitigation options have been considered by Woodside (if any) but are not proposed for implementation.
  - Information regarding Woodside's evaluation and selection process for mitigation measures, including how decisions have been made and what criteria have been applied to the consideration by Woodside of what mitigation measures will be implemented.
  - Information to demonstrate how the chosen mitigation measures will achieve the required outcome of 'as low as reasonably practicable and acceptable' residual impacts.
  - Information on residual impacts and risks
  - Information to specify what residual health risks, impacts and outcomes Woodside believes will occur as a result of the projects after the application of proposed mitigation measures
  - Details of what residual impacts Woodside considers to be acceptable, in the context of the regulatory requirement for 'as low as reasonably practicable and acceptable'
  - Information on relevant person consultation in relation to health impacts and effects
  - What efforts Woodside has made to identify and consult with persons or organisations who may be impacted by health effects of the activities as relevant persons under the regulations.
  - What relevant persons Woodside has consulted with who may be impacted by health effects of the activities and what concerns or issues have been raised in the process of such consultation to date.

- **(3,5,8,10)** shared why the above information is needed for DEA to make an informed assessment as it wants to respond in an evidenced-based manner and direct its activities to better protect the health of communities from such impacts and prepare the health sector for climate change impacts.
- **(3,5,8,10)** requested the above information as part of consultation and it should include reports, analyses, assessments, modelling and/or other documents used by Woodside.
- **(11)** noted that Woodside has made general statements related to its Climate Transaction Action Plan and 2023 Progress Report (the Report) and given majority of this project's emissions will be from Scope 3 emissions which the Report sets only a 5 Mtpa abatement target. It does not describe the health outcomes or impacts from its proposed activities.
- **(3)** noted Regulation 11A of the Environment Regulations requires a "reasonable period" for consultation.
- **(3,5,8)** noted Woodside has not provided "sufficient information" to DEA and further time will be needed to review information when provided.
- **(3)** referenced EP Content Guidance note that specifies consultation time should be based on complexity and volume of information provided and practicalities of DEA's available personnel and resources. After receiving requested information, it can determine the length of time needed for consultation. It noted that the 30 day period for public exhibition of certain EPs specified under Regulation 11B(1)(a) of the Environment Regulations is unlikely to be sufficient for the purposes of consultation under Regulation 11A. This is because the consultation envisaged by Regulation 11A is required to be more rigorous than public exhibitions.
- **(3)** noted the EP Content Guidance and Consultation Guidelines state that under Regulation 11A, consultation should demonstrate two-way communication, transparency, collaboration and inclusiveness. It continued that Regulation 16(b) requires proponents to provide feedback to DEA on its comments.
- **(12)** reiterated that any EP for the project should not be accepted until the requirements of Regulation 11A are met, including consultation requirements with DEA

identified in this document.
  - **(3,5,6,8,12)** noted it looked forward to receiving more information so consultation can commence in accordance with Regulation 11A of the Environment Regulations.

- On 14 May 2024, Woodside responded to DEA's email from 24 April 2024 (SI Report, reference 41.2) and:
  - **(1)** noted receipt of DEA's letter which related to this EP and another EP.
  - **(2)** Woodside consulted DEA for the other EP starting in August 2023. Consultation for this EP closed on 29 March 2024. Woodside outlined its EP feedback process and Management of Change and Review process. Based on feedback for the Pluto Operations EP, DEA has been assessed as being a relevant person for the Pluto Operations EP.
  - **(3)** confirmed it consults relevant persons during EP preparation in accordance with Regulation 25 of the Environment Regulations.
  - **(4)** noted DEA's statements and document reference but makes no comment as to the factual accuracy or otherwise of these documents.
  - **(5)** referred DEA to Section 4.2 Global demand for oil and gas (on pages 44 and 45) of Woodside's Climate Transition Action Plan and 2023 Progress Report available at Woodside's Climate Transition Action Plan and 2023 Progress Report. Woodside referred DEA to publicly available information and noted that more granular detail relating to GHG emissions will be set out and assessed in the respective EPs. GHG emissions will be estimated using the National Greenhouse and Energy Reporting (NGER) Measurement Determination 2008 and other industry standard database. The EP will assess Direct Emissions (Scope 1) and Indirect Emissions, aligned with the definitions of the GHG Protocol Corporate Standard and the National Greenhouse and Energy Reporting Regulations 2008 (Cth).
  - **(6)** provided background on consultation activities including advertisements in The Australian, The West Australian, regional newspapers and Indigenous newspapers between 26 – 28 February 2024, a social media campaign across Facebook and Instagram in February 2024, community events with subject matter experts and information and tailored roadshow in the Pilbara during March and April 2024. The Pluto Operations EP consultation information sheet was published 26 February 2024.
  - **(7)** confirmed it refers to NOPSEMA's guidance materials when undertaking consultation.
  - **(8)** noted that GHG information for another EP is already publicly published. The statutory regime relating to onshore emissions includes various State and Commonwealth legislation which manages potential impacts and risks to environment and cultural features, and legislation is applied to the relevant proponents for the onshore processing facilities.
  - **(9)** recommended review of Section 3.1 Climate strategy (on page 14), Section 3.5 Scope 3 emissions (on page 32 and 33) and Section 3.6 Scope 3 targets (on pages 34 - 40) of Woodside's Climate Transition Action Plan and 2023 Progress Report available at Woodside's Climate Transition Action Plan and 2023 Progress Report. The EPs will assess both direct and indirect impacts and risks associated with the Petroleum Activities Program (PAP), having regard to the nature and scale of the proposed PAP. Direct and indirect emissions with the potential to result in climate change impacts will be considered.
  - **(10)** noted that emissions associated with onshore gas processing are subject to a range of legislative requirements including those which consider and manage potential to impact on human health (for example Part IV environmental impact assessment and associated air quality monitoring management (refer to summary point **(5)** above), as well as broader World Health Organisation requirements and National Environment Protection Measure limits and specific health and safety related regulations.). Woodside does not provide drafts of EPs while in development or under assessment for a number of reasons, including the potential for content to change. Allowing access to publicly available versions enables stakeholders to access and comment on the same information, assists with version control and removes potential for confusion. The EP will be made publicly available on NOPSEMA's website once it has been submitted and is under assessment.
  - **(11)** noted that climate change impacts cannot be attributed to any one activity or one project, as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started. Although the direct and indirect GHG emissions associated with

Scarborough and Pluto cannot be linked to climate change impacts to the environment, a contextual evaluation of climate change impacts will be provided in the EPs. Encouraged DEA to read Woodside's suite of climate disclosures including Woodside's Climate Report 2021, Climate Report 2022 and Climate Transition Action Plan and 2023 Progress Report.
- **(12)** Woodside disagreed with the assertion that the Project should not be accepted as Woodside had engaged in consultation with DEA in accordance with Regulation 25.

- On 12 June 2024, DEA emailed Woodside in response to Woodside's letter dated 14 May 2024 (SI Report, reference 41.3). DEA:
  - **(1)** Welcomed Woodside's acknowledgement that DEA is a relevant person for this EP and another Woodside EP.
  - **(3)** Did not consider that information provided to date was sufficient in terms of consultation, in particular regarding climate and health impacts. DEA stated that consultation requirements of the Regulations have not been met.
  - **(13)** Further stated that given the limited information provided by Woodside, and DEA's voluntary capacity, the information in the letter should not be taken to reflect DEA's complete position or complete submissions on the proposal and that DEA reserved the right to make further submissions as capacity and information became available.
  - **(14)** Claimed that as well as climate change harming human health:
    - Oil and gas developments result in direct health harms from pollution including cancer, reproductive harms, impairment of normal human growth and development, birth defects, respiratory and cardiovascular disease and deaths as well as interference with the body's communication system of hormones regulating growth, behaviour, metabolism and reproductive function; and
    - The destruction of sites of spiritual significance to First Nations people by fossil fuel developments compounds psychosocial harms.
  - **(15)** Advised that any emissions produced from now will need to be removed from the atmosphere at a later date. At a minimum:
    - Woodside's assessment of climate impacts associated with these projects should consider impact on global emissions over at least a 100 year period and preferably longer;
    - Woodside must show how it will cause carbon drawdown (CDR) to remove all emissions that will be produced by the projects from the atmosphere in the long term, and enforceable measures must be imposed by the regulator to ensure this takes place.
  - **(16)** Claimed Woodside's CTAP and 2023 Progress Report (and climate plans in general) could not be relied upon as a basis for assessment of the acceptability of carbon pollution or climate change impacts of the proposed activities because:
    - The plans and targets are unenforceable;
    - The CTAP and 2023 Progress Report amounts to greenwash because it does not address numerous requirements of the UN standards and ISO Guidelines for Net Zero;
    - The plans have repeatedly been rejected as insufficient by a majority of Woodside's shareholders.
  - **(17)** Asserted that reliance on the Federal safeguarding mechanism as a means to align with Australian national emissions goals is inappropriate because of:
    - Australia's national emission reduction goals and legislated carbon emissions budget are not aligned with the temperature goals of the Paris Agreement;
    - Ongoing project emissions beyond 2030 reduction targets;
    - Emissions that will result from these projects in other countries outside of Australia;

  - Potential use of low integrity undisclosed offsets.
- **(18)** Claimed that if comparisons to Australia's emissions reduction targets and budget are to be used, then the total emissions from the proposed activities (not just domestic emissions) should be compared with Australia's abatement efforts and policies.
- **(19)** Stated it did not accept the argument that the total emissions from the proposals are an insignificant contribution to the global carbon budget and therefore should not be considered unacceptable as if this were true, Australia's entire national abatement efforts to 2030, including abatement from all sources, is also insignificant.
- **(20)** Stated that Woodside must adhere to the UN and ISO's guidelines in relation to its proposed activities as part of any assessment on the impacts on the climate and on DEA's activities and interests under the Regulations.
- **(21)** Stated that it looked forward to Woodside providing further information to address DEA's concerns and demonstrating that the impacts of the proposed activities will be managed to a level that is acceptable to DEA.

- On 4 July 2024, Woodside emailed DEA (SI Report, reference 41.4). Woodside advised that it continued to assess and respond to feedback throughout the life of an EP, and that Woodside was available to meet with DEA over the next month. Woodside also acknowledged receipt of DEA's letter dated 12 June 2024 and advised it would be responding shortly.
- On 9 July 2024, Woodside responded to DEA's letter dated 12 June 2024 (SI Report, reference 41.5). Woodside:
  - **(1)** noted DEA's comments regarding relevant person status.
  - **(3)** noted further information on emissions will be included in the revised EP and reiterated that in accordance with regulation 25 of the Environment Regulations, Woodside's consultation process provided relevant persons with sufficient information to allow them to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities. Woodside assesses any objections or claims received and adopts appropriate measures so that the activity is carried out in a manner whereby environmental impacts and risks are reduced to as low as reasonably practicable (ALARP).
  - Noted that DEA's public position is that all new coal, oil and gas projects should be banned, and provided public statements from DEA that indicate that is it fundamentally opposed to fossil fuels. Woodside also noted connections between DEA and other NGOs who have campaigns against Woodside.
  - **(5)** advised that in terms of climate and health impacts associated with this EP, climate change impacts are the result of global GHGs and cannot be attributed to any one activity or project. Emissions associated with the projects are negligible in the context of existing and future anticipated global GHG emissions. In addition, gas can play a role towards the energy transition.
  - Directed DEA to the IPCC's Sixth Assessment Report (AR6) in 2023 and Woodside's approach to climate change (Section 5.3 'Managing Physical Risk' and Section 6.3 'A Just Transition' of Woodside's Climate Transition Action Plan (CTAP) and 2023 Progress Report) for information on GHG emissions in a global and Australian context.
  - **(13)** Noted that, based on DEA's website, DEA's members cite a significant volume of studies, scientific research and videos to inform its position on human impacts from climate change demonstrating that DEA has access to information, and capacity and understanding of that information. Woodside also noted that a number of DEA's members attended Woodside's 2024 AGM.
  - **(14)** Reiterated that climate change impacts are the result of global GHG emissions and cannot be attributed to any one project.
  - Gas can play a role in the energy transition.
  - Stated that the proposed petroleum activities were not anticipated to result in the destruction of sites of spiritual significance to First Nations people.
  - **(15)** Noted DEA's comments regarding the need for emissions produced from now on needing to be removed at a later date, and advised DEA that additional information was also available within Woodside's CTAP and 2023 Progress Report regarding decarbonisation technology development and the role of removal credits

over time in support of our net zero aspiration (pages 28 and 29).
- **(16, 17)** Stated it does not agree with DEA's position that the Federal Safeguarding Mechanism is misaligned with the goals of the Paris Agreement and that scope 3 international emissions should be considered against Australia's targets, as they are subject (where relevant) to customer nations' Paris NDCs
- **(18)** Advised that emissions arising from the consumption of Scarborough gas along with other feed sources in customer markets will be considered under domestic and international emissions control frameworks. Anticipated customers of gas from the Scarborough Project are in countries that have ratified the Paris Agreement. Under the Paris Agreement and global GHG accounting conventions, each country is responsible for accounting for, reporting and reducing emissions that physically occur in its jurisdiction.
- **(19)** Stated it did not accept the position that if the emissions associated with the project are insignificant, so too are Australia's national abatement efforts.
- **(20)** Stated it does not agree with DEA's position that ISO net zero guidelines must be applied to the proposed activities. Section 2.3.6 of the EP defines criteria for demonstration of acceptability.
- **(21)** Stated it does not agree with DEA's position that impacts of the proposed activity must be acceptable to DEA, referring to the purpose of consultation and that acceptability is determined by NOPSEMA under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth).
- **(21)** Advised the acceptability of the proposed activities will be determined by NOPSEMA pursuant to the OPGGS (E) Regulations.

- On 10 July 2024, DEA thanked Woodside for the clarification and for Woodside's complete, considered and prompt response to DEA's request (SI Report, reference 41.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) Referred to another EP and Pluto Operations EP.	**(1)** **Woodside Assessment:** Acknowledged DEA's reference to another EP and Pluto Operations EP and that it had previously responded to issues raised by DEA on another EP. **Woodside Response:** Noted that DEA letter related to another EP and Pluto Operations EP.	**(1)** Not required.
(2) Understood Woodside is consulting on both EPs.	**(2)** **Woodside Assessment:** Woodside reviewed previous consultation with DEA for another EP and that consultation closed on Pluto Operations EP on 29 March 2024. **Woodside Response:** Woodside noted previous consultation with DEA took place for another EP and that consultation closed on Pluto Operations EP on 29 March 2024. It also noted that consultation continues during the life of an EP and has a Management of Change and Review process in place should any feedback be received after EP acceptance identifies a measure or control that	**(2)** Assessment of relevant persons is described in Appendix F, Table 1 of the EP.

	requires implementation or updates to meet intended outcome of consultation. Based on feedback for this EP, DEA has been assessed as being a relevant person.	
(3) Woodside must provide relevant persons with sufficient information and reasonable period for consultation.	**(3)** **Woodside Assessment:** Woodside consults relevant persons in accordance with Regulation 25 of the Environment Regulations and assessed DEA as a relevant person for this EP after receiving feedback. **Woodside Response:** Woodside confirmed it consults relevant persons in accordance with Regulation 25 of the Environment Regulations to provide sufficient information and a reasonable period allowing them to make an informed assessment on their functions, interests or activities. Woodside assessed DEA as a relevant person for this EP after receiving feedback.	**(3)** DEA has been given sufficient information and a reasonable period in which to make an informed assessment of the possible consequences of the activity on its functions, interests or activities, as described in Section 5.4 of the EP.
(4) Provided background information on interests, functions and activities.	**(4)** **Woodside Assessment:** Woodside acknowledges DEA's statements and document references but makes no comment as to the factual accuracy or otherwise of these documents. **Woodside Response:** Woodside notes DEA's statements and document references but makes no comment as to the factual accuracy or otherwise of these documents.	**(4)** Not required.
(5) Supports position of no development of new fossil fuel resources.	**(5)** **Woodside Assessment:** Woodside recognises there is global demand for oil and gas and natural gas. **Woodside Response:** Woodside referred DEA to Section 4.2 Global demand for oil and gas (on pages 44 and 45) of Woodside's Climate Transition Action Plan and 2023 Progress Report available at Woodside's Climate Transition Action Plan and 2023 Progress Report. It noted that more granular detail relating to GHG emissions will be set out and assessed in the EP.	**(5)** Not required.
(6) Wants further information and	**(6)** **Woodside Assessment:** Woodside had consultation efforts in place including newspaper advertising campaign, social media campaign, community events	**(6)** DEA has been given sufficient information and a reasonable period in which to make an

opportunity to comment.	and a tailored roadshow to support consulting relevant persons in the course of preparing this EP. **Woodside Response:** Woodside provided sufficient information and reasonable period of time for relevant persons to make an informed assessment of the proposed activities. Consultation activities included advertisements in The Australian, The West Australian, regional newspapers and Indigenous newspapers between 26 – 28 February 2024, a social media campaign across Facebook and Instagram in February 2024, community events with subject matter experts and information and tailored roadshow in the Pilbara during March and April 2024. The Pluto Operations EP consultation information sheet was published 26 February 2024.	informed assessment of the possible consequences of the activity on its functions, interests or activities, as described in Section 5.4 of the EP.
(7) Noted usage of NOPSEMA guidance materials to support consultation.	**(7)** **Woodside Assessment:** Woodside refers to NOPSEMA's guidance materials. **Woodside Response:** Woodside confirmed it refers to NOPSEMA's guidance material for its consultation methodology.	**(7)** Woodside's consultation methodology is described in Section 5 of the EP.
(8) Consultation materials do not address indirect impacts of GHG emissions, climate change images and health impacts.	**(8)** **Woodside Assessment:** Woodside noted information related to these concerns is available across a number of mostly publicly available sources; Commonwealth and State legislation which manages potential environment and culture features impacts and risks; Ministerial Conditions and associated management plans which address GHG emissions, air quality and cultural heritage and are approved by EPA or Minister for Environment; and generally publicly available approval documents for Pluto LNG and Karratha Gas Plant which are not new as they've been in place for existing operations. State and Federal legislation also manages the physical presence of onshore processing facilities, including in relation to environment and cultural heritage. For anthropogenic climate change, Woodside noted that climate change impacts cannot be attributed to any one activity or one project, as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started. **Woodside Response:** Woodside referenced Commonwealth and State legislation which manages potential environment and culture features impacts and risks that is applied to onshore processing facilities. Atmospheric emissions	**(8)** Not required.

	tied to onshore processing, including the Pluto LNG and Karratha Gas Plant, are managed under the *WA Environmental Protection Act 1986,* State and Federal Aboriginal Heritage Legislation and the Federal EPBC Act. Pluto LNG is subject to approvals including relevant Ministerial Conditions and associated management plans (mostly publicly available) which address GHG emissions, air quality and cultural heritage and are approved by EPA or Minister for Environment. Approval documents for Pluto LNG and Karratha Gas Plant are generally publicly available and are not new as it has been in place for existing operations. State and Federal legislation also manages the physical presence of onshore processing facilities, including in relation to environment and cultural heritage. For anthropogenic climate change, Woodside noted that climate change impacts cannot be attributed to any one activity or one project, as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started.	
(9) Climate change impacts, including Scope 3, must be assessed with approved. NOPSEMA program.	**(9)** **Woodside Assessment:** Woodside has information available in its Climate Transition Action Plan. **Woodside Response:** Woodside recommended review of Section 3.1 Climate strategy (on page 14), Section 3.5 Scope 3 emissions (on page 32 and 33) and Section 3.6 Scope 3 targets (on pages 34 - 40) of Woodside's Climate Transition Action Plan and 2023 Progress Report available at Woodside's Climate Transition Action Plan and 2023 Progress Report. The EPs will assess both direct and indirect impacts and risks associated with the Petroleum Activities Program (PAP), having regard to the nature and scale of the proposed PAP. Direct and indirect emissions with the potential to result in climate change impacts will be considered.	**(9)** Not required.
(10) Provided list of needed information to make assessment.	**(10)** **Woodside Assessment:** Woodside acknowledged there are publicly available documents to provide DEA with information it is seeking and noted the legislative requirements as well as broader requirements including those of the World Health Organisation that onshore gas processing is subject to. **Woodside Response:** Woodside noted that emissions associated with onshore gas processing are subject to a range of legislative requirements including those which consider and manage potential to impact on human health. In	**(10)** Not required.

	addition, it referred DEA to access publicly available documents which provide additional detail. The EP will be made publicly available on NOPSEMA's website once it has been submitted and is under assessment.	
(11) Woodside only makes general statements around health, safety and environment.	**(11)** **Woodside Assessment:** Woodside notes that it has a suite of climate disclosures available for DEA to read and that climate change impacts cannot be attributed to any one activity or one project, as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started. **Woodside Response:** Woodside responded that climate change impacts cannot be attributed to any one activity or one project, as they are instead the result of global GHG emissions, minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution started. Although the direct and indirect GHG emissions associated with Scarborough and Pluto cannot be linked to climate change impacts to the environment, a contextual evaluation of climate change impacts will be provided in the EPs. It encouraged DEA to read Woodside's suite of climate disclosures including Woodside's Climate Report 2021, Climate Report 2022 and Climate Transition Action Plan and 2023 Progress Report.	**(11)** GHG emissions are considered in Section 6.7.10 of the EP.
(12) EP should not be accepted until Regulation 11A requirements are met.	**(12)** **Woodside Assessment:** Woodside disagrees with this assertion. **Woodside Response:** Woodside responded that it disagreed with this assertion and that DEA had engaged in consultation with Woodside in accordance with Regulation 25.	**(12)** Not required.
(13) Due to the limited information provided by Woodside, and DEA's voluntary capacity, the information in DEA's consultation responses should not be taken to reflect its complete position or complete submissions on this EP. DEA reserves the right to make further submissions as capacity and information	**(13)** **Woodside assessment:** Woodside has provided DEA with sufficient information. Woodside does not accept DEA's comments regarding capacity as its members appear to have had at their disposal a significant amount of information and DEA members also attended Woodside's AGM. **Woodside response:** Based on DEA's website, its members cite a significant volume of studies, scientific research and videos which demonstrate that DEA has access to information, and capacity and understanding of the information. A	**(13)** Not required.

become available.	number of DEA members also attended Woodside's 2024 Annual General Meeting.	
(14) As well as climate change harming human health: Oil and gas developments result in direct health harms from pollution including cancer, reproductive and human growth harms, disease and deaths etc; The destruction of sites of spiritual significance to First Nations people by fossil fuel developments compounds psychosocial harms.	**(14)** **Woodside assessment:** Climate change impacts cannot be attributed to any one project and proposed activities are not anticipated to result in the destruction of sites of spiritual significance to First Nations people. **Woodside response:** Climate change impacts are the result of global GHG emissions and cannot be attributed to any one project. Gas can play a role in the energy transition. The proposed petroleum activities for this EP are not anticipated to result in the destruction of sites of spiritual significance to First Nations people.	**(14)** Potential impacts of climate change are described in Section 6.7.6 of the EP, and potential impacts of atmospheric emissions are assessed in Section 6.7.7 of the EP. Potential impacts on cultural features and heritage values are assessed in Section 4.9 of the EP
(15) Any emissions produced from now will need to be removed from the atmosphere at a later date. At a minimum: Woodside's assessment of climate impacts associated with these projects should consider impact on global emissions over at least a 100 year period and preferably longer; Woodside must show how it will cause carbon drawdown (CDR) to remove all emissions that will be produced by the projects from the atmosphere in the long term, and enforceable measures must be imposed by the regulator to ensure this takes place.	**(15)** **Woodside assessment:** Woodside acknowledged DEA's comments regarding the need for emissions produced from now to be removed. **Woodside response:** Additional information is available in Woodside's CTAP and 2023 Progress Report, specifically Section 3.3, regarding decarbonisation technology development (pages 26-27) and Section 3.4 specific to carbon credits and the role of removal credits over time in support of our net zero aspiration (pages 28 and 29).	**(15)** Not required.
(16)	**(16)** **Woodside assessment:** Woodside does not agree with DEA's position.	**(16)** Not required.

The CTAP and 2023 Progress Report (and climate plans in general) cannot be relied upon as a basis for assessment of the acceptability of carbon pollution or climate change impacts of the proposed activities because: The plans and targets are unenforceable; The Report amounts to greenwash because it does not address numerous requirements of the UN standards and ISO Guidelines for Net Zero; The plans have repeatedly been rejected by Woodside's shareholders.	**Woodside response:** Woodside is targeting a reduction of net equity Scope 1 and 2 GHG emissions of 15% by 2025 and 30% by 2030, with an aspiration of net zero by 2050 or sooner; referred DEA to section 3.3 of Woodside's CTAP and 2023 Progress Report; does not agree with DEA's claim regarding greenwash.	
(17) Reliance on the Federal SGM as a means to align with Australian national emissions goals is inappropriate because of: Australia's national emission reduction goals and legislated carbon emissions budget are not aligned with the temperature goals of the Paris Agreement; Ongoing project emissions beyond 2030 reduction targets; Emissions that will result from these projects in other countries outside of Australia; Potential use of low integrity undisclosed offsets.	**(17)** **Woodside assessment:** Woodside does not agree with DEA's position. **Woodside response:** Emissions associated with anticipated third party consumption of Scarborough gas outside Australia are subject (where relevant) to the relevant customer nation's Paris NDCs.	**(17)** Not required
(18)	**(18)**	**(18)**

If comparisons to Australia's emissions reduction targets and budget are to be used, then the total emissions from the proposed activities (not just domestic emissions) should be compared with Australia's abatement efforts and policies.	**Woodside's assessment:** Woodside does not agree with DEA's comments. **Woodside's response:** Emissions arising from the consumption of Pluto along with other feed sources in customer markets will be considered under domestic and international emissions control frameworks. Anticipated customers of gas from Pluto are in countries that have ratified the Paris Agreement. Under the Paris Agreement and global GHG accounting conventions, each country is responsible for accounting for, reporting and reducing emissions that physically occur in its jurisdiction.	Not required
(19) DEA does not accept the argument that the total emissions from the proposals (i.e. this EP and another Woodside EP) is an insignificant contribution to the global carbon budget and therefore should not be considered unacceptable as, if this were true, Australia's entire national abatement efforts to 2030, including abatement from all sources, is also insignificant.	**(19)** **Woodside assessment:** Woodside does not agree with DEA's position. **Woodside response:** Woodside does not accept DEA's position. It is not appropriate to conflate emissions associated with the project's lifecycle, including those originating internationally, with Australia's abatement efforts or targets.	**(19)** Not required
(20) Woodside must adhere to the UN's and the ISO's guidelines in relation to its proposed activities as part of any assessment on the impacts on the climate and on DEA's activities and interests under the Regulations.	**(20)** **Woodside assessment:** Woodside does not agree with DEA's position. **Woodside response:** Woodside acknowledged DEA's comments but does not agree with DEA's position and referred DEA to Section 2.3.6 of the EP which defines criteria for demonstration of acceptability.	**(20)** Section 2.3.6 of the EP defines criteria for demonstration of acceptability.
(21) Woodside should provide further information to address DEA's concerns and demonstrate that the impacts of the proposed activities will be managed to a level that is acceptable to DEA.	**(21)** **Woodside assessment:** Woodside is required to manage impacts of the proposed activities in accordance with the OPGGS (Environment) Regulations and determined by NOPSEMA. **Woodside response:** The acceptability of the proposed activities will be determined by NOPSEMA pursuant to the OPGGS (Environment) Regulations.	**(21)** Section 2.3.6 of the EP defines criteria for demonstration of acceptability.

Woodside has addressed objections and claims as noted above.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with DEA for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- DEA self-identified for this EP on 24 April 2024.
- Woodside has addressed and responded to DEA over a 3 month period.

Research institutes and local conservation groups or organisations

Cape Conservation Group (CCG)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed CCG advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to CCG, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to CCG regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with CCG for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Consultation Information provided to CCG on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided CCG with the opportunity to provide feedback over a 5 month period.

Protect Ningaloo

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Protect Ningaloo advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Protect Ningaloo, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Protect Ningaloo regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with Protect Ningaloo for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.4 of the EP. Specifically:

- Consultation Information Sheet publicly available on the Woodside website since Friday 23 February 2024.
- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, the Australian and the West Australian (28 February 2024) advising of the proposed activities and requesting feedback.

- Consultation Information provided to Protect Ningaloo on 27 February 2024 based on their functions, interests or activities.
- Woodside has provided a link to NOPSEMA's brochure Consultation on offshore petroleum environment plans: Information for the community.
- Woodside has sent a follow up email seeking feedback on the proposed activities.
- Woodside has provided Protect Ningaloo with the opportunity to provide feedback over a 5 month period.

Other

Save our Songlines (SoS)

Historical Engagement:

- On 25 July 2023, Woodside met with EDO, SoS, and/or [Individual 1] , and/or [Individual 2] on an activity not relevant to this activity (SI Report reference 26.1). During the meeting, SoS and/or [Individual 1] and/or [Individual 2] stated that they are broadly concerned about:
  - **(1)** impact on the whales and other animals.
  - **(2)** the Songlines (unspecified) and the energy lines (unspecified).
- **(3)** On 25 July 2023, EDO on behalf of SoS, and/or [Individual 1] and/or [Individual 2] emailed Woodside in response to another activity not related to this activity (SI Report, reference 26.2) requesting a response to questions relating to the dept of wells, freshwater, migratory patterns of whales, dugongs and turtles, and seagrass distribution.
- **(1, 3)** On 27 July 2023, Woodside responded to EDO's email of 25 July 2023 in relation to another activity (SI Report, reference 26.3) providing information in response to the interest SoS, and/or [Individual 1] , and/or [Individual 2] had in marine mammals, seagrass, and the meeting of saltwater and freshwater.
- On 13 December 2023, Woodside emailed EDO in relation to another activity, and also requested EDO respond as to who their client was (SI Report, reference 26.4).
- On 18 December 2023, the EDO emailed Woodside, confirming that the EDO was currently acting only for [Individual 1] , not [Individual 2] or SoS (SI Report, reference 26.5).

Summary of information provided and record of consultation for this EP:

- On 26 March 2024, Woodside emailed SoS and/or [Individual 1] advising of the proposed activity (Record of Consultation, reference 2.39), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that SoS and its members may have within the EMBA, information on how SoS would like to engage, and requested that SoS provide information to other individuals as required.
- On 26 March 2024, EDO on behalf of SoS and/or [Individual 1] emailed Woodside acknowledging the information for this activity and noting they would obtain instructions (SI Report, reference 26.6).
- **(4)** On 29 April 2024 EDO emailed Woodside to confirm SoS and/or [Individual 1] would like to consult on this activity and that a written comment would be provided (SI Report, 26.7).
- **(4)** On 2 May 2024, Woodside emailed EDO to advise the consultation period for SoS and/or [Individual 1] would be extended until 9 May 2024 to enable them to

provide a written response to the activity (SI Report, reference 26.8).

- On 2 May 2024, EDO on behalf of SoS and/or [Individual 1] emailed Woodside (SI Report, reference 26.9) to clarify they understood the 26 April to be the date to confirm interest in consultation, rather than the end of consultation, and confirmed they would provide a written response as soon as possible.
- On 9 May 2024, SoS and/or [Individual 1] emailed Woodside (SI Report, reference 26.10) with comments relating to this activity and another unrelated activity and noted there was no culturally sensitive information included. The letter outlines [Individual 1] feedback including:
  - **(5)** An overview of [Individual 1] function interests and activities including:
    - [Individual 1] connection to Murujuga and cultural responsibilities.
    - [Individual 1] opposition to all industry on Murujuga.
    - That [Individual 1] holds information that is critical for Woodside to understand the impacts of the activity and that [Individual 1] may also have feedback on proposed mitigation measures.
  - **(6)** [Individual 1] concern that the sacred rock art at Murujuga is at risk from emissions from the Pluto and Scarborough facilities
  - **(7)** That [Individual 1] would like Woodside to consider GHG emissions as a potential impact or risk in the EP.
  - **(8)** [Individual 1] is concerned about the cumulative impacts of any industry on Murujuga which:
    - restricts access to Murujuga.
    - affects cultural practices.
    - contributes to cultural genocide by creating irreplaceable, irreversible cultural damage.
    - Affects the environment.
  - **(9)** That climate change should be considered as an impact.
  - **(10)** That [Individual 1] is concerned about drilling a new well and seabed disturbance and specifically:
    - The disturbance of underwater cultural heritage, what surveys Woodside has conducted and how these aspects will be managed.
    - The impacts of drilling noise and pollution on marine life, songlines, the seabed and the ecosystem.
    - That mitigation measures are not strong enough.
  - **(11)** That activities are offshore from culturally significant islands, including Rosemary Island which is a women's island to which [Individual 1] has a major connection and that Rosemary Island:
    - holds a connection to songlines.
    - Is a main breeding ground and habitat for turtles, which are culturally significant.
    - That erosion on the island caused by climate change, vessel traffic and fishing prevent turtles laying eggs and incubating properly.
    - Can only be protected by stopping use of the Pluto facility, and asks how Woodside will protect the island and the species reliant on the island.
  - **(12)** That consultation of relevant persons needs to be consistent. Specifically:
    - Offering the same level of support.
    - Consulting in two stages, information provision, then response.

- Providing assurance that culturally sensitive information will not be shared.

- **(13)** That the environment and cultural values are one, that Dreaming stories come from the animals depicted on the rock art and will live forever, that the connection and songlines are being disrupted.
- **(14)** That there are other individuals that Woodside should speak to about these activities but [Individual 1] is not comfortable identifying these people.

- On 14 May 2024, Woodside emailed SoS and/or [Individual 1] to thank them for their feedback, confirm that Woodside would reply shortly, and request an attachment that was missing from the original email (SI Report, reference 26.11).
- On 16 May 2024, EDO emailed Woodside to attach the Border Affidavit as requested (SI Report, reference 26.12).
- On 29 May 2024, Woodside emailed EDO a response to their 9 May 2024 letter outlining:
  - **(5)** that Woodside acknowledged [Individual 1] was a Mardudhunera person, a Traditional Custodian of Murujuga and opposed to industry at Murujuga
  - **(6)** the management of emissions under a range of Federal and State legislation and Woodside's support of the monitoring of emissions in relation to rock art.
  - **(7)** the assessment of emissions and the controls in the EP to reduce GHG emissions to ALARP and acceptable levels.
  - **(8)** the commitment to facilitating access to Murujuga to Traditional Custodians.
  - **(9)** the consideration of climate change impacts through the assessment of GHG emissions.
  - **(10)** the consideration of tangible and intangible heritage in the EP.
  - **(11)** that Woodside notes [Individual 1] connection to Rosemary Island.
  - **(12)** Woodside's methodology in identifying relevant persons for the purpose of consultation and commitment to engaging with Traditional Custodians through their preferred method of engagement.
  - **(13)** Woodside's efforts to understand and record the nature of the cultural values provided through consultation.
  - **(14)** Woodside's willingness to consult with Traditional Custodians, including those who self-identify as relevant.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) In a previous unrelated EP, cultural features associated with whales was raised.	**(1)** **Woodside Assessment:** Woodside understands that some species hold spiritual and cultural importance to SoS and/or [Individual 1] . **Woodside Response:** During consultation on a previous EP, Woodside discussed controls put in place to manage impacts and risks relating to their spiritual and cultural connection to the environment. Woodside has implemented controls to reduce potential risks and impacts to ecological and cultural values to ALARP and to an acceptable level.	**(1)** Assessment of potential impacts to cultural values are described in section 6 of the EP.
(2)	**(2)**	**(2)**

In a previous unrelated EP, it was noted there were cultural features associated with Songlines, dreaming and energy lines.	**Woodside Assessment:** Woodside understands that Songlines and energy lines to hold personal spiritual and cultural value individually (rather than communally) to SoS and/or [Individual 1] . Woodside has consistently sought to understand the nature of these values to ensure impacts to these values can be minimised. SoS and/or [Individual 1] has declined to provide further information on these values. **Woodside Response:** In any event, Woodside has sought to include controls that seek to reduce risks and impacts to ALARP and acceptable levels.	Woodside has considered SoS's and/or [Individual 1] feedback and updated Section 4.9 to record topics of interest and cultural values, including Songlines and energy lines. These are assessed in Section 6.11 with appropriate controls implemented. At this stage, Woodside has not been provided with specific information on these potential values to enable a more fulsome assessment.
(3) In a previously unrelated EP, an interest in marine mammals, seagrass, and the meeting of freshwater and saltwater was demonstrated.	**(3)** **Woodside Assessment:** SoS and/or [Individual 1] has not expressly confirmed their interests, rather, have raised topics of interest to them during consultation for another activity. Woodside has considered SoS's and/or [Individual 1] topics of interest and shared relevant information in relation to a previous EP, with SoS and/or [Individual 1] relating to these interests, including controls put in place to manage risks and impacts to them. **Woodside Response:** Woodside has updated Section 4.9 to record the interests and assessed them in Section 6.10 implementing appropriate controls.	**(3)** Woodside has considered topics raised by SoS and/or [Individual 1] and updated Section 4.9 to record these. These are assessed in 6.11 with appropriate controls implemented.
(4) A representative for SoS and/or [Individual 1] has confirmed they wish to consult on this activity and will do so in writing.	**(4)** **Woodside Assessment:** Woodside understands that SoS and/or [Individual 1] will provide feedback in writing for this activity. **Woodside Response:** Woodside extended the consultation period for SoS and/or [Individual 1] until 9 May 2024 to enable them to provide their written response.	**(4)** Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).
(5) In a letter on 9 May 2024, SoS and/or [Individual 1] advised of cultural responsibilities and a connection to Murujuga and that they held critical information for Woodside.	**(5)** **Woodside Assessment:** SoS and/or [Individual 1] refer to an affidavit filed in September 2023 which articulates the connection and some of the cultural responsibilities. The content of this affidavit has been considered in Section 4.9.4 of this EP. SoS and/or [Individual 1] also refer to other cultural responsibilities, but these are not specified. Woodside has consistently sought	**(5)** Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change

	to understand the nature of these values to ensure impacts to these values can be minimised. SoS and/or [Individual 1] has declined to provide further information on these values. **Woodside Response:** Woodside has considered the connection and cultural responsibilities articulated in the referenced affidavit in Section 4.9.4**,** and assessed these in Section 6.11 implementing appropriate controls.	and Revision process (see Section 7.2.5 of this EP).
(6) In a letter on 9 May 2024, SoS and/or [Individual 1] advised that rock art is at risk from the emissions by the activity.	**(6)** **Woodside Assessment:** The presence of industry on the Burrup Peninsula has generated concerns that emissions may lead to an accelerated weathering of rocks on which rock art is present which may reduce the visibility or destroy the rock art. Research to date on the impacts of emissions on rock art has not been conclusive, and there are currently no set air quality thresholds for the protection of rock art. The WA Government is currently implementing the Murujuga Rock Art Strategy, which plans to develop a long-term framework to guide the management and protection of the rock art located on the Dampier Archipelago and the Burrup Peninsula. Woodside actively supports the implementation of the Murujuga Rock Art Strategy through membership of the Murujuga Rock Art Reference Group and provides funding associated with the Murujuga Rock Art Monitoring Program. **Woodside Response:** Woodside has considered the potential risks to rock art from the activity in Section 6.11.	**(6)** Woodside has considered potential risks to rock art in Section 6.11 with appropriate controls implemented.
(7) In a letter on 9 May 2024, SoS and/or [Individual 1] asked Woodside to consider GHG emissions as a potential impact or risk in the EP.	**(7)** **Woodside Assessment:** GHG emissions are considered in Section 6.7.10 of the EP. No new information regarding GHG emissions has been provided in this letter. **Woodside Response:** Woodside has considered GHG emissions and potential impacts or risks in Section 6.7.10.	**(7)** Woodside has addressed the topic raised by SoS and/or [Individual 1] in Section 6.7.10.
(8) In a letter on 9 May 2024, SoS and/or [Individual 1] listed concerns regarding the cumulative impact of all industry on Murujuga, including restricted access to Murujuga, affected cultural practices,	**(8)** **Woodside Assessment:** Intangible heritage such as cultural practices and Traditional Custodian access to significant areas are addressed in Section 4.9. of this EP. No additional or new information is provided in this letter. Through the management measures adopted in Section 6 of this EP the activities subject to this EP will avoid any potential irreplaceable, irreversible cultural	**(8)** Woodside has considered topics raised by SoS and/or [Individual 1] and updated Section 4.9 to record these. These are assessed in 6.11 with appropriate controls implemented.

and industry's contribution to cultural genocide by creating irreplaceable, irreversible cultural damage.	damage that Woodside has been advised of. **Woodside Response:** Woodside has considered cultural practices and access to country in Section 4.9.	
(9) In a letter on 9 May 2024, SoS and/or [Individual 1] outlined concerns with climate change and asked that climate change be considered as an impact.	**(9)** **Woodside Assessment:** Potential climate change impacts are considered in Section 6.7.10 of the EP. **Woodside Response:** Woodside has considered potential climate change impacts in Section 6.7.10 of the EP.	**(9)** Woodside has considered potential climate change impacts in Section 6.7.10.
(10) In a letter on 9 May 2024, SoS and/or [Individual 1] outlined concerns with drilling and seabed disturbance including the disturbance of underwater cultural heritage, the impacts of drilling noise and pollution, and the strength of mitigation measures. SoS and/or [Individual 1] asked what surveys Woodside has conducted for underwater cultural heritage and how these aspects will be managed.	**(10)** **Woodside Assessment:** Drilling and seabed disturbance is located at approximately 177 m water depth. The ancient landscape, which was exposed to human habitation during the periods of occupation of the Australian continent extends to a depth of 125 m below current sea level. Therefore, no potential for impacts to tangible underwater cultural heritage is anticipated. Intangible heritage including sea country values is considered in Section 4.9.4 of this EP. This letter does not include any additional values of the environment not already addressed. **Woodside Response:** Woodside has considered intangible cultural heritage in Section 4.9.4. Due to the water depth of seabed disturbance, no impacts to tangible cultural heritage are anticipated.	**(10)** Woodside has considered topics raised by SoS and/or [Individual 1] and updated Section 4.9.4 to record these. These are assessed in Section 6.11 with appropriate controls implemented.
(11) In a letter on 9 May 2024, SoS and/or [Individual 1] outlined the significance of offshore islands, including Rosemary Island, and asked how Woodside will protect the island and the species reliant on the island.	**(11)** **Woodside Assessment:** Rosemary Island is within the EMBA. Rosemary Island provides nesting habitat for turtles. Rosemary Island also has a number of rock art sites. **Woodside Response:** Woodside has updated Section 4.9.4 to capture the significance of Rosemary Island. Consideration of risk, impacts and mitigations to Rosemary Island and the receptors associated with the island are addressed in Sections 6.8, 6.9 and 6.11.	**(11)** Woodside has updated the EP to capture feedback regarding the significance of Rosemary Island in Section 4.9.4. Assessment of risks and mitigation measures to islands and associated species, including Rosemary Island and turtles are addressed in Section 6.8, 6.9, 6.11.
(12) In a letter on 9 May 2024, SoS and/or [Individual 1] advised that consultation should be consistent with all relevant	**(12)** **Woodside Assessment:** Woodside applies its methodology for 'Traditional Custodians and nominated representative corporations' and 'Other non-government groups or organisations' under regulation 25(1)(d) of the	**(12)** Woodside outlines its Consultation Approach and assessment of relevant persons in Appendix F.

persons.	Environment Regulations to determine relevant persons for consultation. **Woodside Response:** Woodside consults with all relevant persons for each activity. Woodside has meaningful long-term relationships with relevant Traditional Custodians specifically tailored to provide for effective engagement which is continuous and is not confined to individual EPs, instead covering all EPs and other issues that are relevant at the time of engagement.	
(13) In a letter on 9 May 2024, SoS and/or [Individual 1] outlined that the environment and cultural values are one, and the connection and songlines are being disrupted.	**(13)** **Woodside Assessment:** Woodside understands that SoS and/or [Individual 1] references to Songlines and energy lines relate to personal spiritual value individually (rather than communally) to SoS and/or [Individual 1] . Woodside has consistently sought to understand the nature of these values to ensure impacts to these values can be minimised. SoS and/or [Individual 1] has declined to provide further information on these values. **Woodside Response:** In any event, Woodside has sought to include controls that seek to reduce risks and impacts to ALARP and acceptable levels.	**(13)** Section 4.9 records topics of interest and cultural values, including Songlines and energy lines. These are assessed in Section 6.11.
(14) In a letter on 9 May 2024, SoS and/or [Individual 1] advised there were other individuals who should be consulted but states that they are not comfortable to identify them.	**(14)** **Woodside Assessment:** Woodside has applied its process for the identification of relevant persons. It is unclear if the other individuals mentioned by SoS and/or [Individual 1] have been identified through this process. Woodside has also advertised publicly to invite comment from relevant persons. **Woodside Response:** Woodside has sought to engage with all of the relevant persons it has identified, or who have self-identified as such for this EP. Woodside welcomes any person who wishes to provide feedback on this EP to do so through the means provided on the consultation factsheet.	**(14)** Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received from additional parties after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).
Woodside has addressed objections and claims as noted above.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside has assessed the objections or claims raised by SoS and/or [Individual 1] . No additional measures or controls are required.
Outcomes of Consultation Woodside has discharged its obligations for consultation under regulation 25 of the Environment Regulations and consultation with SoS and/or [Individual 1] for the purpose of regulation 25 is complete. Sufficient information and a reasonable period have been provided, as described in Section 5.5 of the EP. Specifically:		

Sufficient Information:

- Woodside sought direction on SoS and/or [Individual 1] preferred method of consultation. As sufficient information and a reasonable period have been provided, any meetings are ongoing engagement post regulation 25 of the Environment Regulations consultation.
- Provided Consultation Summary Sheets developed by Indigenous staff to SoS and/or [Individual 1] . These set out details of the proposed activity, the location of the activity, the timing of the activity as well as the potential risks and impacts of the activity with controls in a digestible, plain English format.
- Articulated planned and unplanned environmental risks and impacts, with proposed controls.
- Confirmed the purpose of consultation and set out in detail what was being sought through consultation.
- Asked for the consultation and information sheets to be distributed to members and individuals as required.
- Provided NOPSEMA's Brochure "Consultation on offshore petroleum environment plans" and Guideline "Guideline: Consultation in the course of preparing an environment plan".
- Advised that SoS and/or [Individual 1] could request the particular information provided in the consultation not be published (to align with regulation 25(4) of the Environment Regulations).

Reasonable Period:

- Woodside published advertisements in national, state and relevant local newspapers including the National Indigenous Times (26 February 2024), the Koori Mail, the North West Telegraph, the Pilbara News, The Australian and The West Australian (28 February 2024) advising of the proposed activities and requesting feedback.
- Woodside has provided SoS and/or [Individual 1] with the opportunity to provide feedback over a 4 month period, demonstrating a "reasonable period" of consultation.

Woodside asked SoS and/or [Individual 1] if it was aware of any other Traditional Custodian groups or individuals with whom Woodside should consult. None were identified.

Woodside engages in ongoing consultation, beyond that required by regulation 25 of the Environment Regulations, throughout the life of an EP. Should feedback be received after the EP has been accepted (including any relevant new information on cultural values), it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of the EP).

Woodside considers the measures and controls described in this EP address the potential impact from the proposed activity on SoS and/or [Individual 1] functions, interests or activities.

Table 3: Engagement Report with Persons and Organisations Assessed as Not Relevant

Commonwealth Commercial fisheries and representative bodies		
Australian Southern Bluefin Tuna Industry Association (ASBTIA)		
Summary of information provided and record of consultation for this EP: • On 26 February 2024, Woodside emailed ASBTIA advising of the proposed activity (Record of Consultation, reference 2.14), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.* • On 18 March 2024, Woodside sent an email reminder to ASBTIA, following up on the proposed activity (Record of Consultation, reference 3.2) and included a link to the Consultation Information Sheet on Woodside's website. • On 27 March 2024, Woodside provided an activity update to ASBTIA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).		
Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
While ASBTIA is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for ASBTIA to provide feedback during the consultation process.		
Tuna Australia		
Summary of information provided and record of consultation for this EP: • On 27 February 2024, Woodside emailed Tuna Australia advising of the proposed activity (Record of Consultation, reference 2.14), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.* • On 28 February 2024, Tuna Australia emailed Woodside (SI Report, reference 11.1) and: - **(1)** provided its industry position statement. - **(2)** requested a service agreement to assist Woodside meeting its consultation requirements. **(2)** The consultation regulations do not require Woodside to enter into service agreements in order to engage in consultation or for an EP to be complete. • **(1)** On 3 April 2024, Woodside thanked Tuna Australia for providing its position statement and provided an activity update regarding wells location coordinates and		

included an updated Consultation Information Sheet (SI Report, reference 11.2).		
Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
(1) Provided its industry position statement.	**(1)** **Woodside assessment:** Woodside previously received and reviewed the position statement. **Woodside response:** Woodside thanked Tuna Australia for sending its position statement.	**(1)** Not required.
(2) Recommended entering into a Service Agreement to support consultation.	**(2)** **Woodside assessment:** The Environment Regulations do not require the entry into a fee for service agreement in order to meet Environment Plan consultation requirements. **Woodside response:** Woodside responded to Tuna Australia during consultation on another EP. Woodside respects that, for a relevant person, consultation is voluntary. Woodside advised Tuna Australia the level of feedback provided by an organisation, if any, was at the person or organisation's discretion, and Woodside was open to suggestions from Tuna Australia on ways to improve efficiency and simplicity for feedback.	**(2)** Not required.
Woodside has addressed objections and claims as noted above.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
While Tuna Australia is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for Tuna Australia to provide feedback during the consultation process.		
Other non-government groups or organisations		
350 Australia (350A)		
Summary of information provided and record of consultation for this EP: • On 27 February 2024, Woodside emailed 350A advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and		

a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.

- On 19 March 2024, Woodside sent an email reminder to 350A, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to 350A regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).
- **(1)** On 28 March 2023, 350A emailed Woodside stating it had not been consulted adequately on the Scarborough Offshore Facility and Trunkline (Operations) EP (SI Report, reference 29.1).
- **(1)** On 2 April 2024, Woodside responded to 350A seeking clarification as to whether it was providing feedback on this EP as it had already consulted 350A on the Scarborough Operations EP (SI Report, reference 29.2).
- On 10 May 2024, Woodside emailed 350A to advise consultation for this EP has closed (SI Report, reference 29.3).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) 350A stated it has not been consulted adequately on Scarborough Offshore Facility and Trunkline (Operations) EP.	**(1)** **Woodside assessment:** The activities covered under the Scarborough Offshore Facility and Trunkline (Operations) EP are not relevant for this EP. Woodside consulted 350A for the Scarborough Offshore Facility and Trunkline (Operations) EP separately. **Woodside response:** Woodside sought clarification from 350A on which EP the feedback relates to.	**(1)** Not required.
Woodside has addressed objections and claims as noted above.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While 350A is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for 350A to provide feedback during the consultation process.

Australian Conservation Foundation (ACF)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed ACF advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and

a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*

- On 19 March 2024, Woodside sent an email reminder to ACF, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to ACF regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While ACF is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for ACF to provide feedback during the consultation process.

Australian Marine Conservation Society (AMCS)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed AMCS advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to AMCS, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to AMCS regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While AMCS is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable

period outside of regulatory requirements for AMCS to provide feedback during the consultation process.

Conservation Council of Western Australia (CCWA)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed CCWA advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to CCWA, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to CCWA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While CCWA is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for CCWA to provide feedback during the consultation process.

Greenpeace Australia Pacific (GAP)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed GAP advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to GAP, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to GAP regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims	Woodside engages in ongoing consultation throughout the life of an EP. Should	No additional measures or controls are

received despite follow up.	feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	required.

Outcomes of Consultation

While GAP is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for GAP to provide feedback during the consultation process.

Australasian Centre for Corporate Responsibility (ACCR)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed ACCR advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to ACCR, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to ACCR regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While ACCR is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for ACCR to provide feedback during the consultation process.

Market Forces

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Market Forces advising of the proposed activity (Record of Consultation, reference 2.24), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Market Forces, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.

- On 27 March 2024, Woodside provided an activity update to Market Forces regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While Market Forces is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for Market Forces to provide feedback during the consultation process.

Research institutes and local conservation groups or organisations

University of Western Australia (UWA)

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed UWA advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*.
- On 19 March 2024, Woodside sent an email reminder to UWA, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to UWA regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While UWA is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for UWA to provide feedback during the consultation process.

Curtin University		
Summary of information provided and record of consultation for this EP: • On 27 February 2024, Woodside emailed Curtin University advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.* • On 19 March 2024, Woodside sent an email reminder to Curtin University, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website. • On 27 March 2024, Woodside provided an activity update to Curtin University regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).		
Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
While Curtin University is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for Curtin University to provide feedback during the consultation process.		
Edith Cowan University (ECU)		
Summary of information provided and record of consultation for this EP: • On 27 February 2024, Woodside emailed ECU advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community*. • On 19 March 2024, Woodside sent an email reminder to ECU, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website. • On 27 March 2024, Woodside provided an activity update to ECU regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).		
Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and,	No additional measures or controls are required.

	where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	

Outcomes of Consultation

While ECU is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for ECU to provide feedback during the consultation process.

Murdoch University

Summary of information provided and record of consultation for this EP:

- On 27 February 2024, Woodside emailed Murdoch University advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 19 March 2024, Woodside sent an email reminder to Murdoch University, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website.
- On 27 March 2024, Woodside provided an activity update to Murdoch University regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.

Outcomes of Consultation

While Murdoch University is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for Murdoch University to provide feedback during the consultation process.

Western Australian Marine Science Institution (WAMSI)

Summary of information provided and record of consultation for this EP:

- On 18 March 2024, Woodside emailed WAMSI advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*
- On 2 April 2024, Woodside sent an email reminder to WAMSI, following up on the proposed activity and provided an activity update regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.8).

Summary of Feedback, Objection or	Assessment of Merits of Feedback, Objection or Claim and Woodside's	Inclusion in Environment Plan

Claim	Response	
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
While WAMSI is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for WAMSI to provide feedback during the consultation process.		
Commonwealth Scientific and Industrial Research Organisation (CSIRO)		
Summary of information provided and record of consultation for this EP: • On 27 February 2024, Woodside emailed CSIRO advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.* • On 19 March 2024, Woodside sent an email reminder to CSIRO, following up on the proposed activity (Record of Consultation, reference 3.3) and included a link to the Consultation Information Sheet on Woodside's website. • On 27 March 2024, Woodside provided an activity update to CSIRO regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.6).		
Summary of Feedback, Objection or Claim	**Assessment of Merits of Feedback, Objection or Claim and Woodside's Response**	**Inclusion in Environment Plan**
No feedback, objections or claims received despite follow up.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
While CSIRO is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for CSIRO to provide feedback during the consultation process.		
Australian Institute of Marine Science (AIMS)		
Summary of information provided and record of consultation for this EP: • On 27 February 2024, Woodside emailed AIMS advising of the proposed activity (Record of Consultation, reference 2.26), provided a Consultation Information Sheet, and a link to NOPSEMA's brochure *Consultation on offshore petroleum environment plans: Information for the community.*		

- On 8 March 2024, AIMS emailed Woodside (SI Report, reference 4.1) and:
  - **(1)** confirmed it has no operations occurring in the area.
  - **(2)** requested to be informed if the activity location changes.
- **(1,2)** On 12 March 2024, Woodside thanked AIMS for its feedback and confirmed it will provide AIMS with updates (SI Report, reference 4.2).
- On 27 March 2024, Woodside provided an activity update to AIMS regarding wells location coordinates and included an updated Consultation Information Sheet (Record of Consultation, reference 3.5).
- **(1)** On 8 April 2024, AIMS emailed Woodside and confirmed the activities will not disrupt AIMS operations (SI Report, reference 4.3).
- **(1)** On 9 April 2024, Woodside thanked AIMS for reviewing the information (SI Report, reference 4.4).

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) AIMS confirmed the activities will not disrupt its operations.	**(1)** **Woodside assessment:** Woodside noted AIMS feedback. **Woodside response:** Woodside thanked AIMS for confirming it has no operations in the area.	**(1)** Not required.
(2) AIMS requested to be notified.	**(2)** **Woodside assessment:** Woodside will provide notifications to relevant stakeholders as outlined in Table 7-7 of this EP. **Woodside response:** Woodside confirmed it will contact AIMS should the activity location change.	**(2)** Woodside will provide notification of significant change, as appropriate, to AIMS, as referenced in Table 7-7 of the EP.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Woodside notes that further feedback may be received as part of ongoing consultation. Should further feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	Woodside considers the measures and controls in the EP are appropriate.

Outcomes of Consultation

While AIMS is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for AIMS to provide feedback during the consultation process.

Traditional Custodians

Wanparta Aboriginal Corporation (Wanparta)

Wanparta is established under the Native Title Act 1993 by the Ngarla people to represent the Ngarla people (defined broadly by reference to descent from the set of ancestors who were known to have a continuous and unbroken connection as the Traditional Custodians at the time of European colonisation) and represent their communal interests including, among other things, management and protection of cultural values.

Historical Engagement:

- On 26 July 2023, Woodside emailed Wanparta Woodside's planned Program of Ongoing Engagement with Traditional Custodians and confirming Woodside's preference to attend the 31 August 2023 board meeting (SI Report, reference 21.1).
- On 31 August 2023, Woodside met with the Wanparta Board and members in South Hedland (SI Report, reference 21.2). Woodside presented on activities unrelated to this activity, and also described the Environment Plan framework, referring to the Offshore Petroleum and Greenhouse Gas Storage Act (Environment) Regulations, NOPSEMA's role as regulator and general contents of Environment Plans.
- At the 31 August 2023 meeting (SI Report, reference 21.2) Wanparta asked/noted:
  - **(1)** Wanparta stated that water is extremely important to Ngarla people, and they feel a responsibility to look after the ocean and lore.
  - **(2)** Wanparta asked about ranger group involvement in spill response.
    - **(1)** Woodside responded that it would get back to the team with regards to training and involvement.
  - Wanparta would like to engage in an annual meeting with Woodside.
- On 4 October 2023, Woodside emailed Wanparta (SI Report, reference 21.3) following up with a summary of a phone call on the same day. The outcomes of the phone discussion were:
  - **(2)** Wanparta's interest in a Wanparta Ranger program.
  - **(3)** Wanparta's interest in EP funding.
  - Wanparta's interest in a Karratha Gas Plant visit, as well as possible school visits and Perth Office visits.
  - Wanparta's request for updates on EPs unrelated to this one.
  - Woodside's query into Wanparta's thoughts on a formal process for consultation on future EPs.
- On 6 October 2023, Wanparta emailed Woodside advising that the Board would consider these items at its 4 October 2023 meeting and would revert shortly after (SI Report, reference 21.4).
- **(2)** On 10 November 2023, Wanparta emailed Woodside with a Ngarla Ranger Proposal for Woodside's consideration (SI Report, reference 21.5).
- On 10 November 2023, Woodside called Wanparta (SI Report, reference 21.6) and discussed:
  - **(2)** Ngarla Ranger Proposal
  - **(3)** Further funding request for management of EP's
  - Proposed meeting location and date - parties agreed for Woodside to host the Wanparta Board on February 23rd 2024 at the Karratha Gas Plant
- **(2)** On 12 November 2023, Woodside emailed Wanparta confirming receipt of the Ranger Proposal (SI Report, reference 21.7).

- **(3)** On 13 November 2023, Wanparta emailed Woodside with a written request for funding to assist ongoing consideration of Environmental Plans (SI Report, reference 21.8).
- **(3)** Between 22-30 November 2023, Woodside and Wanparta exchanged emails regarding funding to assist with consultation meetings, and the availability of Directors for a meeting on 23 February 2024 (SI Report, references 21.9, 21.10, 21.11).
- Between 8 – 15 February 2024, Woodside and Wanparta exchanged emails confirming logistics of consultation and site visit meetings in Karratha for week of 26 February 2024 (SI Report, references 21.12, 21.13, 21.14, 21.15).
- On 20 February 2024, Wanparta emailed Woodside informing of a death in the community and requesting a re-schedule of the meeting (SI Report, reference 21.16).
- On 21 February 2024, Woodside acknowledged and agreed to a re-schedule (SI Report, reference 21.17).
- On 23 February 2024, Wanparta emailed Woodside with suggested dates for a re-scheduled meeting in April 2024 (SI Report, reference 21.18).
- On 26 February 2024, Woodside emailed Wanparta confirming availability for the proposed April meeting and noting logistics (SI Report, reference 21.19).

Summary of information provided and record of consultation for this EP:

- On 28 February 2024, Woodside emailed Wanparta advising of the proposed activity (Record of Consultation, reference 2.36), providing a Summary Information Sheet (including a link to the detailed information sheet on Woodside's website), and links to the NOPSEMA consultation brochure and guidelines, and draft policy for managing gender-restricted information. The email requested information on the interests that Wanparta and its members may have within the EMBA, information on how Wanparta would like to engage, and requested that Wanparta provide information to other individuals as required.

Ongoing Engagement:

- Between 16-22 April, Woodside and Wanparta exchanged emails regarding logistics and funding for a meeting for consultation on this activity and a site visit with the Wanparta Board. (SI Report, references, 21.20-21.29)
- On 24 April 2024, Woodside met with Wanparta at Murujuga. Woodside presented an overview of EPs and ongoing consultation in 2024, and provided information on this activity, Aboriginal employment, and ranger programs. Wanparta informed Woodside that there were no issues following the discussion (SI Report, reference 21.30).
- On 7 May 2024, Wanparta emailed Woodside following the meeting on 24 April 2024 (SI Report, reference 21.31). Wanparta advised:
  - **(4)** The Ngarla People have a deep spiritual connection to sea country. **(4)** Woodside recognises Wanparta's interests and potential cultural values and these have been recorded in the EP.
  - **(5)** The Ngarla peoples' totem species – the octopus, stingray, spiny bream fish and kestrel – is of great significance. **(5)** Woodside recognises Wanparta's interests and potential cultural values and these have been recorded in the EP.
  - **(6)** The protection and management of marine life and healthy ocean plays a significant role in their lore, culture and customs. **(6)** Woodside recognises Wanparta's interests and potential cultural values and these have been recorded in the EP.
  - **(7)** That they request Woodside attends an annual Board meeting with Wanparta for the purposes of progressing ongoing and meaningful consultation. **(7)** Woodside supports ongoing consultation with Wanparta through their preferred method of consultation.
  - **(8)** That Wanparta requires immediate consultation the parameters of the activity change. **(8)** Woodside will provide notification to Wanparta in the event of significant change.

- On 30 May 2024, Woodside emailed Wanparta following up on its meeting on 24 April 2024. (SI Report, reference 21.32). In the email Woodside:
  - **(5)** acknowledged the significance of the Ngarla People's totem species – the octopus, stingray, spiny bream fish and kestrel.
  - **(6)** acknowledged the protection and management of marine life for Ngarla People to continue practising lore, culture and custom.
  - **(7)** welcomed the opportunity to attend the annual Board meeting
  - **(8)** would provide timely updates on any changes to the Pluto Facility Operations.

Summary of Feedback, Objection or Claim	Assessment of Merits of Feedback, Objection or Claim and Woodside's Response	Inclusion in Environment Plan
(1) During face-to-face engagement related to other activities Wanparta provided feedback on the importance of water and the ocean.	**(1)** **Woodside Assessment:** Woodside assessed Wanparta's interest in water to represent potential cultural values. **Woodside Response:** Wanparta's interests and potential cultural values have been recorded in the EP, the potential impact on the interests and values, including controls, have been assessed.	**(1)** Woodside updated Section 4.9 to record Wanparta's interests and potential cultural values and assessed potential impact on these, including controls, in Section 6.11.
(2) Wanparta has expressed interest in a range of social investment opportunities including a ranger program and have provided a Ranger Program proposal for Woodside's consideration.	**(2)** **Woodside Assessment:** Woodside supports ongoing engagement with Traditional Custodians through their Program of Ongoing Engagement. **Woodside Response:** Separate from consultation under regulation 25 of the Environment regulations, Woodside has discussed a ranger program with Wanparta and their proposal is under consideration.	**(2)** Ranger programs are able to be addressed as part of Woodside's Program of Ongoing Engagement (Appendix G).
(3) Wanparta expressed an interest in funding to assist in consultation.	**(3)** **Woodside Assessment:** Woodside supports resourcing for Traditional Custodians to allow for consultation on proposed activities. **Woodside Response:** Woodside has agreed to provide support to Wanparta for consultation purposes.	**(3)** Not required.
(4) On 7 May 2024, Wanparta advised of its connection to sea country.	**(4)** **Assessment:** Woodside assessed Wanparta's connection to sea country to represent potential cultural values. **Woodside Response:** Wanparta's interests and potential cultural values have been recorded in the EP, the potential impact on the interests and values, including	**(4)** Woodside recognises that Wanparta holds Sea Country rights and interests that need to be protected (Section 4.9).

	controls, have been assessed.	
(5) On 7 May 2024, Wanparta advised of the significance of their totem species including the octopus, stingray, spiny bream fish and kestrel.	**(5)** **Woodside assessment:** Woodside respects Wanparta's cultural connections and knowledge, including their totem species. **Woodside response:** Woodside has noted the Wanparta's values and interests in their totem species in Section 4.9.4.	**(5)** Woodside updated Section 4.9 to record Wanparta's interests and potential cultural values.
(6) On 7 May 2024, Wanparta advised of the importance of the protection of marine life and ocean to its lore, culture and customs.	**(6)** **Woodside assessment:** Woodside respects Wanparta's position that they have cultural obligations to protect marine life and ocean. **Woodside response:** Woodside has noted the Wanparta's values and interests in Sea Country in Section 4.9.4.	**(6)** Woodside updated Section 4.9 to record Wanparta's interests and potential cultural values.
(7) On 7 May 2024, Wanparta requested Woodside attend an annual Board Meeting for the purpose of ongoing consultation.	**(7)** **Woodside Assessment:** Woodside supports ongoing consultation with Traditional Custodians. **Woodside Response:** Woodside supports ongoing consultation with Wanparta through their preferred method of consultation.	**(7)** Not required.
(8) On 7 May 2024, Wanparta requested it be advised on any change in activity parameters.	**(8)** **Woodside assessment:** Woodside will provide notification to Wanparta in the event of significant change. **Woodside response:** Woodside has outlined this requirement in Table 7-7 of the EP.	**(8)** Woodside will provide notification of significant change, as appropriate, to Wanparta, as referenced in Table 7-7 of the EP.
While feedback has been received, there were no objections or claims.	Woodside engages in ongoing consultation throughout the life of an EP. Should feedback be received after the EP has been accepted, it will be assessed and, where appropriate, Woodside will apply its Management of Change and Revision process (see Section 7.2.5 of this EP).	No additional measures or controls are required.
Outcomes of Consultation		
While Wanparta is not a relevant person under regulation 25 of the Environment Regulations, Woodside considers it has still provided sufficient information and a reasonable period outside of regulatory requirements for Wanparta to provide feedback during the consultation process.		

RECORD OF CONSULTATION

1. INFORMATION SHEETS

1.1 Consultation Information Sheet

Woodside Energy

CONSULTATION

INFORMATION SHEET

February 2024

PLUTO FACILITY OPERATIONS ENVIRONMENT PLAN

CARNARVON BASIN, NORTH-WEST AUSTRALIA

Woodside consults relevant persons in the course of preparing an environment plan (EP) to notify them, obtain their input and to assist Woodside to confirm current measures or identify additional measures, if any, that could be taken to lessen or avoid potential adverse effects of the proposed activity on the environment. This is the intended outcome of consultation.

Woodside's aim is to ensure the activity is carried out in a manner that is consistent with the principles of ecologically sustainable development (ESD), by which the environmental impacts and risks of the activity are reduced to as low as reasonably practicable (ALARP) and of an acceptable level. Woodside wants relevant persons whose functions, interests or activities may be affected by the proposed activity to have the opportunity to provide feedback on our proposed activity, in accordance with the intended outcome of consultation.

Overview

Woodside will submit a five-year revision of the Operations EP for the Pluto Facility (Pluto) located in Commonwealth waters, in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* (Cth) (regulations). The Operations EP currently covers the operation of a fixed platform (Pluto) and subsea infrastructure connected to the Pluto, Xena and Pyxis reservoirs. The Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Location and Operations

The Pluto platform and associated subsea infrastructure is located in Production Licenses WA-1-IL and WA-34-L. The export pipeline and flowline are within Pipeline Licenses WA-17-PL and WA 16 PL, respectively (see **Figure 1**).

The Xena-03 well is located in Production Licence WA 34 L, around 15km from the Pluto Platform and around 190km west north-west of Dampier. The Xena-03 well will be located around 2 km from the existing Xena-02 well and tied back to the existing Pluto production systems.

The Pluto facility commenced production in 2012. The facility produces wet gas and condensate, which is transported for processing at the onshore Pluto LNG Plant via a 180km long export pipeline. The Pluto platform is a not-normally-manned facility, with remote operation from a fixed operator console at the Pluto onshore Central Control Room (CCR), which is constantly manned.

Installation of a water handling module on the platform is underway to enable the processing and discharge of produced water at the platform. Wet gas will be processed through the water handling module and transported onshore, with treated water discharged overboard.

Table 1 summarises the activities, which will be managed under the Operations EP.

Proposed Activity Overview – Production / Operations

The production scope includes the following activities to be undertaken during the next five-year period:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR) activities
- Commissioning and operation of the water handling module
- Non-routine and unplanned activities and incidents associated with the above.

Future decommissioning of infrastructure will be subject to separate future EPs.

Production

Production commenced from the Pluto facility in 2012 and is currently expected to continue until at least 2031. Production is planned to commence from the Xena-03 well around Q3 2025.

Inspection

Inspection of infrastructure is the process of physical verification and assessment of subsea components to detect changes compared to its installed state. Typical site inspection activities include visual surveys via a remotely operated vehicle, side scan sonar surveillance, cathodic protection measurements and ultrasonic pipe condition checks.

Monitoring

Monitoring is the surveillance of the physical and chemical environment around subsea infrastructure. Monitoring activities may include process composition, corrosion probes, corrosion mitigation checks, and metocean and geological monitoring.

Maintenance

Maintenance of infrastructure is required at regular and/or planned intervals to maintain performance reliability and prevent deterioration or failure of equipment. Maintenance activities may include cycling of valves and leak pressure testing.

Repair

Repair activities are those required when a subsea system or component is degraded or damaged as defined by design codes.

Vessels

Operations support vessels will be used to undertake IMMR of subsea infrastructure. The vessel size and type will be dependent on the work scope. The vessels will not anchor during IMMR activities unless there is an unexpected event or an emergency. An Accommodation Support Vessel (ASV) may be required for short periods (typically less than 1 month) to support planned maintenance campaigns, shutdown maintenance or major projects.

1 Pluto Facility Operations Environment Plan | February 2024

Proposed Activity Overview – Drilling and Tie-Back

The scope for this EP includes drilling, completion, subsea installation (including minor changes to existing infrastructure) along with commissioning activities to bring in gas from the Xena-03 well to the Pluto platform. This includes directly installing infrastructure from the installation vessel in the relevant location.

Other contingent activities that Woodside may need to perform include well abandonment, re-spud, side-track, well suspension, well intervention, wireline logging, leaving wellhead assembly in situ, sediment mobilisation and relocation, venting, well test/unload and emergency disconnect sequence.

Drilling, subsea installation and commissioning activities

Woodside plans to drill one new well in the Xena field (Xena-03) and to install an associated wellhead and Xmas tree. Xena-03 will be connected to the existing Pyxis Hub subsea infrastructure. The well will be located at approximately 177 m water depth. Other activities include:

- Pre-commissioning and cold-commissioning (non-hydrocarbon) activities associated with subsea infrastructure including leak testing of the flexibles, subsea control systems verification and function-testing of valves to verify the production system and electric and hydraulic flying leads are ready for entry into the commissioning phase; and
- Well start-up and commissioning (initial start-up) of the Xena 03 well involving slow and gradual build up to maximum well gas production rates and then well performance testing such as Multi-Rate Testing, simulated emergency shut down (ESD) of the well followed by Pressure Build-Up Testing.

Drilling activities are currently anticipated to commence around Q2 2025, subsea installation and commissioning activities are currently anticipated around Q3 2025.

The timing and duration of the proposed activities is subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

Project vessels

Activities will be completed using a range of vessels. Operations will use support vessels to undertake inspection, monitor, maintenance and repair of subsea infrastructure. The vessel size and type will be dependent on the work scope.

The proposed Xena-03 drilling and tie-back will be performed using a moored, dynamically positioned (DP) or hybrid (DP/moored) mobile offshore drilling unit (MODU). During the subsea installation campaign, a construction/primary installation vessel will perform installation activities.

The project will be supported by other vessels, such as general support vessels, cargo vessels, anchor handling vessels and multiservice construction vessels during drilling activities. Support vessels will be used to transport equipment and materials between the MODU/installation vessel and port.

Drilling operations for the production well are currently expected to take around 60 days to complete.

Installation of subsea infrastructure and pre-commissioning is anticipated to commence when the relevant new production well has been drilled and is expected to have a cumulative duration of about three weeks. Drilling and installation of subsea infrastructure may be performed over multiple campaigns.

The support and installation vessels will operate on DP and will not anchor/moor on the seabed. It is anticipated vessels will operate 24 hours per day for the duration of drilling and tie-back activities.

Communications with mariners

The location of Pluto is marked on nautical charts and the platform is surrounded by a 500 m radius petroleum safety zone (PSZ). A 4 km radius Operational Area will be applied around the Xena-03 drill centre.

A temporary 500 m safety exclusion zone will apply around the MODU and subsea installation vessel to manage vessel movements.

Commercial fishers and other marine users are permitted to use the Operational Area but should take care when entering and remain clear of the safety exclusion zones. The wells will continue to be marked on navigational charts.

Assessment

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant persons, considering timing, duration, location and potential impacts arising from the planned activities. Mitigation and management measures will be implemented and are summarised in **Table 3.** Further details will be provided in the EP.

In preparing the EP, Woodside's intent is to minimise environmental and social impacts associated with the proposed activities. Woodside is seeking any interest or comments you may have to inform Woodside's decision making.

Joint Venture

Woodside Burrup Ltd is the Titleholder for this activity on behalf of the Pluto LNG joint venture partners, Tokyo Gas Pluto Pty Ltd and Kansai Electric Power Australia Pty Ltd.

We welcome your feedback by 29 March 2024.

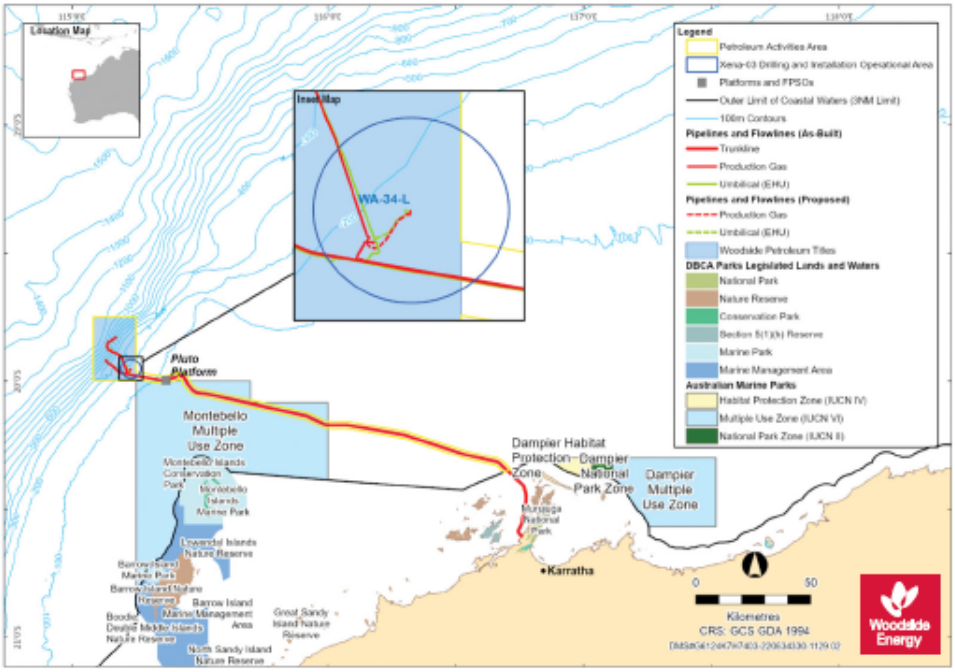

Figure 1. Pluto Facility and Operational Areas.

Table 1. Activity summary

Pluto Operations Facility Environment Plan	
Facility type	• Fixed platform, processing equipment, pipelines
Production License Areas	• WA-1-IL, WA-34-L
Pipeline Licenses	• WA-16-PL, WA-17-PL
Approximate water depth	• ~80–960 m
Activities Summary	Routine Operations: • routine production • routine IMMR of the platform and associated subsea infrastructure including pigging of the flowlines and pipeline • well unloading and clean-up • installation and use of the water handling unit • non-routine and unplanned activities and incidents associated with the above • supporting activities associated with the activities (e.g. vessel operations, helicopter transfers, etc.) Xena-03 Drilling and Tie-back: • drill one new well (Xena-03) in the Xena field • tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform • pre-commissioning and commissioning activities
Infrastructure	• Platform, wells, Xmas trees, umbilicals, spools, jumpers, manifolds, flowlines, riser, chemical supply lines and the export pipeline (see **Table 2** for their approximate location)
Vessels	• MODU type could be Moored, Dynamically Positioned (DP) or hybrid moored/DP (required for Xena-03 drilling activity) • Primary Installation Vessel (required for Xena-03 subsea installation activity) • Vessel for routine IMMR and Xmas tree installation, isolation testing or contingent activities • Support vessels including heavy lift vessel(s) (HLVs), multi-service construction vessel(s), anchor handling vessel(s) and other general supply/support vessels appropriate to the nature of petroleum activities

Pluto Operations Facility Environment Plan	
Key dates	Routine Operations: • Ongoing
Approximate duration of Xena-03 Drilling and Tie-back	• Drilling: Activities are currently anticipated to take around 60 days to complete • Subsea installation: Activities are currently anticipated to have a cumulative duration of around three weeks (including mobilisation, demobilisation and contingency) • Timing and duration of activities is subject to change due to project schedule requirements, MODU/vessel availability, unforeseen circumstances and weather constraints
Operational Areas and Exclusion zones	The Operational Area for Routine Operations comprises: • The platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform • The export pipeline (PITL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m corridor either side of the pipeline • Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure Xena-03 Drilling and Tie-Back: • The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities • Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements • An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities
Distance to nearest town	• ~ 160 km north-west of Dampier
Distance to nearest marine park/ nature reserve	• The Operational Area overlaps the Montebello Australian Marine Park Multiple Use Zone (IUCN category VI)

Table 2. Approximate locations of key infrastructure related to the Pluto Facility Operations Petroleum Activities Program

Structure	Approximate Water Depth (m)	Latitude	Longitude	Petroleum Titles
Existing infrastructure				
Platform	-	19°54'49.23614"	115°7'54.46587"	WA-1-IL
Existing subsea infrastructure				
PYA manifold	-844 m	19°52'46.2896"S	115°09'00.0179"E	WA-34-L
XNA manifold	-182 m	19°5.7'52.6141"S	115°12'54.6816"E	
Pluto A and B flowlines	-	-	-	WA-16-PL
Export pipeline (Commonwealth)	-	-	-	WA-17-PL
Existing wells				
PLA01ST1 well	-830 m	19°54'48.23107"	115°7'54.75273"	WA-34-L
PLA02 well	-830 m	19°54'48.56705"	115°7'55.78025"	
PLA03ST1 well	-830 m	19°54'48.70289"	115°7'56.32877"	
PLA04 well	-830 m	19°54'48.69494"	115°7'55.57246"	
PLA05 well	-830 m	19°54'49.23614"	115°7'54.46587"	
PLA06 well	-830 m	19°54'48.25708"	115°7'54.13355"	
PLA07 well	-830 m	19°54'48.96"	115°07'55.2"	
PLA08 well	-820 m	19°54'42.003"	115°08'02.424" E	
PYA01 well	-985 m	19°49'34.18078"	115°10'52.96514"	
PL-PYA02 well	-862 m	19°52'11.83574"	115°8'18.55154"	
XNA01 well	-180 m	19°58'13.56660"	115°12'46.17465"	
XNA02 well	-180 m	19°49'34.18078"	115°10'52.96514"	
Proposed well and infrastructure				
XNA03	-177 m	19° 54' 42.003"S	115°08'02.424"E	WA-34-L
Xena tie-in	-	19° 58' 15.25052"	115°12 '45.46775"	

Environment That May Be Affected (EMBA)

The environment that may be affected (EMBA) is the largest spatial extent where Pluto Facility Operations (including Xena-03 drilling and tie-back activities) could potentially have an environmental consequence (direct or indirect). The broadest extent of the EMBA takes into consideration planned and unplanned activities. For this EP, the EMBA has been developed by combining numerous modelling outputs based on highly unlikely releases of hydrocarbons to the environment. For this EP, the modelling scenarios that inform the EMBA are a loss of well integrity, loss of pipeline integrity or a vessel collision. The EMBA is depicted in **Figure 2**.

The EMBA does not represent the extent of the predicted impact of the highly unlikely unplanned release of hydrocarbons. Rather, the EMBA represents the merged area of many possible paths that a highly unlikely hydrocarbon release could travel, depending on the weather and ocean conditions at the time of the release. This means that in the highly unlikely event that a hydrocarbon release does occur, the whole EMBA will not be affected. The specific and minimal part of the EMBA that is affected will only be known at the time of the release.

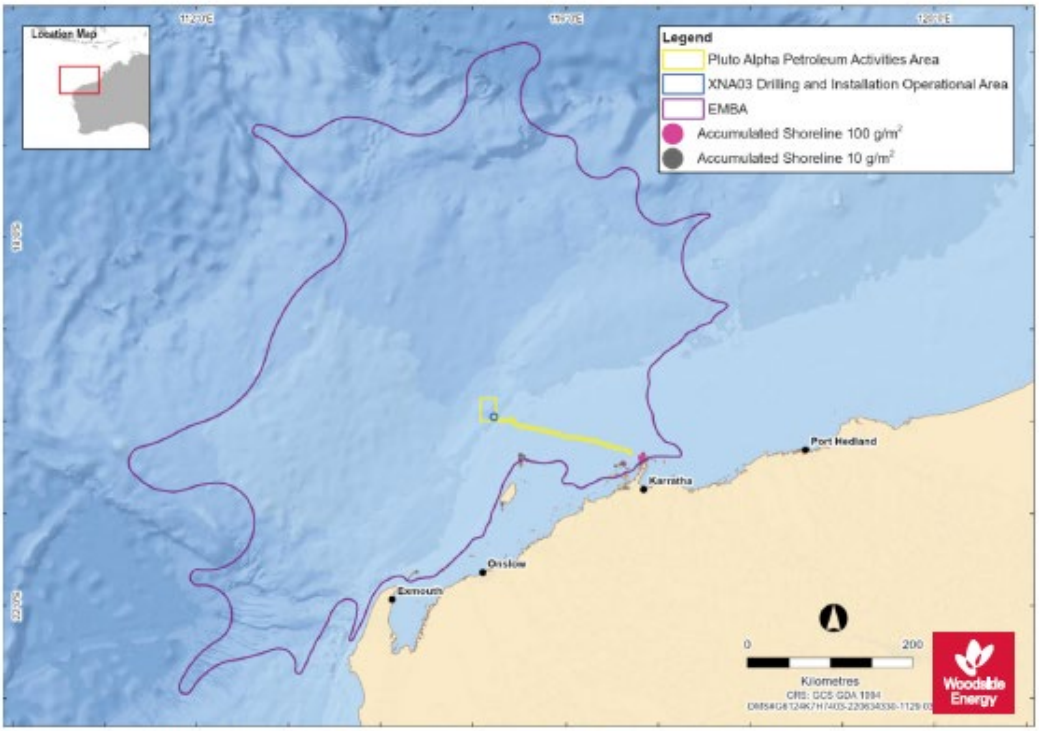

Figure 2: Environment that May Be Affected by the Pluto Facility Operations Petroleum Activities Program including Xena-03 drilling and tie-back

Mitigation and Management Measures

Woodside has undertaken an assessment to identify potential impacts and risks to the environment arising from the proposed activities considering timing, duration, location. Mitigation and management measures for proposed activities are outlined in **Table 3**. Further details will be provided in the EP.

Table 3. Summary of key risks and/or impacts and management measures associated with Pluto Facility Operations, including Xena-03 drilling and tie-back.

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Planned Activities (Routine and Non-routine)			

Physical Presence: Interaction with Other Marine Users	**Operations**
	Presence of the Pluto facility, subsea infrastructure and routine IMMR activities excluding and/or displacing other users from the Petroleum Safety Zone (PSZ) and Operational Area respectively.
	
	Drilling and Tie-back Activities
	Physical presence of anchor system, mobile offshore drilling unit (MODU), support vessels, anchor handling vessels, installation vessels, and associated safety exclusion zones.
		Operations
		Potential isolated social impact resulting from interaction with other sea users such as:
		• Commercial fisheries
		• Tourism and recreation
		• Commercial vessels/ shipping
		
		Drilling and Tie-back Activities
		Temporary displacement of commercial fishing activities.
			• Implement a 500 m PSZ around the platform.
			• Establish a 500 m safety exclusion zone around MODU and the installation vessel which is communicated to marine users
			• Notifying the Australian Hydrographic Office (AHO) of location of permanent new infrastructure to enable update of maritime charts
			• Continued consultation relating to the Petroleum Activities Program
			• Implement Pluto's collision prevention system to alert marine vessels of the facility location which reduces the likelihood of adverse interaction with other marine users
			• Other controls include:
			  • Activity support vessel on standby as required (during drilling)
			  • Notice to Mariners
			  • Notify Australian Maritime Safety Authority (AMSA)
			  • Activity support vessel surveillance

Physical Presence: Disturbance to Seabed	**Operations** Presence of Pluto facility and subsea infrastructure modifying marine habitats. Subsea operations, IMMR activities resulting in disturbance to seabed. **Drilling and Tie-back Activities** Disturbance to seabed during drilling operations. Disturbance to seabed during subsea installation.	**Operations** Localised modification of seabed habitat (formation of artificial reef) within Operational Area. Potential minor, localised modification of seabed habitat within the Operational Areas. **Drilling and Tie-back Activities** Loss or damage to benthic habitats and communities.	• Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement within integrity envelope • Monitoring and maintenance of redundant infrastructure in accordance with the IMMR process • Vessels used for IMMR will not anchor under routine operations • Reasonable attempt(s) at removal of wellhead will be undertaken in the event of a re-spud • Positioning technology used to place seabed infrastructure within the design footprint to reduce seabed disturbance • Project-specific Basis of Well Design, which includes an assessment of seabed sensitivity • Wet parked items will be tracked and removed from the seabed • Pre-lay survey undertaken prior to installation of flowlines
Routine Acoustic Emissions: Generation of Noise during Routine Operations	Noise generated from operational activities from: • facility and associated infrastructure • vessels • helicopters • IMMR activities • Positioning equipment	Localised behavioural impacts to marine fauna around vessels and Pluto platform.	• Comply with regulatory requirements for interactions with marine fauna to prevent adverse interactions

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Acoustic Emissions: Generation of Noise during Tie-back Activities	Noise during Tie-back Activities generated from: • drilling, (hybrid MODU and DP) • vessels and helicopters • positioning equipment	Potential impacts to marine mammals, reptiles and fish, varying from behavioural responses to physiological impact (TTS).	• Comply with regulatory requirements for interactions with marine fauna to prevent adverse interactions • Implement adaptive management procedures as required

Routine and Non-Routine Discharges: Discharge of Hydrocarbons and Chemicals	**Operations**
	Discharge of subsea control fluids.
	Potential non-routine hydraulic fluid discharge.
	Discharge of hydrocarbons remaining in subsea pipelines/ flowlines and equipment as a result of subsea intervention works.
	Discharge of chemicals remaining in subsea infrastructure and equipment or the use of chemicals for subsea IMMR activities.
	Discharge of minor fugitive hydrocarbon from subsea equipment.
	Drilling and Tie-back Activities
	Discharge of flexible jumper and flying leads precommissioning fluids to the marine environment.
	Discharge of minor fugitive hydrocarbon from subsea equipment.
		Operations
		Potential slight short-term, localised decrease in water quality at release location during IMMR activities.
		Drilling and Tie-back Activities
		Potential short-term impacts on marine biota.
		Potential slight short-term, localised decrease in water quality at release location during installation activities.
			• Marine discharges managed according to regulatory requirements
			• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process
			• Flushing and isolation of subsea infrastructure where practicable during IMMR disconnection activities to reduce releases to the environment
			• Monitoring subsea control fluid use, investigating material discrepancies to identify potential integrity failures
			• Other controls include:
			  • Chemical Selection and Assessment
			  • Development and application of robust procedures

Routine and Non-Routine Discharges: Produced Water (PW)	Discharge of PW during routine and non-routine operations.	Potential minor, short term impact to water quality, marine sediments and marine biota.	• Marine discharges managed according to regulatory requirements • Online monitoring and procedural controls in place for PW discharge • Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process. Woodside internal guidance and procedures are adhered to • Implement adaptive monitoring and management
Routine and Non-Routine Marine Wastewater Discharges: Discharge of Sewage, Putrescible Waste, Grey Water, Bilge Water, Drain Water, Cooling Water and Brine	**Operations** Discharge of sewage, grey water and putrescible waste from the platform and support vessels to the marine environment. Discharge of deck, bilge and drain water from the platform and support vessels to the marine environment. Discharge brine and cooling water from platform and support vessels to the marine environment. **Drilling and Tie-back Activities** Routine offshore discharge from MODU and vessels of sewage, grey water, waste, bilge water and deck drainage.	**Operations** Potential slight, localised increase in water temperature, salinity and short-term water quality changes around discharge location. **Drilling and Tie-back Activities** Potential slight, localised increase in water temperature, salinity and short-term water quality changes around discharge location.	• Marine discharges managed according to regulatory requirements • Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process • Where there is the potential for loss of primary containment of oil and chemicals on the platform, MODU or vessels, bunding or closed drainage systems are in place to contain spills

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Routine and Non-routine Atmospheric Emissions	**Operations** Operational fuel combustion, flaring and fugitive emissions. Operational emissions associated with energy generation, onshore processing of Pluto gas, third party transportation, regassification and combustion by end users. **Drilling and Tie-back Activities** Contingent venting of gas during drilling (e.g. well kick). Vessel and helicopter emissions.	Potential slight short-term, localised air quality changes, limited to the airshed local to the facility.	• Comply with legislative and regulatory requirements for marine air pollution and emissions reporting • Robust well control procedures to minimise risk of well kick during drilling • Maintain flare to maximise efficiency of combustion
Routine Light Emissions: Light Emissions from the Platform and Project Vessels	**Operations** Light emissions from facility, MODU and support vessels. Light emissions from facility during flaring. **Drilling and Tie-back Activities** Light emissions during drilling including flaring, from support vessels, primary installation vessel as well as subsea vehicles.	Negligible, localised potential for behavioural disturbance of species near Pluto platform and vessels including fish, marine reptiles and seabirds.	• Lighting limited to the minimum required for navigational and safety requirements, except for emergency events • Well unloading acceptance criteria that define the well objectives will be established, minimising light from flaring • Implementation of a Seabird Management Plan

Routine and Non-Routine Discharges: Drill Cuttings, Drilling Fluids and Well Removal Fluids during drilling and tie-back activities	Routine discharge of water-based muds (WBM) drill cuttings to the seabed and the marine environment.
	Non-routine discharge of treated non-water-based muds (NWBM) drill cuttings to the marine environment.
	Non-routine discharge of wash water from mud pits and vessel tank wash fluids during drilling and tie-back.
	Routine discharge of well clean-out fluids during drilling and tie-back.
	Non-routine discharge of well annular fluids during drilling and tie-back.
	Non-routine discharge of WBM and cement cuttings to the marine environment during drilling out of a cement plug.
	Non-routine discharge of grit and flocculant during removal of well infrastructure.
		Potential impacts to marine biota, as well as localised reduction in water quality with potential effects on both water quality and benthic communities.	• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process
			• NWBM base oils selected based on expected toxicity
			• NWBM will be used where written justification process has been followed and bulk NWBM will be retained for disposal onshore or maintained on rig for re-use
			• Fluids contaminated with hydrocarbons will be treated to meet specified discharge limits prior to discharge or contained. If discharge specifications are not met the fluid will be returned to shore
			• Drill cuttings returned to the MODU will be discharged below the water line to reduce carriage and dispersion to other areas
			• Other controls include:
			  ◦ Restrict overboard discharge of NWBM
			  ◦ Measure oil content in displacement, brine, workover or intervention fluids, pit and tank wash
			  ◦ Permit to Work system
			  ◦ Solid Control Equipment
			  ◦ Woodside Engineering Standard for Rig Equipment

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Routine and Non-Routine Discharges: Cement, Cementing Fluids, Subsea Well Fluids, Unused Bulk Product and Subsea Chemicals during drilling and tie-back activities	Routine discharge of cement and cementing fluids, to the seabed and the marine environment during drilling and tie-back. Routine discharge of subsea well fluids (inc. blow-out preventer (BOP)) and well construction activity control fluids) during drilling and tie-back. Non-routine discharge of unused bulk products during drilling and tie-back.	Potential impacts to marine biota, as well as localised reduction in water quality with potential effects on both water quality and benthic communities.	• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process • Fluids contaminated with hydrocarbons will be treated to meet specified discharge limits prior to discharge or contained. If discharge specifications are not met, fluids will be returned to shore • During well unloading and completion activities, if produced water is not flared, it will be processed through a water treatment package prior to discharge to the environment • Options for use of excess bulk cement, bentonite or barite will be managed and only discharged to the marine environment as a last option
Unplanned Events (Accidents / Incidents) – Routine Operations (i.e. no drilling or subsea installation activities)			
Unplanned Hydrocarbon Release: Loss of Well Containment	Release of hydrocarbons resulting from loss of subsea well containment.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of well control** • Well operated in compliance with the accepted well operation management plan (WOMP) including implementation of barriers to prevent a loss of well control • Checks completed during well operations to establish a minimum acceptable standard of well integrity **Spill response arrangements** • Arrangements supporting the Oil Pollution Emergency Plan (OPEP) will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP
Unplanned Hydrocarbon Release: Pipeline and Riser Loss of Containment	Release of hydrocarbons resulting from loss of export pipeline containment. Release of hydrocarbons resulting from loss of containment of subsea flowlines and infrastructure.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of pipeline and riser containment** • The pipeline, flowline and riser design include a range of measures that specifically aid in minimising the risk of external damage • Maintain well integrity to contain reservoir fluids within the well envelope to avoid an incident • Maintain emergency shutdown (ESD) system and critical external and internal communication systems to facilitate prevention and response to accidents and emergencies **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP
Unplanned Hydrocarbon Release: Loss of Structural Integrity	Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere. Hydrocarbon release from topsides equipment to the marine environment and atmosphere.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of structural integrity** • Maintain structural integrity to ensure availability of critical systems during a major accident or environment event and prevent structural failures from contributing to escalation • Maintain control of ignition sources and passive fire protection to prevent loss of structural integrity • Maintain topsides hydrocarbon-containing infrastructure integrity **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Unplanned Hydrocarbon Release: Loss of Structural Integrity	A loss of marine vessel separation between a vessel and the platform may result in a loss of hydrocarbon containment from the Pluto facility and/or the release of fuel from the vessel.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of marine vessel separation** • Maintaining collision warning systems and navigational aids to alert facility of a potential collision with a vessel, and to alert vessels so that they may avoid collisions with the facility **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP
Unplanned Hydrocarbon Release: Topsides Loss of Containment	Hydrocarbon release from topsides process equipment o the marine environment and atmosphere.	Potential moderate short-term impacts to the marine environment: • Disruption to marine fauna, including protected species and/or impacts to water quality	**Preventing topsides loss of containment** • Wells drilled in compliance with the accepted WOMP including implementation of barriers to prevent a loss of well control • Checks completed during well operations to establish a minimum acceptable standard of well integrity • An approved Source Control Emergency Response Plan will be prepared prior to drilling each well including feasibility and specific considerations for relief well • Subsea BOP specification, installation and testing compliant with internal Woodside Standards and international requirements **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP are raised for unplanned releases within event reporting system
Unplanned Hydrocarbon Release: Loss of Control of Suspended Load from Platform	Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere. Hydrocarbon release from topsides equipment to the marine environment and atmosphere.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of control of suspended load** • Maintain platform lifting equipment to prevent failure or dropped/swinging loads that could result in an incident
Unplanned Events (Accidents / Incidents) – Drilling and subsea installation			
Unplanned Hydrocarbon Release: Loss of Well Integrity During Drilling Operations	Loss of hydrocarbons to marine environment due to loss of well containment.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of well control** • Wells drilled in compliance with the accepted WOMP including implementation of barriers to prevent a loss of well control • An approved Source Control Emergency Response Plan will be prepared prior to drilling each well including feasibility and specific considerations for relief well • Subsea BOP specification, installation and testing compliant with internal Woodside Standards and international requirements **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure

Unplanned Hydrocarbon Release: Vessel Collision	Loss of hydrocarbons to marine environment due to a vessel collision (e.g. project vessels or other marine users).	Potential minor, short-term impact on marine species, habitats and protected areas.	**Preventing vessel collision**
			• Comply with regulatory requirements for the prevention of vessel collisions and safety and emergency arrangements
			• Establish temporary safety exclusion zones around vessels which are communicated to marine users to reduce the likelihood of collision
			• Other controls include:
			  • Activity support vessel on standby as required (during drilling)
			  • Notice to Mariners
			  • Notify Australian Maritime Safety Authority (AMSA)
			Spill response arrangements
			• Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned
			• Emergency response activities would be implemented in line with the OPEP

Unplanned Discharges: Release of Hydrocarbons During Bunkering, Transfer, Storage and Use	Accidental discharge of marine diesel to the marine environment during bunkering, transfer, storage or use on the facility, MODU or vessels.	Potential slight, short-term local impacts to marine species and habitats.	**Preventing unplanned hydrocarbon release due to bunkering** • Comply with regulatory requirements for the prevention of marine pollution • Liquid chemical and fuel storage areas bunded or secondarily contained when they are not being handled or temporarily moved • Appropriate bunkering equipment kept and maintained • Compliance with Contractor procedures for the management of bunkering/helicopter operations to reduce the likelihood and potential severity of a spill **Spill response arrangements** • Maintain and locate spill kits in proximity to hydrocarbon storage and deck areas for use to contain and recover deck spills • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP • Incident reports are raised for unplanned releases within event reporting system
Unplanned Discharges: Deck and Subsea Spills	Accidental discharge of hydrocarbons/ chemicals from MODU, installation vessel and project vessels deck activities and equipment, from subsea ROV hydraulic leaks. Unplanned release of chemicals or hydraulic fluid due to failure of subsea equipment.	No lasting effect, localised impact to the marine environment.	• Comply with regulatory requirements for the prevention of marine pollution • Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily • Spill kits positioned in high-risk locations around vessels and the MODU (near potential spill points such as transfer stations) • Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process • Installation vessels have self-containing hydraulic oil drip tray management system • Woodside Engineering Standard for Rig Equipment (incl third party equipment such as ROVs) **Spill response arrangements** • First strike plan • Shipboard Oil Pollution Emergency Plan (SOPEP)

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure

Unplanned Discharge: Drilling/ Project Fluids	Accidental discharge of project fluids (WBM/NWBM/ base oil) and cement to marine environment due to failure of slip joint packers, bulk transfer hose/fitting, emergency disconnect system or from drilling and installation operations.	Potential slight, short-term local impacts to marine species and habitats.	• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process
			• Marine riser's telescopic joint to be comprised of a minimum of two packers (one hydraulic and one pneumatic) and pressure tested
			• No overboard disposal of bulk NWBM
			• Compliance with Contractor procedures for the transfer and management of drilling fluids to reduce the likelihood and severity of a spill
			• Other controls include:
			  • Oil % content in displacement, brine, workover or intervention fluids, pit and tank wash
			  • PTW system
			  • Solid Control Equipment

Unplanned Discharges: Loss of Hazardous and Non-Hazardous Waste	Incorrect disposal or accidental discharge of non hazardous and hazardous waste to the marine environment.	No lasting effect, localised impact to the marine environment.	• Comply with regulatory requirements for the prevention of marine pollution and handling of hazardous wastes • Implement Waste Management Plan, which provides for safe handling and transportation, segregation and storage and appropriate classification of waste generated • Solid waste/equipment dropped to the marine environment will be recovered where safe and practicable to do so • Where retrieval is not reasonably practicable and/ or safe, material items (property) lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title • Incident reports are raised for unplanned releases within event reporting system
Physical Presence: Seabed disturbance from dropped objects or loss of station keeping leading to anchor drag	Dropped objects resulting in the disturbance of benthic habitat. Loss of station keeping of the MODU leading to anchor drag and the disturbance of benthic habitat. Dropped objects over live infrastructure. Dropped objects during vessel transfers or installation activities.	Potential slight, short-term local impacts to marine species and habitats.	• MODU/installation vessel inductions include control measures for dropped object prevention • Equipment dropped to the marine environment will be recovered where safe and practicable to do so • Where retrieval is not reasonably practicable and/ or safe, material items (property) lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title • Implement project-specific mooring design, with sufficient capability, testing and inspection
Physical Presence: Interactions with Marine Fauna	Physical presence of project/ support vessels resulting in collision with marine fauna.	Potential injury or death of marine fauna (single animal), including protected species.	• Comply with regulatory requirements for interactions with marine fauna to reduce the likelihood of a collision occurring
Physical Presence: Introduction of Invasive Marine Species (IMS)	Invasive species in vessel ballast tanks or on vessels/ submersible equipment.	Potential introduction of IMS possibly resulting in an alteration of the localised environment and potential reduction in native species through predation, competition or interspecies breeding.	• Ballast water and biofouling will be managed according to regulatory requirements, including the Australian Ballast Water Management Requirements, and the Australian Biofouling Management Requirements, as applicable • Woodside's IMS risk assessment process will be applied to project vessels and immersible equipment entering the Operational Area

Feedback

Woodside consults relevant persons in the course of preparing Environment Plans to notify them of the activity and to obtain relevant feedback to inform its planning for proposed petroleum activities in the region.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before **29 March 2024** via:

E: Feedback@woodside.com.au

Toll free: 1800 442 977

You can subscribe on our website to receive Consultation Information Sheets for proposed activities:

http://www.woodside.com/what-we-do/consultation-activities

Please note that stakeholder feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) as required under legislation. Woodside will communicate material changes to the proposed activity to affected stakeholders as they arise.

Please note that your feedback and our response will be included in our Environment Plan for the proposed activity, which will be submitted to the NOPSEMA for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* (Cth) and to support other regulatory processes associated with the planned activities (which may or may not be confidential).

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

www.woodside.com

Woodside Energy

1.2 Summary Information Sheet

Woodside Energy

CONSULTATION

SUMMARY INFORMATION SHEET

Februrary 2024

PLUTO FACILITY OPERATIONS ENVIRONMENT PLAN

CARNARVON BASIN, NORTH-WEST AUSTRALIA

When preparing an environment plan (EP), Woodside needs to notify relevant persons and obtain their input. This helps confirm current measures or identify additional measures that may need to be taken to lessen or avoid potential adverse effects of the proposed activity on the environment. Woodside wants to give relevant persons whose functions, interests or activities may be affected by the proposed activity the opportunity to identify themselves and provide feedback on our proposed activity.

This summary information sheet provides a high-level overview of the Pluto Facility Operations environment plan. Further details, including an assessment of the potential impacts and risks to the environment, as well as mitigation and management measures, are available within the Pluto Facility Operations Environment Plan Consultation Information Sheet (February 2024) which can be found at:

http://www.woodside.com/what-we-do/consultation-activities

Overview

Woodside plans to submit a five-year revision of the Operations EP for the Pluto Facility. Operations commenced in 2012.

The Pluto platform is located in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) Plant via a 180 km long export pipeline.

The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore Central Control Room.

The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

A map showing the location of the activities is provided below.

Work Method

Key features of the Pluto Facilities include:

- A fixed platform with five decks, separated by two major vertical trusses. The platform has a pedestal crane, a flare boom, helideck and accommodation facilities. A water handling module is currently being installed to enable overboard discharge of treated produced water.
- The export pipeline and associated 6-inch chemical supply line, extending from the offshore platform to the onshore LNG Plant.
- Subsea infrastructure connecting wells at the Pluto, Xena and Pyxis reservoirs to the platform via production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers.

Summary of key activities includes:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR) of the platform and associated subsea infrastructure.
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above
- The Xena-03 Drilling and Tie-Back project, which includes:
  - drilling one new well (Xena-03) in the Xena field
  - tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform
  - pre-commissioning and commissioning activities.

During normal operations, vessels will typically be limited to supply/support vessels and IMMR vessels. It is anticipated vessels will operate 24 hours per day for the duration of activities.

The Xena-03 Drilling and Tie-Back project is anticipated to commence with drilling in Q2 2025 and installation in Q3 2025.

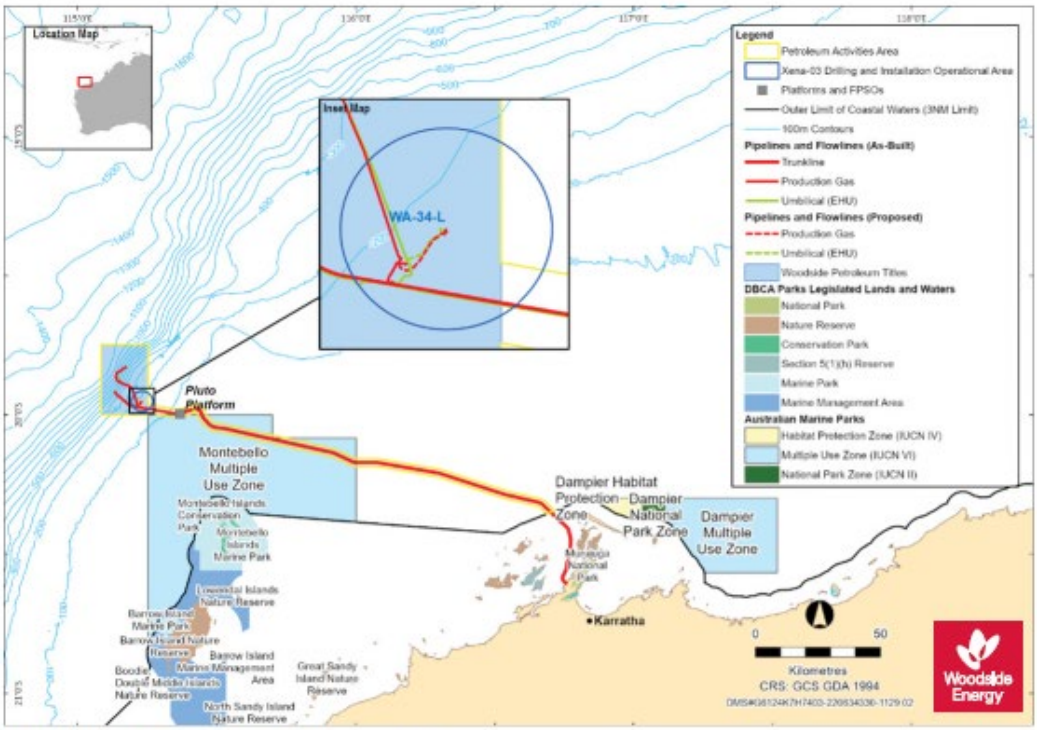

Figure 1 Pluto Facility Operational Area and Drilling Operational Area.

Environment That May Be Affected (EMBA)

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The EMBA does not represent the extent of the predicted impact of the highly unlikely unplanned release of hydrocarbons. Rather, the EMBA represents the merged area of many possible paths that a highly unlikely hydrocarbon release could travel, depending on the weather and ocean conditions at the time of the release. This means that in the highly unlikely event that a hydrocarbon release does occur, the whole EMBA will not be affected. The specific and minimal part of the EMBA that is affected will only be known at the time of the release.

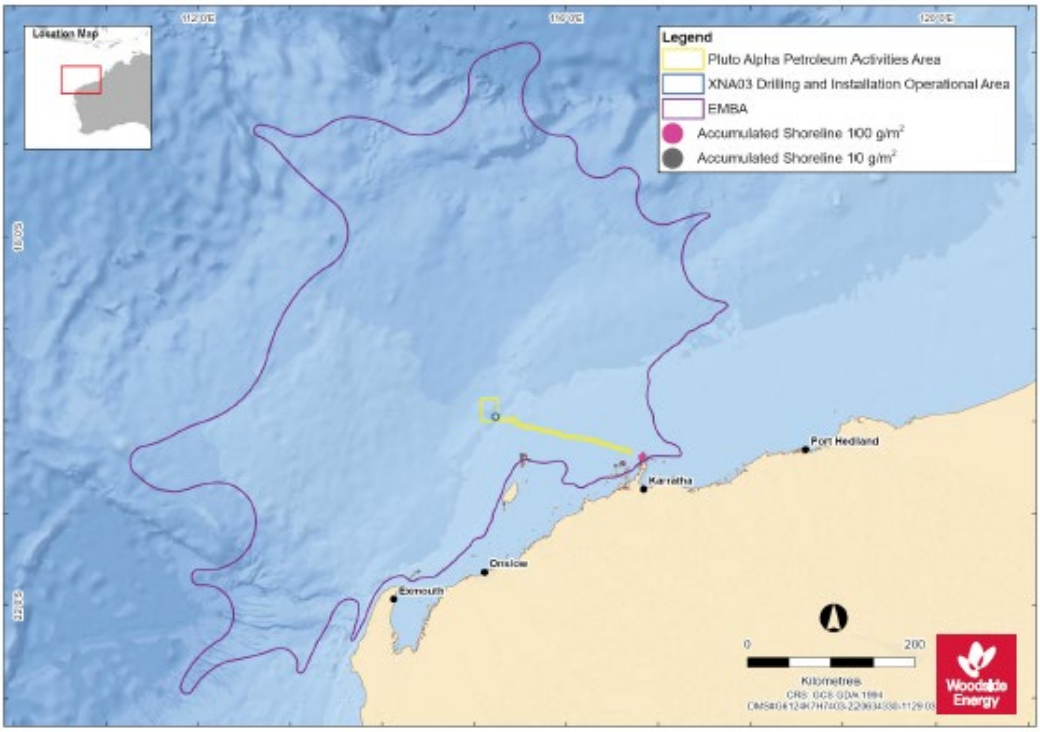

Figure 2. Environment that May Be Affected (EMBA) by the Pluto Facility operations Petroleum Activities Program including Xena-03 drilling and tie-back.

Feedback

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You can subscribe on our website to receive Consultation Information Sheets for proposed activities:

http://www.woodside.com/what-we-do/consultation-activities

Please note that stakeholder feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) as required under legislation. Woodside will communicate any material changes to the proposed activity to affected stakeholders as they arise.

Please note that your feedback and our response will be included in our Environment Plan for the proposed activities, which will be submitted to NOPSEMA for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth)* and support other regulatory processes associated with the planned activities (which may or may not be confidential).

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

1.3 Updated Consultation Information Sheet

Woodside Energy

CONSULTATION

INFORMATION SHEET

February 2024

PLUTO FACILITY OPERATIONS ENVIRONMENT PLAN

CARNARVON BASIN, NORTH-WEST AUSTRALIA

Woodside consults relevant persons in the course of preparing an environment plan (EP) to notify them, obtain their input and to assist Woodside to confirm current measures or identify additional measures, if any, that could be taken to lessen or avoid potential adverse effects of the proposed activity on the environment. This is the intended outcome of consultation.

Woodside's aim is to ensure the activity is carried out in a manner that is consistent with the principles of ecologically sustainable development (ESD), by which the environmental impacts and risks of the activity are reduced to as low as reasonably practicable (ALARP) and of an acceptable level. Woodside wants relevant persons whose functions, interests or activities may be affected by the proposed activity to have the opportunity to provide feedback on our proposed activity, in accordance with the intended outcome of consultation.

Overview

Woodside will submit a five-year revision of the Operations EP for the Pluto Facility (Pluto) located in Commonwealth waters, in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* (Cth) (regulations). The Operations EP currently covers the operation of a fixed platform (Pluto) and subsea infrastructure connected to the Pluto, Xena and Pyxis reservoirs. The Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Location and Operations

The Pluto platform and associated subsea infrastructure is located in Production Licenses WA-1-L and WA-34-L. The export pipeline and flowline are within Pipeline Licenses WA-17-PL and WA 16 PL, respectively (see **Figure 1**).

The Xena-03 well is located in Production Licence WA 34 L, around 15km from the Pluto Platform and around 190km west north-west of Dampier. The Xena-03 well will be located around 2 km from the existing Xena-02 well and tied back to the existing Pluto production systems.

The Pluto facility commenced production in 2012. The facility produces wet gas and condensate, which is transported for processing at the onshore Pluto LNG Plant via a 180km long export pipeline. The Pluto platform is a not-normally-manned facility, with remote operation from a fixed operator console at the Pluto onshore Central Control Room (CCR), which is constantly manned.

Installation of a water handling module on the platform is underway to enable the processing and discharge of produced water at the platform. Wet gas will be processed through the water handling module and transported onshore, with treated water discharged overboard.

Table 1 summarises the activities, which will be managed under the Operations EP.

Proposed Activity Overview – Production / Operations

The production scope includes the following activities to be undertaken during the next five-year period:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR) activities
- Commissioning and operation of the water handling module
- Non-routine and unplanned activities and incidents associated with the above.

Future decommissioning of infrastructure will be subject to separate future EPs.

Production

Production commenced from the Pluto facility in 2012 and is currently expected to continue until at least 2031. Production is planned to commence from the Xena-03 well around Q3 2025.

Inspection

Inspection of infrastructure is the process of physical verification and assessment of subsea components to detect changes compared to its installed state. Typical site inspection activities include visual surveys via a remotely operated vehicle, side scan sonar surveillance, cathodic protection measurements and ultrasonic pipe condition checks.

Monitoring

Monitoring is the surveillance of the physical and chemical environment around subsea infrastructure. Monitoring activities may include process composition, corrosion probes, corrosion mitigation checks, and metocean and geological monitoring.

Maintenance

Maintenance of infrastructure is required at regular and/or planned intervals to maintain performance reliability and prevent deterioration or failure of equipment. Maintenance activities may include cycling of valves and leak pressure testing.

Repair

Repair activities are those required when a subsea system or component is degraded or damaged as defined by design codes.

Vessels

Operations support vessels will be used to undertake IMMR of subsea infrastructure. The vessel size and type will be dependent on the work scope. The vessels will not anchor during IMMR activities unless there is an unexpected event or an emergency. An Accommodation Support Vessel (ASV) may be required for short periods (typically less than 1 month) to support planned maintenance campaigns, shutdown maintenance or major projects.

Proposed Activity Overview – Drilling and Tie-Back

The scope for this EP includes drilling, completion, subsea installation (including minor changes to existing infrastructure) along with commissioning activities to bring in gas from the Xena-03 well to the Pluto platform. This includes directly installing infrastructure from the installation vessel in the relevant location.

Other contingent activities that Woodside may need to perform include well abandonment, re-spud, side-track, well suspension, well intervention, wireline logging, leaving wellhead assembly in situ, sediment mobilisation and relocation, venting, well test/unload and emergency disconnect sequence.

Drilling, subsea installation and commissioning activities

Woodside plans to drill one new well in the Xena field (Xena-03) and to install an associated wellhead and Xmas tree. Xena-03 will be connected to the existing Pyxis Hub subsea infrastructure. The well will be located at approximately 177 m water depth. Other activities include:

- Pre-commissioning and cold-commissioning (non-hydrocarbon) activities associated with subsea infrastructure including leak testing of the flexibles, subsea control systems verification and function-testing of valves to verify the production system and electric and hydraulic flying leads are ready for entry into the commissioning phase; and
- Well start-up and commissioning (initial start-up) of the Xena 03 well involving slow and gradual build up to maximum well gas production rates and then well performance testing such as Multi-Rate Testing, simulated emergency shut down (ESD) of the well followed by Pressure Build-Up Testing.

Drilling activities are currently anticipated to commence around Q2 2025, subsea installation and commissioning activities are currently anticipated around Q3 2025.

The timing and duration of the proposed activities is subject to approvals, project schedule requirements, vessel availability, weather or unforeseen circumstances.

Project vessels

Activities will be completed using a range of vessels. Operations will use support vessels to undertake inspection, monitor, maintenance and repair of subsea infrastructure. The vessel size and type will be dependent on the work scope.

The proposed Xena-03 drilling and tie-back will be performed using a moored, dynamically positioned (DP) or hybrid (DP/moored) mobile offshore drilling unit (MODU). During the subsea installation campaign, a construction/primary installation vessel will perform installation activities.

The project will be supported by other vessels, such as general support vessels, cargo vessels, anchor handling vessels and multiservice construction vessels during drilling activities. Support vessels will be used to transport equipment and materials between the MODU/installation vessel and port.

Drilling operations for the production well are currently expected to take around 60 days to complete.

Installation of subsea infrastructure and pre-commissioning is anticipated to commence when the relevant new production well has been drilled and is expected to have a cumulative duration of about three weeks. Drilling and installation of subsea infrastructure may be performed over multiple campaigns.

The support and installation vessels will operate on DP and will not anchor/moor on the seabed. It is anticipated vessels will operate 24 hours per day for the duration of drilling and tie-back activities.

Communications with mariners

The location of Pluto is marked on nautical charts and the platform is surrounded by a 500 m radius petroleum safety zone (PSZ). A 4 km radius Operational Area will be applied around the Xena-03 drill centre.

A temporary 500 m safety exclusion zone will apply around the MODU and subsea installation vessel to manage vessel movements.

Commercial fishers and other marine users are permitted to use the Operational Area but should take care when entering and remain clear of the safety exclusion zones. The wells will continue to be marked on navigational charts.

Assessment

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant persons, considering timing, duration, location and potential impacts arising from the planned activities. Mitigation and management measures will be implemented and are summarised in **Table 3.** Further details will be provided in the EP.

In preparing the EP, Woodside's intent is to minimise environmental and social impacts associated with the proposed activities. Woodside is seeking any interest or comments you may have to inform Woodside's decision making.

Joint Venture

Woodside Burrup Ltd is the Titleholder for this activity on behalf of the Pluto LNG joint venture partners, Tokyo Gas Pluto Pty Ltd and Kansai Electric Power Australia Pty Ltd.

We welcome your feedback by 29 March 2024.

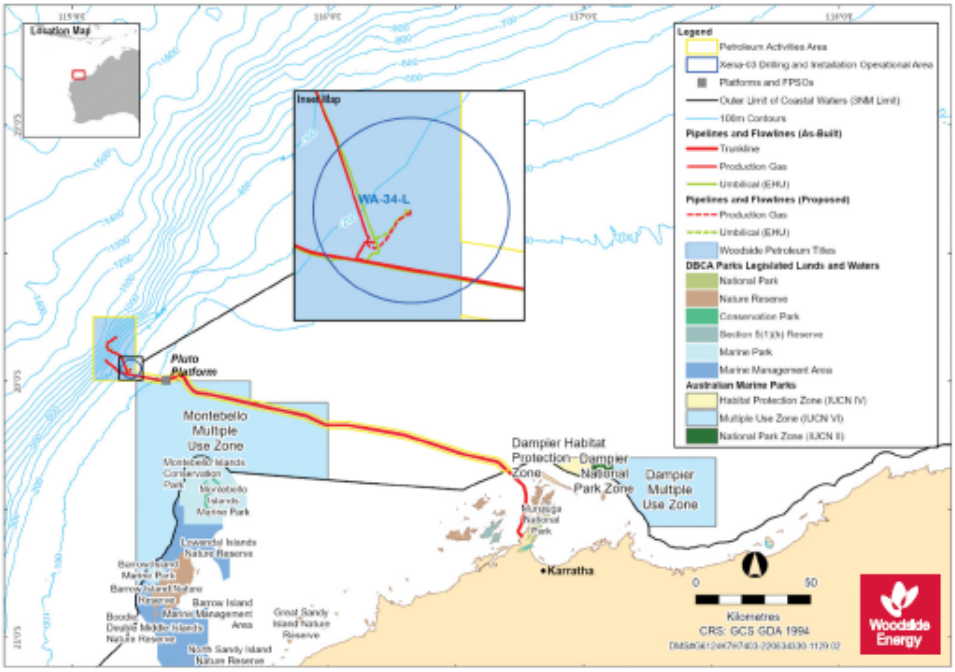


Figure 1. Pluto Facility and Operational Areas.

Table 1. Activity summary

Pluto Operations Facility Environment Plan	
Facility type	• Fixed platform, processing equipment, pipelines
Production License Areas	• WA-1-IL, WA-34-L
Pipeline Licenses	• WA-16-PL, WA-17-PL
Approximate water depth	• ~80–960 m
Activities Summary	Routine Operations: • routine production • routine IMMR of the platform and associated subsea infrastructure including pigging of the flowlines and pipeline • well unloading and clean-up • installation and use of the water handling unit • non-routine and unplanned activities and incidents associated with the above • supporting activities associated with the activities (e.g. vessel operations, helicopter transfers, etc.) Xena-03 Drilling and Tie-back: • drill one new well (Xena-03) in the Xena field • tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform • pre-commissioning and commissioning activities
Infrastructure	• Platform, wells, Xmas trees, umbilicals, spools, jumpers, manifolds, flowlines, riser, chemical supply lines and the export pipeline (see **Table 2** for their approximate location)
Vessels	• MODU type could be Moored, Dynamically Positioned (DP) or hybrid moored/DP (required for Xena-03 drilling activity) • Primary Installation Vessel (required for Xena-03 subsea installation activity) • Vessel for routine IMMR and Xmas tree installation, isolation testing or contingent activities • Support vessels including heavy lift vessel(s) (HLVs), multi-service construction vessel(s), anchor handling vessel(s) and other general supply/support vessels appropriate to the nature of petroleum activities

Pluto Operations Facility Environment Plan	
Key dates	Routine Operations: • Ongoing
Approximate duration of Xena-03 Drilling and Tie-back	• Drilling: Activities are currently anticipated to take around 60 days to complete • Subsea installation: Activities are currently anticipated to have a cumulative duration of around three weeks (including mobilisation, demobilisation and contingency) • Timing and duration of activities is subject to change due to project schedule requirements, MODU/vessel availability, unforeseen circumstances and weather constraints
Operational Areas and Exclusion zones	The Operational Area for Routine Operations comprises: • The platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform • The export pipeline (PITL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m corridor either side of the pipeline • Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure Xena-03 Drilling and Tie-Back: • The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities • Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements • An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities
Distance to nearest town	• ~ 160 km north-west of Dampier
Distance to nearest marine park/ nature reserve	• The Operational Area overlaps the Montebello Australian Marine Park Multiple Use Zone (IUCN category VI)

Table 2. Approximate locations of key infrastructure related to the Pluto Facility Operations Petroleum Activities Program

Structure	Approximate Water Depth (m)	Latitude	Longitude	Petroleum Titles
Existing infrastructure				
Platform	-	19°54'49.23614"	115°7'54.46587"	WA-1-IL
Existing subsea infrastructure				
PYA manifold	-844 m	19°52'46.2896"S	115°09'00.0179"E	WA-34-L
XNA manifold	-182 m	19°57'52.6141"S	115°12'54.6816"E	
Pluto A and B flowlines	-	-	-	WA-16-PL
Export pipeline (Commonwealth)	-	-	-	WA-17-PL
Existing wells				
PLA01ST1 well	-830 m	19°54'48.23107"	115°7'54.75273"	WA-34-L
PLA02 well	-830 m	19°54'48.56705"	115°7'55.78025"	
PLA03ST1 well	-830 m	19°54'48.70289"	115°7'56.32877"	
PLA04 well	-830 m	19°54'48.69494"	115°7'55.57246"	
PLA05 well	-830 m	19°54'49.23614"	115°7'54.46587"	
PLA06 well	-830 m	19°54'48.25708"	115°7'54.13355"	
PLA07 well	-830 m	19°54'48.96"	115°07'55.2"	
PLA08 well	-820 m	19°54'42.003"	115°08'02.424"	
PYA01 well	-985 m	19°49'40.331"	115°10'34.942"	
PL-PYA02 well	-862 m	19°52'34.882"	115°09'00.645"	
XNA01 well	-180 m	19°58'13.56660"	115°12'46.17465"	
XNA02 well	-180 m	19°57'49.130"	115°13'02.764"	
Proposed well and infrastructure				
XNA03	-177 m	19°56'28.914"S	115°13'44.302"E	WA-34-L
Xena tie-in	-	19° 58' 15.25052"	115°12 '45.46775"	

Environment That May Be Affected (EMBA)

The environment that may be affected (EMBA) is the largest spatial extent where Pluto Facility Operations (including Xena-03 drilling and tie-back activities) could potentially have an environmental consequence (direct or indirect). The broadest extent of the EMBA takes into consideration planned and unplanned activities. For this EP, the EMBA has been developed by combining numerous modelling outputs based on highly unlikely releases of hydrocarbons to the environment. For this EP, the modelling scenarios that inform the EMBA are a loss of well integrity, loss of pipeline integrity or a vessel collision. The EMBA is depicted in **Figure 2**.

The EMBA does not represent the extent of the predicted impact of the highly unlikely unplanned release of hydrocarbons. Rather, the EMBA represents the merged area of many possible paths that a highly unlikely hydrocarbon release could travel, depending on the weather and ocean conditions at the time of the release. This means that in the highly unlikely event that a hydrocarbon release does occur, the whole EMBA will not be affected. The specific and minimal part of the EMBA that is affected will only be known at the time of the release.

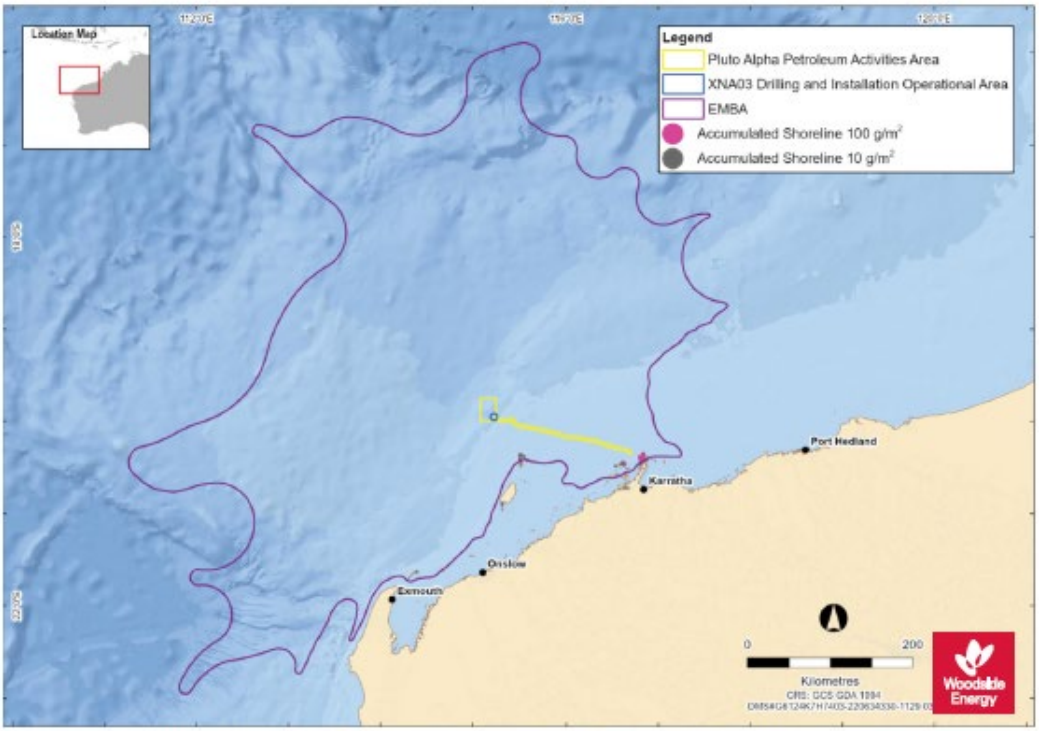


Figure 2: Environment that May Be Affected by the Pluto Facility Operations Petroleum Activities Program including Xena-03 drilling and tie-back

Mitigation and Management Measures

Woodside has undertaken an assessment to identify potential impacts and risks to the environment arising from the proposed activities considering timing, duration, location. Mitigation and management measures for proposed activities are outlined in **Table 3**. Further details will be provided in the EP.

Table 3. Summary of key risks and/or impacts and management measures associated with Pluto Facility Operations, including Xena-03 drilling and tie-back.

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Planned Activities (Routine and Non-routine)			

Physical Presence: Interaction with Other Marine Users	**Operations**
	Presence of the Pluto facility, subsea infrastructure and routine IMMR activities excluding and/or displacing other users from the Petroleum Safety Zone (PSZ) and Operational Area respectively.
	
	Drilling and Tie-back Activities
	Physical presence of anchor system, mobile offshore drilling unit (MODU), support vessels, anchor handling vessels, installation vessels, and associated safety exclusion zones.
		Operations
		Potential isolated social impact resulting from interaction with other sea users such as:
		• Commercial fisheries
		• Tourism and recreation
		• Commercial vessels/ shipping
		
		Drilling and Tie-back Activities
		Temporary displacement of commercial fishing activities.
			• Implement a 500 m PSZ around the platform.
			• Establish a 500 m safety exclusion zone around MODU and the installation vessel which is communicated to marine users
			• Notifying the Australian Hydrographic Office (AHO) of location of permanent new infrastructure to enable update of maritime charts
			• Continued consultation relating to the Petroleum Activities Program
			• Implement Pluto's collision prevention system to alert marine vessels of the facility location which reduces the likelihood of adverse interaction with other marine users
			• Other controls include:
			  • Activity support vessel on standby as required (during drilling)
			  • Notice to Mariners
			  • Notify Australian Maritime Safety Authority (AMSA)
			  • Activity support vessel surveillance

Physical Presence: Disturbance to Seabed	**Operations** Presence of Pluto facility and subsea infrastructure modifying marine habitats. Subsea operations, IMMR activities resulting in disturbance to seabed. **Drilling and Tie-back Activities** Disturbance to seabed during drilling operations. Disturbance to seabed during subsea installation.	**Operations** Localised modification of seabed habitat (formation of artificial reef) within Operational Area. Potential minor, localised modification of seabed habitat within the Operational Areas. **Drilling and Tie-back Activities** Loss or damage to benthic habitats and communities.	• Monitoring and maintenance of subsea infrastructure to manage scour and flowline movement within integrity envelope • Monitoring and maintenance of redundant infrastructure in accordance with the IMMR process • Vessels used for IMMR will not anchor under routine operations • Reasonable attempt(s) at removal of wellhead will be undertaken in the event of a re-spud • Positioning technology used to place seabed infrastructure within the design footprint to reduce seabed disturbance • Project-specific Basis of Well Design, which includes an assessment of seabed sensitivity • Wet parked items will be tracked and removed from the seabed • Pre-lay survey undertaken prior to installation of flowlines
Routine Acoustic Emissions: Generation of Noise during Routine Operations	Noise generated from operational activities from: • facility and associated infrastructure • vessels • helicopters • IMMR activities • Positioning equipment	Localised behavioural impacts to marine fauna around vessels and Pluto platform.	• Comply with regulatory requirements for interactions with marine fauna to prevent adverse interactions

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Acoustic Emissions: Generation of Noise during Tie-back Activities	Noise during Tie-back Activities generated from: • drilling, (hybrid MODU and DP) • vessels and helicopters • positioning equipment	Potential impacts to marine mammals, reptiles and fish, varying from behavioural responses to physiological impact (TTS).	• Comply with regulatory requirements for interactions with marine fauna to prevent adverse interactions • Implement adaptive management procedures as required

Routine and Non-Routine Discharges: Discharge of Hydrocarbons and Chemicals	**Operations**
	Discharge of subsea control fluids.
	Potential non-routine hydraulic fluid discharge.
	Discharge of hydrocarbons remaining in subsea pipelines/ flowlines and equipment as a result of subsea intervention works.
	Discharge of chemicals remaining in subsea infrastructure and equipment or the use of chemicals for subsea IMMR activities.
	Discharge of minor fugitive hydrocarbon from subsea equipment.
	Drilling and Tie-back Activities
	Discharge of flexible jumper and flying leads precommissioning fluids to the marine environment.
	Discharge of minor fugitive hydrocarbon from subsea equipment.
		Operations
		Potential slight short-term, localised decrease in water quality at release location during IMMR activities.
		Drilling and Tie-back Activities
		Potential short-term impacts on marine biota.
		Potential slight short-term, localised decrease in water quality at release location during installation activities.
			• Marine discharges managed according to regulatory requirements
			• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process
			• Flushing and isolation of subsea infrastructure where practicable during IMMR disconnection activities to reduce releases to the environment
			• Monitoring subsea control fluid use, investigating material discrepancies to identify potential integrity failures
			• Other controls include:
			  • Chemical Selection and Assessment
			  • Development and application of robust procedures

Routine and Non-Routine Discharges: Produced Water (PW)	Discharge of PW during routine and non-routine operations.	Potential minor, short term impact to water quality, marine sediments and marine biota.	• Marine discharges managed according to regulatory requirements • Online monitoring and procedural controls in place for PW discharge • Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process. Woodside internal guidance and procedures are adhered to • Implement adaptive monitoring and management
Routine and Non-Routine Marine Wastewater Discharges: Discharge of Sewage, Putrescible Waste, Grey Water, Bilge Water, Drain Water, Cooling Water and Brine	**Operations** Discharge of sewage, grey water and putrescible waste from the platform and support vessels to the marine environment. Discharge of deck, bilge and drain water from the platform and support vessels to the marine environment. Discharge brine and cooling water from platform and support vessels to the marine environment. **Drilling and Tie-back Activities** Routine offshore discharge from MODU and vessels of sewage, grey water, waste, bilge water and deck drainage.	**Operations** Potential slight, localised increase in water temperature, salinity and short-term water quality changes around discharge location. **Drilling and Tie-back Activities** Potential slight, localised increase in water temperature, salinity and short-term water quality changes around discharge location.	• Marine discharges managed according to regulatory requirements • Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process • Where there is the potential for loss of primary containment of oil and chemicals on the platform, MODU or vessels, bunding or closed drainage systems are in place to contain spills

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Routine and Non-routine Atmospheric Emissions	**Operations** Operational fuel combustion, flaring and fugitive emissions. Operational emissions associated with energy generation, onshore processing of Pluto gas, third party transportation, regassification and combustion by end users. **Drilling and Tie-back Activities** Contingent venting of gas during drilling (e.g. well kick). Vessel and helicopter emissions.	Potential slight short-term, localised air quality changes, limited to the airshed local to the facility.	• Comply with legislative and regulatory requirements for marine air pollution and emissions reporting • Robust well control procedures to minimise risk of well kick during drilling • Maintain flare to maximise efficiency of combustion
Routine Light Emissions: Light Emissions from the Platform and Project Vessels	**Operations** Light emissions from facility, MODU and support vessels. Light emissions from facility during flaring. **Drilling and Tie-back Activities** Light emissions during drilling including flaring, from support vessels, primary installation vessel as well as subsea vehicles.	Negligible, localised potential for behavioural disturbance of species near Pluto platform and vessels including fish, marine reptiles and seabirds.	• Lighting limited to the minimum required for navigational and safety requirements, except for emergency events • Well unloading acceptance criteria that define the well objectives will be established, minimising light from flaring • Implementation of a Seabird Management Plan

Routine and Non-Routine Discharges: Drill Cuttings, Drilling Fluids and Well Removal Fluids during drilling and tie-back activities	Routine discharge of water-based muds (WBM) drill cuttings to the seabed and the marine environment.
	Non-routine discharge of treated non-water-based muds (NWBM) drill cuttings to the marine environment.
	Non-routine discharge of wash water from mud pits and vessel tank wash fluids during drilling and tie-back.
	Routine discharge of well clean-out fluids during drilling and tie-back.
	Non-routine discharge of well annular fluids during drilling and tie-back.
	Non-routine discharge of WBM and cement cuttings to the marine environment during drilling out of a cement plug.
	Non-routine discharge of grit and flocculant during removal of well infrastructure.
		Potential impacts to marine biota, as well as localised reduction in water quality with potential effects on both water quality and benthic communities.	• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process
			• NWBM base oils selected based on expected toxicity
			• NWBM will be used where written justification process has been followed and bulk NWBM will be retained for disposal onshore or maintained on rig for re-use
			• Fluids contaminated with hydrocarbons will be treated to meet specified discharge limits prior to discharge or contained. If discharge specifications are not met the fluid will be returned to shore
			• Drill cuttings returned to the MODU will be discharged below the water line to reduce carriage and dispersion to other areas
			• Other controls include:
			  ◦ Restrict overboard discharge of NWBM
			  ◦ Measure oil content in displacement, brine, workover or intervention fluids, pit and tank wash
			  ◦ Permit to Work system
			  ◦ Solid Control Equipment
			  ◦ Woodside Engineering Standard for Rig Equipment

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Routine and Non-Routine Discharges: Cement, Cementing Fluids, Subsea Well Fluids, Unused Bulk Product and Subsea Chemicals during drilling and tie-back activities	Routine discharge of cement and cementing fluids, to the seabed and the marine environment during drilling and tie-back. Routine discharge of subsea well fluids (inc. blow-out preventer (BOP)) and well construction activity control fluids) during drilling and tie-back. Non-routine discharge of unused bulk products during drilling and tie-back.	Potential impacts to marine biota, as well as localised reduction in water quality with potential effects on both water quality and benthic communities.	• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process • Fluids contaminated with hydrocarbons will be treated to meet specified discharge limits prior to discharge or contained. If discharge specifications are not met, fluids will be returned to shore • During well unloading and completion activities, if produced water is not flared, it will be processed through a water treatment package prior to discharge to the environment • Options for use of excess bulk cement, bentonite or barite will be managed and only discharged to the marine environment as a last option
Unplanned Events (Accidents / Incidents) – Routine Operations (i.e. no drilling or subsea installation activities)			
Unplanned Hydrocarbon Release: Loss of Well Containment	Release of hydrocarbons resulting from loss of subsea well containment.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of well control** • Well operated in compliance with the accepted well operation management plan (WOMP) including implementation of barriers to prevent a loss of well control • Checks completed during well operations to establish a minimum acceptable standard of well integrity **Spill response arrangements** • Arrangements supporting the Oil Pollution Emergency Plan (OPEP) will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP
Unplanned Hydrocarbon Release: Pipeline and Riser Loss of Containment	Release of hydrocarbons resulting from loss of export pipeline containment. Release of hydrocarbons resulting from loss of containment of subsea flowlines and infrastructure.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of pipeline and riser containment** • The pipeline, flowline and riser design include a range of measures that specifically aid in minimising the risk of external damage • Maintain well integrity to contain reservoir fluids within the well envelope to avoid an incident • Maintain emergency shutdown (ESD) system and critical external and internal communication systems to facilitate prevention and response to accidents and emergencies **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP
Unplanned Hydrocarbon Release: Loss of Structural Integrity	Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere. Hydrocarbon release from topsides equipment to the marine environment and atmosphere.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of structural integrity** • Maintain structural integrity to ensure availability of critical systems during a major accident or environment event and prevent structural failures from contributing to escalation • Maintain control of ignition sources and passive fire protection to prevent loss of structural integrity • Maintain topsides hydrocarbon-containing infrastructure integrity **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure
Unplanned Hydrocarbon Release: Loss of Structural Integrity	A loss of marine vessel separation between a vessel and the platform may result in a loss of hydrocarbon containment from the Pluto facility and/or the release of fuel from the vessel.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of marine vessel separation** • Maintaining collision warning systems and navigational aids to alert facility of a potential collision with a vessel, and to alert vessels so that they may avoid collisions with the facility **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP
Unplanned Hydrocarbon Release: Topsides Loss of Containment	Hydrocarbon release from topsides process equipment o the marine environment and atmosphere.	Potential moderate short-term impacts to the marine environment: • Disruption to marine fauna, including protected species and/or impacts to water quality	**Preventing topsides loss of containment** • Wells drilled in compliance with the accepted WOMP including implementation of barriers to prevent a loss of well control • Checks completed during well operations to establish a minimum acceptable standard of well integrity • An approved Source Control Emergency Response Plan will be prepared prior to drilling each well including feasibility and specific considerations for relief well • Subsea BOP specification, installation and testing compliant with internal Woodside Standards and international requirements **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP are raised for unplanned releases within event reporting system
Unplanned Hydrocarbon Release: Loss of Control of Suspended Load from Platform	Surface or subsea release from flowline, pipeline and riser to the marine environment and atmosphere. Hydrocarbon release from topsides equipment to the marine environment and atmosphere.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of control of suspended load** • Maintain platform lifting equipment to prevent failure or dropped/swinging loads that could result in an incident
Unplanned Events (Accidents / Incidents) – Drilling and subsea installation			
Unplanned Hydrocarbon Release: Loss of Well Integrity During Drilling Operations	Loss of hydrocarbons to marine environment due to loss of well containment.	Potential significant impacts to the marine environment: • Long-term impacts to sensitive nearshore areas of offshore islands and coastal shorelines • Disruption to marine fauna, including protected species • Potential medium-term interference with or displacement of other sea users	**Preventing loss of well control** • Wells drilled in compliance with the accepted WOMP including implementation of barriers to prevent a loss of well control • An approved Source Control Emergency Response Plan will be prepared prior to drilling each well including feasibility and specific considerations for relief well • Subsea BOP specification, installation and testing compliant with internal Woodside Standards and international requirements **Spill response arrangements** • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure

Unplanned Hydrocarbon Release: Vessel Collision	Loss of hydrocarbons to marine environment due to a vessel collision (e.g. project vessels or other marine users).	Potential minor, short-term impact on marine species, habitats and protected areas.	**Preventing vessel collision**
			• Comply with regulatory requirements for the prevention of vessel collisions and safety and emergency arrangements
			• Establish temporary safety exclusion zones around vessels which are communicated to marine users to reduce the likelihood of collision
			• Other controls include:
			  • Activity support vessel on standby as required (during drilling)
			  • Notice to Mariners
			  • Notify Australian Maritime Safety Authority (AMSA)
			Spill response arrangements
			• Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned
			• Emergency response activities would be implemented in line with the OPEP

Unplanned Discharges: Release of Hydrocarbons During Bunkering, Transfer, Storage and Use	Accidental discharge of marine diesel to the marine environment during bunkering, transfer, storage or use on the facility, MODU or vessels.	Potential slight, short-term local impacts to marine species and habitats.	**Preventing unplanned hydrocarbon release due to bunkering** • Comply with regulatory requirements for the prevention of marine pollution • Liquid chemical and fuel storage areas bunded or secondarily contained when they are not being handled or temporarily moved • Appropriate bunkering equipment kept and maintained • Compliance with Contractor procedures for the management of bunkering/helicopter operations to reduce the likelihood and potential severity of a spill **Spill response arrangements** • Maintain and locate spill kits in proximity to hydrocarbon storage and deck areas for use to contain and recover deck spills • Arrangements supporting the OPEP will be tested to ensure the OPEP can be implemented as planned • Emergency response activities would be implemented in line with the OPEP • Incident reports are raised for unplanned releases within event reporting system
Unplanned Discharges: Deck and Subsea Spills	Accidental discharge of hydrocarbons/ chemicals from MODU, installation vessel and project vessels deck activities and equipment, from subsea ROV hydraulic leaks. Unplanned release of chemicals or hydraulic fluid due to failure of subsea equipment.	No lasting effect, localised impact to the marine environment.	• Comply with regulatory requirements for the prevention of marine pollution • Liquid chemical and fuel storage areas are bunded or secondarily contained when they are not being handled/moved temporarily • Spill kits positioned in high-risk locations around vessels and the MODU (near potential spill points such as transfer stations) • Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process • Installation vessels have self-containing hydraulic oil drip tray management system • Woodside Engineering Standard for Rig Equipment (incl third party equipment such as ROVs) **Spill response arrangements** • First strike plan • Shipboard Oil Pollution Emergency Plan (SOPEP)

Potential Impact/ Risk	Description of Source of Potential Impact/Risk	Description of Potential Impacts/Risks	Preliminary Draft Mitigation and/or Management Measure

Unplanned Discharge: Drilling/ Project Fluids	Accidental discharge of project fluids (WBM/NWBM/ base oil) and cement to marine environment due to failure of slip joint packers, bulk transfer hose/fitting, emergency disconnect system or from drilling and installation operations.	Potential slight, short-term local impacts to marine species and habitats.	• Chemicals selected with the lowest reasonably practicable environmental impacts and risks subject to technical constraints and approved through the Woodside chemical assessment process
			• Marine riser's telescopic joint to be comprised of a minimum of two packers (one hydraulic and one pneumatic) and pressure tested
			• No overboard disposal of bulk NWBM
			• Compliance with Contractor procedures for the transfer and management of drilling fluids to reduce the likelihood and severity of a spill
			• Other controls include:
			  • Oil % content in displacement, brine, workover or intervention fluids, pit and tank wash
			  • PTW system
			  • Solid Control Equipment

Unplanned Discharges: Loss of Hazardous and Non-Hazardous Waste	Incorrect disposal or accidental discharge of non hazardous and hazardous waste to the marine environment.	No lasting effect, localised impact to the marine environment.	• Comply with regulatory requirements for the prevention of marine pollution and handling of hazardous wastes • Implement Waste Management Plan, which provides for safe handling and transportation, segregation and storage and appropriate classification of waste generated • Solid waste/equipment dropped to the marine environment will be recovered where safe and practicable to do so • Where retrieval is not reasonably practicable and/ or safe, material items (property) lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title • Incident reports are raised for unplanned releases within event reporting system
Physical Presence: Seabed disturbance from dropped objects or loss of station keeping leading to anchor drag	Dropped objects resulting in the disturbance of benthic habitat. Loss of station keeping of the MODU leading to anchor drag and the disturbance of benthic habitat. Dropped objects over live infrastructure. Dropped objects during vessel transfers or installation activities.	Potential slight, short-term local impacts to marine species and habitats.	• MODU/installation vessel inductions include control measures for dropped object prevention • Equipment dropped to the marine environment will be recovered where safe and practicable to do so • Where retrieval is not reasonably practicable and/ or safe, material items (property) lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title • Implement project-specific mooring design, with sufficient capability, testing and inspection
Physical Presence: Interactions with Marine Fauna	Physical presence of project/ support vessels resulting in collision with marine fauna.	Potential injury or death of marine fauna (single animal), including protected species.	• Comply with regulatory requirements for interactions with marine fauna to reduce the likelihood of a collision occurring
Physical Presence: Introduction of Invasive Marine Species (IMS)	Invasive species in vessel ballast tanks or on vessels/ submersible equipment.	Potential introduction of IMS possibly resulting in an alteration of the localised environment and potential reduction in native species through predation, competition or interspecies breeding.	• Ballast water and biofouling will be managed according to regulatory requirements, including the Australian Ballast Water Management Requirements, and the Australian Biofouling Management Requirements, as applicable • Woodside's IMS risk assessment process will be applied to project vessels and immersible equipment entering the Operational Area

Feedback

Woodside consults relevant persons in the course of preparing Environment Plans to notify them of the activity and to obtain relevant feedback to inform its planning for proposed petroleum activities in the region.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before **29 March 2024** via:

E: Feedback@woodside.com.au

Toll free: 1800 442 977

You can subscribe on our website to receive Consultation Information Sheets for proposed activities:

http://www.woodside.com/what-we-do/consultation-activities

Please note that stakeholder feedback will be communicated to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) as required under legislation. Woodside will communicate material changes to the proposed activity to affected stakeholders as they arise.

Please note that your feedback and our response will be included in our Environment Plan for the proposed activity, which will be submitted to the NOPSEMA for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* (Cth) and to support other regulatory processes associated with the planned activities (which may or may not be confidential).

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

www.woodside.com

Woodside Energy

2. INITIAL CONSULTATION

2.1 Email sent to Australian Border Force (ABF), Australian Maritime Safety Authority (AMSA) Marine Pollution, Pilbara Ports Authority (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems

Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com.au or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.2 Email sent to Australian Communications and Media Authority (ACMA) (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. Also attached is a map of the submarine communications cables in the operational area. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	Pluto Facility Operations Environment Plan

Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback

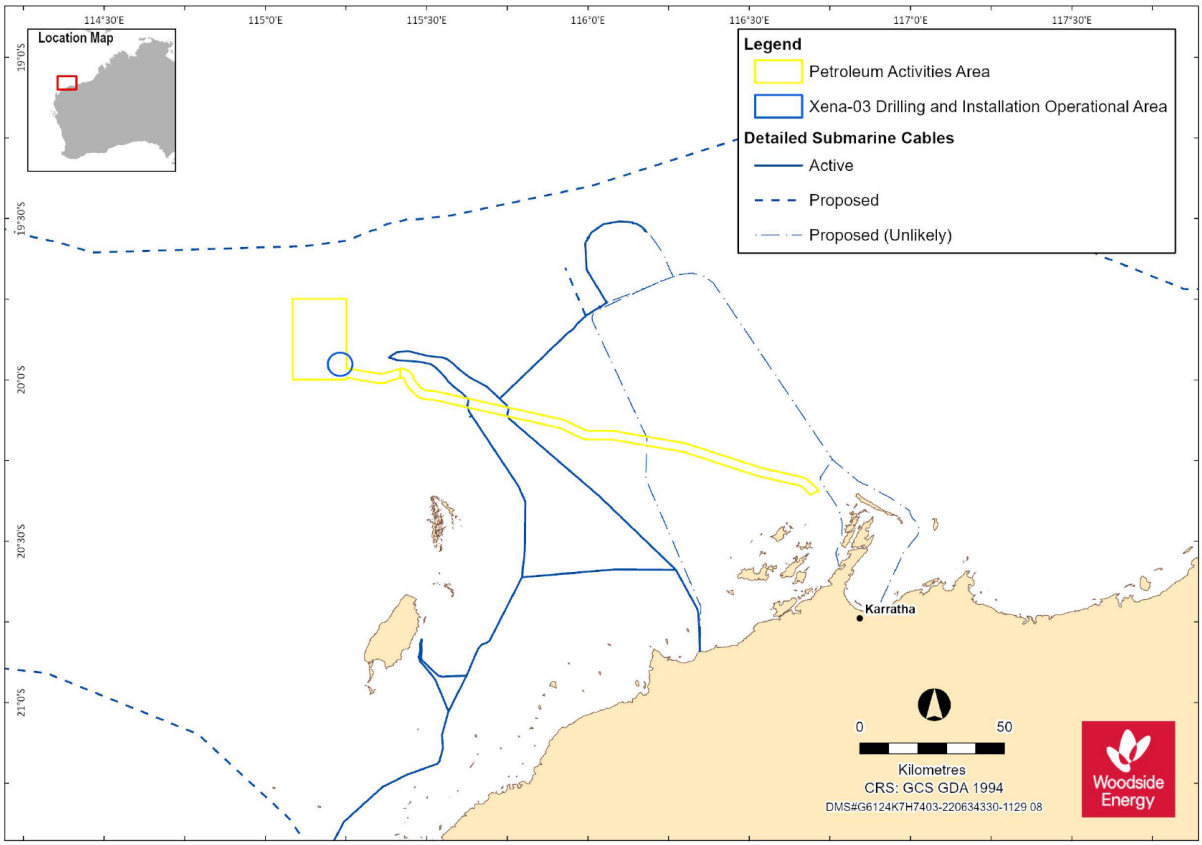
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com.au or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.2.1 Submarine Communications Cables



2.3 Email sent to Australian Fisheries Management Authority (AFMA), Department of Primary Industries and Regional Development (DPIRD) (26 February 2024)

Woodside is planning to submit a five-year revision of the Operations Environment Plan (EP) for the Pluto Facility.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported onshore via a 180 km long export pipeline. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Operational Areas and Exclusion Zones

Infrastructure is located within the Operational Areas described below. This area is where Woodside vessels can be expected to be operating to undertake routine operations:

- The riser platform and the area within a 500 m radius operational area around the platform
- The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m operational area corridor either side of the pipeline
- Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m operational area around the subsea infrastructure.

The Xena-03 Drilling and Tie-Back activity will take place within an Operational Area that includes the Xena-03 well location and the area within a 4000 m radius.

Exclusion zones, which are established for navigational safety and fishing vessels are not allowed to enter, will include:

- The 500 m-radius Petroleum Safety Zone (PSZ) around the platform, and
- A temporary 500 m-radius safety exclusion zone around vessels conducting drilling and installation activities.

An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities.

Environment that May be Affected (EMBA)

Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A Consultation Information Sheet is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations Environment Plan

Environment Plan	Pluto Facility Operations Environment Plan	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Relevant Fisheries	**Commonwealth fisheries** **Operational Areas:** North-West Slope Trawl Fishery. **EMBA:** North-West Slope Trawl Fishery, Western Deepwater Trawl Fishery.

Feedback
Should you require notification prior to, and on completion of, the proposed activities, or have feedback specific to the proposed activities described, we would welcome your feedback at Feedback@woodside.com.au or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential).

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.4 Email sent to Australian Hydrographic Office (AHO), Australian Maritime Safety Authority (AMSA) Marine Safety (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:
- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. Also attached are a map of the shipping lanes and GIS shape files. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
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Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

	jumpers) and an area within 1500 m around the subsea infrastructure.	
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

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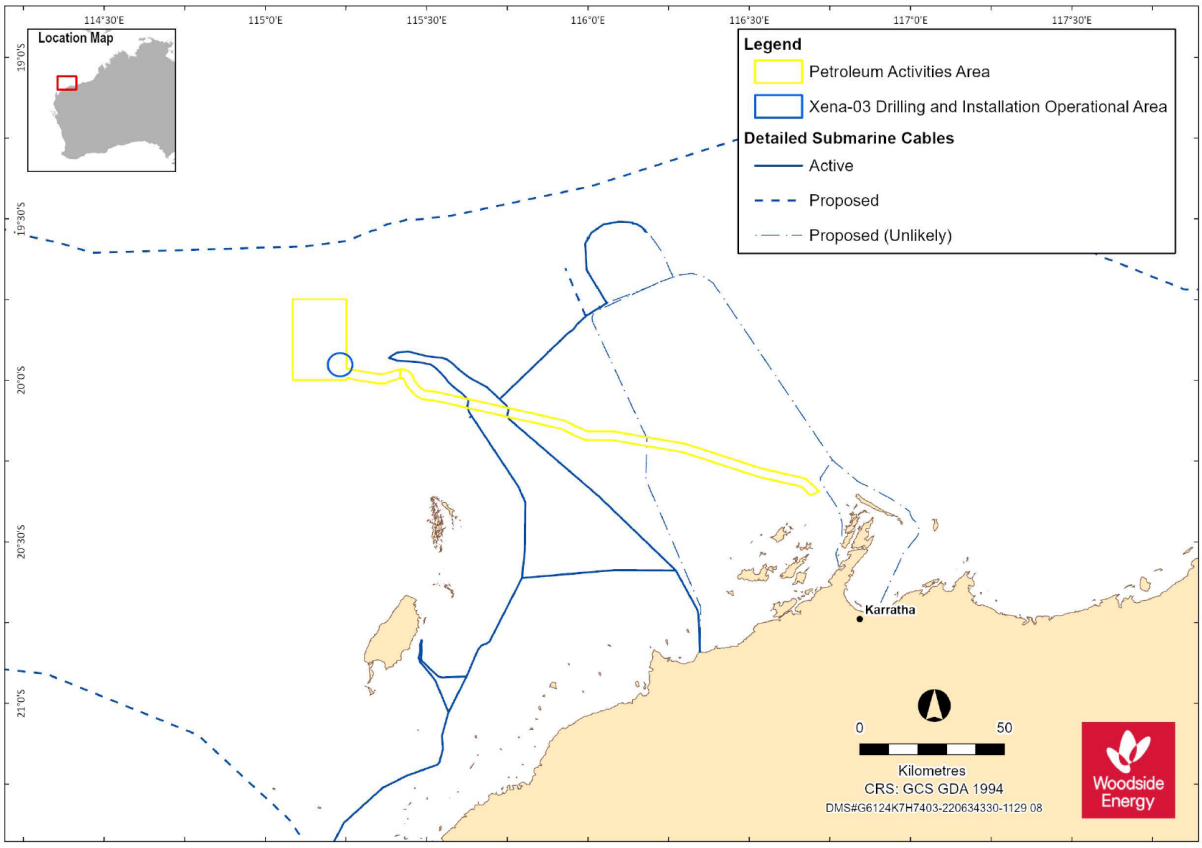
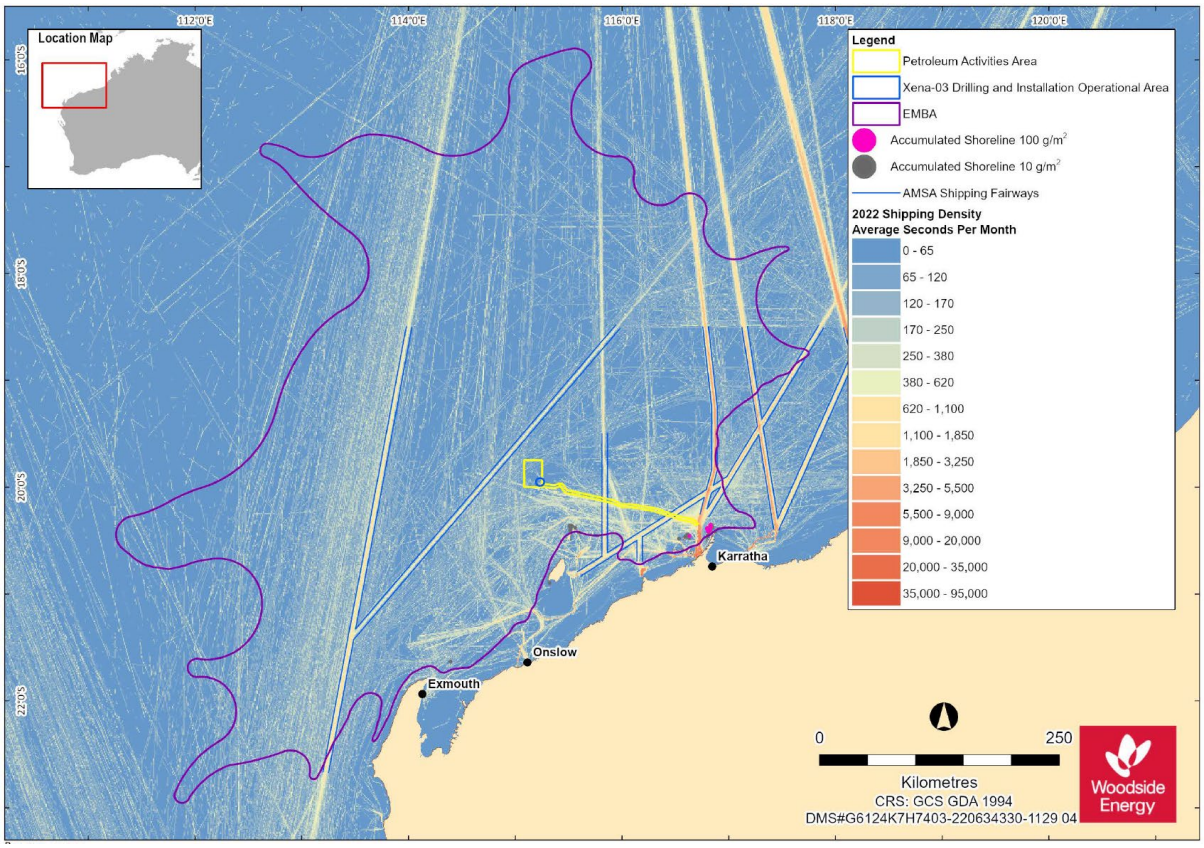
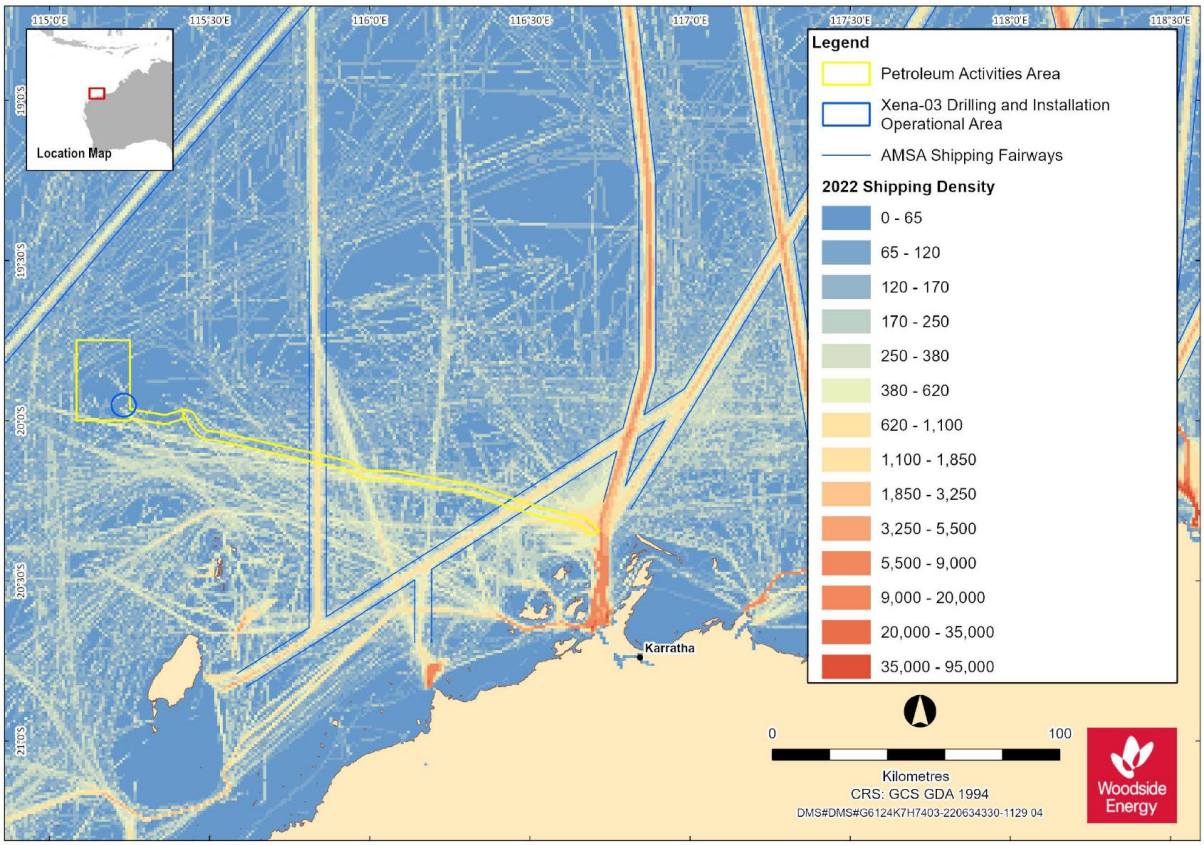
2.4.1 Submarine Communications Cables



2.4.2 Shipping Lanes





2.5 Email sent to Department of Agriculture, Fisheries and Forestry (DAFF) Fisheries and Biosecurity (26 February 2024)

Woodside is planning to submit a five-year revision of the Operations Environment Plan (EP) for the Pluto Facility.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported onshore via a 180 km long export pipeline. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Operational Areas and Exclusion Zones

Infrastructure is located within the Operational Area described below. This area is where Woodside vessels can be expected to be operating to undertake routine operations:

- The riser platform and the area within a 500 m radius around the platform
- The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m corridor either side of the pipeline
- Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.

The Xena-03 Drilling and Tie-Back activity will take place within an Operational Area that includes the Xena-03 well location and the area within a 4000 m radius.

Exclusion zones, which are established for navigational safety and fishing vessels are not allowed to enter, will include:

- The 500 m-radius Petroleum Safety Zone (PSZ) around the platform, and
- A temporary 500 m-radius safety exclusion zone around vessels conducting drilling and installation activities.

An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities.

Environment that May be Affected (EMBA)

Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A Consultation Information Sheet is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations Environment Plan

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.
Relevant Fisheries	**Commonwealth fisheries** **Operational Areas:** North-West Slope Trawl Fishery. **EMBA:** North-West Slope Trawl Fishery, Western Deepwater Trawl Fishery.	

Biosecurity

With respect to biosecurity matters, please note the following information below:

Environment description:	
The operational areas for Pluto routine operations and Xena-03 drilling and tie-back are located in water depths of approximately 80-960 m within the North-West Marine Region (NWMR). Within the NWMR, the Pluto export pipeline lies within the North West Shelf Province, while the platform and subsea infrastructure lie across the boundary of the North West Shelf Province and the deeper waters of the Northwest Province.	
Potential biosecurity risk	***Biosecurity risk mitigation and/or management***
Accidental introduction and establishment of non-indigenous species	All vessels will manage their ballast water in compliance with Australian Ballast Water Management Requirements under the *Biosecurity Act 2015*) to prevent the introduction of IMS. Internationally sourced project vessels will manage their biosecurity risk associated with biofouling in compliance with Australian Biofouling Management Requirements. Woodside's IMS risk assessment process will be applied to MODU, project vessels and relevant immersible equipment undertaking the Petroleum Activities Program. 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.

Woodside recognises the requirement to manage biosecurity risk to domestic conveyances, the requirements under the Biosecurity Control Act 2015, and the mechanism for exemption under the Biosecurity (Exposed Conveyances - Exceptions from Biosecurity Control) Determination 2016.

Woodside notes the specified timeframes for pre-arrival reporting using the Maritime and Aircraft Reporting System (MARS), and for submission of the supplied "Questionnaire for Biosecurity Exemptions for Biosecurity Control Determination".

Woodside works closely with our suppliers and contractors to address the risks and assure awareness of the obligations outlined above.

Feedback

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential).

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.6 Email sent to Department of Defence (DoD) (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)

- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. Also attached is a map of the defence zones. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025

Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

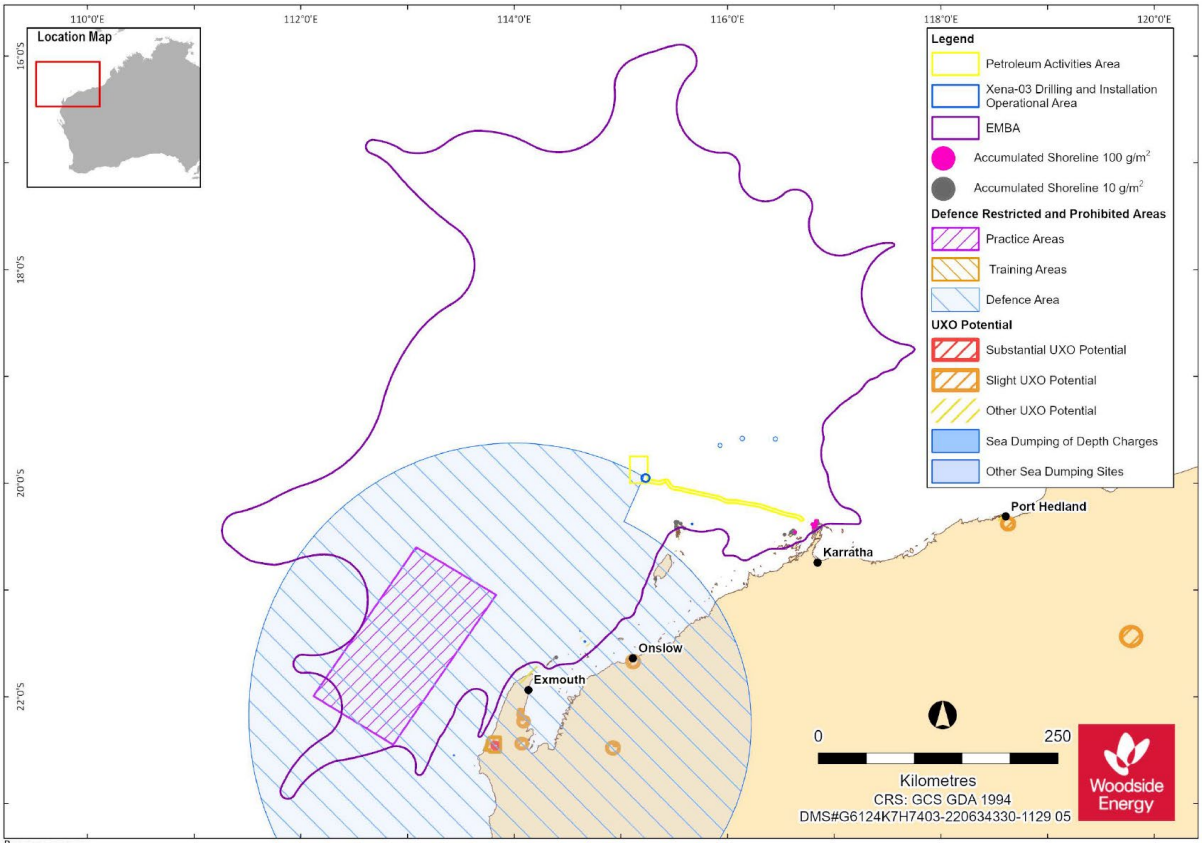
Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com.au or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.6.1 Defence Zones



2.7 Email sent to Department of Transport (DoT) (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)

Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could

potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

If there is a risk of a spill impacting State waters, Woodside will further consult the Department of Transport as outlined in the Department of Transport Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (July 2020).

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

	jumpers) and an area within 1500 m around the subsea infrastructure.	
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback:
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

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2.8 Email sent to Department of Planning, Lands and Heritage (DPLH) (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Given the proximity of the proposed activities with Marine Parks, Woodside is consulting with the Department of Biodiversity, Conservation and Attractions (DBCA) for this EP. Woodside is also consulting with the Western Australian Museum and provided relevant shipwreck information for this EP.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m

Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in l. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.8.1 Email sent to DPLH including State Shipwrecks (29 February 2024)

Dear Department of Planning, Lands and Heritage,

Further to the email sent to you on 26 February 2024 (below), please find attached the list of State Shipwrecks.

Pluto Facility Operations EP State Historical Shipwrecks OVERLAP					
Vessel Name	Comments	When Lost	Where Lost	Latitude	Longitude
Trial	Ship	1622/05/24	Trial Rocks	20°17.159	115°22.514
McCormack	Barge	1989/10/00	N.E. tip of Eaglehawk Island West of Dampier, Dampier Archipelago	20°08.200	115°57.200
Plym HMS	Warship	10/2/1948	Trimouille Island Island	20°24.208	115°33.950
Dampier		unknown	Enderby Island, Dampier Archipelago	20°31.4	116°14.2
Haw Kiet		6/25/1905		18°27.49	117°15.5
Tropic Queen		4/9/1975		20°26	115°30.05
Zelma		7/20/1990	Dampier Archipelago	20°22.63	116°52.48
Veronica	Lugger	1928/07	Sunday Island, Exmouth Gulf	21°41	114°23
Lady Ann	Ship (non-sail)	9/18/1982	24 miles north of NW Cape	21°24	114°12
McDermott Derrick Barge No 20	Barge	10/20/1989	N.E. tip of Eaglehawk Island, Dampier Archipelago	20°08.200	115°57.200

2.9 Email sent to Western Australian Museum (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

As per the Underwater Cultural Heritage Act 2018 (Cwth), Woodside will contact the Commonwealth regulator – the Department of Climate Change, Energy, the Environment and Water (DCCEEW) regarding this EP.

Woodside also refers to the Commonwealth Government's Underwater Cultural Heritage (UCH) Guidance document regarding assessments and the draft Guidelines for Working in Near and Offshore Environment to Protect Underwater Cultural Heritage.

Any additional identification for non-Aboriginal UCH within the project areas will be done during EP development if not previously completed within the project areas during ongoing operations.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. Also attached is a list of shipwrecks in State waters within the EMBA. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025

Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
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2.9.1 State Shipwrecks

Pluto Facility Operations EP State Historical Shipwrecks OVERLAP					
Vessel Name	Comments	When Lost	Where Lost	Latitude	Longitude
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Plym HMS	Warship	10/2/1948	Trimouille Island Island	20°24.208	115°33.950
Dampier		unknown	Enderby Island, Dampier Archipelago	20°31.4	116°14.2
Haw Kiet		6/25/1905		18°27.49	117°15.5
Tropic Queen		4/9/1975		20°26	115°30.05
Zelma		7/20/1990	Dampier Archipelago	20°22.63	116°52.48
Veronica	Lugger	1928/07	Sunday Island, Exmouth Gulf	21°41	114°23
Lady Ann	Ship (non-sail)	9/18/1982	24 miles north of NW Cape	21°24	114°12
McDermott Derrick Barge No 20	Barge	10/20/1989	N.E. tip of Eaglehawk Island, Dampier Archipelago	20°08.200	115°57.200

2.10 Email sent to Department of Climate Change, Energy, the Environment and Water (DCCEEW) (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
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In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. Also attached is a list of shipwrecks in Commonwealth waters within the EMBA. You can also subscribe to receive updates on our consultation activities by subscribing here.
Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in l. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.10.1 Commonwealth Shipwrecks

Pluto Facility Operations EP Australia National Shipwrecks OVERLAP					
Vessel Name	Vessel Type	Wreck Year	Where Lost	Latitude	Longitude
Vianen	Sailing vessel	1628	Barrow Island Area	-20	115.1666667
Wild Wave (China)	Sailing vessel	1873	Monte Bello Island	-20	115.1666667
Haw Kiet	Unknown	2003		-18.45816667	117.2583333
Marietta	Unknown	1905	Barrow Island	-20	115.1666667
Lady Ann	Sailing vessel	1982	24 miles north of NW Cape	-21.4	114.2
Beatrice	Sailing vessel	1899	Off North-West Cape	-21.61666667	113.9833333
Tanami	Sailing vessel		Trial Rocks	-20.28333	115.36666
Trial	Sailing vessel	1622	Trial Rocks	-20.28598333	115.3752333
Veronica	Sailing vessel	1928	Sunday Island, Exmouth Gulf	-21.68333333	114.3833333
Zelma	Unknown	1990	Dampier Archipelago	-20.37716667	116.8746667
Gem	Sailing vessel	1893	North West Cape	-21.61666667	113.9833333
Curlew	Sailing vessel	1911	At Onslow, Monte Bellos Group	-20	115.1666667
Dampier	Trawler		Enderby Island, Dampier Archipelago	-20.52333333	116.2366667
McCormack		1989	N.E. tip of Eaglehawk Island West of Dampier,	-20.13666667	115.9533333
McDermott Derrick Barge No 20	Barge	1989	N.E. tip of Eaglehawk Island, Dampier Archipelago	-20.13666667	115.9533333
Plym HMS	Frigate	1952		-20.40346667	115.5658333
Tropic Queen		1975		-20.43333333	115.5008333

2.11 Email sent to Director of National Parks (DNP) (26 February 2024)

Woodside is planning to submit a five-year revision of the Operations Environment Plan (EP) for the Pluto Facility.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported onshore via a 180 km long export pipeline. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Australian Marine Parks

We note Australian Government Guidance on consultation activities and confirm that:

- A small portion of the facility Operational Area overlaps the Montebello AMP, and
- The export pipeline Operational Area is 13 km east of the Dampier AMP.
- We have assessed potential impacts to AMPs in the development of the proposed EP revisions and believe that planned activities have no potential to impact the values of the Marine Parks.
- For this EP, the worst-case credible spill scenario is a hydrocarbon release from a loss of well control, or a vessel collision, releasing crude oil to the environment. Through review of hydrocarbon spill modelling, and with consideration of a 50 ppb dissolved and 100 ppb entrained hydrocarbon threshold, the following AMPs may be contacted in the event of a spill:
  - Montebello AMP
  - Dampier AMP
  - Argo-Rowley Terrace AMP
  - Gascoyne AMP
  - Ningaloo AMP
- 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 any Marine Park.

Woodside is aware of and will consider the 'Petroleum Activities and Australian Marine Parks' guidance note developed and published jointly by DNP and NOPSEMA, while preparing this EP to ensure that the EP:

- Identifies and manages all impacts and risks on AMP values (including ecosystem values) to an acceptable level and has considered all options to avoid or reduce them to as low as reasonably practicable (ALARP),
- Clearly demonstrates that the activities will not be inconsistent with the North-west Marine Parks Network Management Plan 2018.

If there is a change in activities which results in an overlap or new impact to a marine park Woodside will notify DNP.

Environment that May Be Affected (EMBA)

Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations whom are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly

unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations Environment Plan

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023 (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential).

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.12 Email sent to Ningaloo Coast World Heritage Advisory Committee (NCWHAC), Department of Biodiversity, Conservation and Attractions (DBCA) (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit

- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	Pluto Facility Operations Environment Plan	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

	Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.13 Email sent to Department of Industry, Science and Resources (DISR), Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) (26 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025

Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

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2.14 Email sent to North West Slope Trawl Fishery, Western Deepwater Trawl Fishery, Commonwealth Fisheries Association (CFA), Australian Southern Bluefin Tuna Industry Association (ASBTIA), Tuna Australia (26 and 27 February 2024)

Woodside is planning to submit a five-year revision of the Operations Environment Plan (EP) for the Pluto Facility.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported onshore via a 180 km long export pipeline. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Operational Areas and Exclusion Zones

Infrastructure is located within the Operational Areas described below. This area is where Woodside vessels can be expected to be operating to undertake routine operations:

- The riser platform and the area within a 500 m radius operational area around the platform
- The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m operational area corridor either side of the pipeline
- Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m operational area around the subsea infrastructure.

The Xena-03 Drilling and Tie-Back activity will take place within an Operational Area that includes the Xena-03 well location and the area within a 4000 m radius.

Exclusion zones, which are established for navigational safety and fishing vessels are not allowed to enter, will include:

- The 500 m-radius Petroleum Safety Zone (PSZ) around the platform, and
- A temporary 500 m-radius safety exclusion zone around vessels conducting drilling and installation activities.

An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities.

Environment that May be Affected (EMBA)

Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A Consultation Information Sheet is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations Environment Plan

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

	jumpers) and an area within 1500 m around the subsea infrastructure.	
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.
Relevant Fisheries	**Commonwealth fisheries** **Operational Areas:** North-West Slope Trawl Fishery. **EMBA:** North-West Slope Trawl Fishery, Western Deepwater Trawl Fishery.	

Feedback
Should you require notification prior to, and on completion of, the proposed activities, or have feedback specific to the proposed activities described, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential).

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2.15 Email sent to Western Australian Fishing Industry Council (WAFIC) (28 February 2024)

Woodside is planning to submit a five-year revision of the Operations Environment Plan (EP) for the Pluto Facility.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported onshore via a 180 km long export pipeline. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Operational Areas and Exclusion Zones

Infrastructure is located within the Operational Areas described below. This area is where Woodside vessels can be expected to be operating to undertake routine operations:

- The riser platform and the area within a 500 m radius operational area around the platform
- The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m operational area corridor either side of the pipeline
- Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m operational area around the subsea infrastructure.

The Xena-03 Drilling and Tie-Back activity will take place within an Operational Area that includes the Xena-03 well location and the area within a 4000 m radius.

Exclusion zones, which are established for navigational safety and fishing vessels are not allowed to enter, will include:

- The 500 m-radius Petroleum Safety Zone (PSZ) around the platform, and
- A temporary 500 m-radius safety exclusion zone around vessels conducting drilling and installation activities.

An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities.

Environment that May be Affected (EMBA)

Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

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Activity: Pluto Facility Operations Environment Plan

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025

Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.
Relevant Fisheries	**<u>State Fisheries</u>** **Operational Areas:** The West Australian Sea Cucumber Fishery, Hermit Crab Fishery, Mackerel Managed Fishery (Area 2 and 3), Marine Aquarium Fish Managed Fishery, Onslow Prawn Managed Fishery, Pilbara Crab Managed Fishery, Pilbara Fish Trawl Managed Fishery, Pilbara Line Fishery, Specimen Shell Managed Fishery, Tour Operators. **EMBA:** The Exmouth Gulf Prawn Managed Fishery, West Australian Sea Cucumber Fishery, Hermit Crab Fishery, Mackerel Managed Fishery (Area 2), Marine Aquarium Fish Managed Fishery, Nickol Bay Prawn Managed Fishery, Onslow Prawn Managed Fishery, Pilbara Crab Managed Fishery, Pilbara Fish Trawl Fishery, Specimen Shell Managed Fishery, West Coast Deep Sea Crustacean Managed Fishery.	

Feedback

Should you require notification prior to, and on completion of, the proposed activities, or have feedback specific to the proposed activities described, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential).

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2.16 Letter sent to Gascoyne and Pilbara/Kimberley Recreational Marine Users (26 February 2024)

Please direct all responses/queries to:
Woodside Energy Feedback
T: 1800 442 977
E: feedback@woodside.com

26 February 2024

Woodside Energy (Australia) Pty Ltd
ACN 006 923 879
Mia Yellagonga
11 Mount Street
Perth WA 6000
Australia
T +61 8 9348 4000
www.woodside.com

Dear Stakeholder

Woodside is planning to submit a five-year revision of the Operations Environment Plan (EP) for the Pluto Facility.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported onshore via a 180 km long export pipeline. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Operational Areas and Exclusion Zones
Infrastructure is located within the Operational Areas described below. This area is where Woodside vessels can be expected to be operating to undertake routine operations:

- The riser platform and the area within a 500 m radius operational area around the platform
- The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m operational area corridor either side of the pipeline
- Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m operational area around the subsea infrastructure.

The Xena-03 Drilling and Tie-Back activity will take place within an Operational Area that includes the Xena-03 well location and the area within a 4000 m radius.

Exclusion zones, which are established for navigational safety and fishing vessels are not allowed to enter, will include:

- The 500 m-radius Petroleum Safety Zone (PSZ) around the platform, and
- A temporary 500 m-radius safety exclusion zone around vessels conducting drilling and installation activities.

An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. You can also choose to receive updates on our consultation activities by subscribing on our website woodside.com.

Activity: Pluto Facility Operations Environment Plan

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

Infrastructure	Key infrastructure includes, but is not limited to: • Riser platform • Pluto A and B flowlines • Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: • Xena tie-in • One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback:
Should you require notification prior to, and on completion of, the proposed activities, or have feedback specific to the proposed activities described, we would welcome your feedback at Feedback@woodside.com.au or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential).

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. It can be accessed online through the QR code provided below.

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

Regards,

Woodside Energy Feedback

Woodside Energy
Mia Yellagonga
Karlak, 11 Mount Street
Perth WA 6000
Australia

T: 1800 442 977
E: feedback@woodside.com
www.woodside.com

2.17 Email sent to Gascoyne Recreational Marine Users, Recfishwest, Marine Tourism WA, WA Game Fishing Association (28 February 2024)

Woodside is planning to submit a five-year revision of the Operations Environment Plan (EP) for the Pluto Facility.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported onshore via a 180 km long export pipeline. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Operational Areas and Exclusion Zones

Infrastructure is located within the Operational Areas described below. This area is where Woodside vessels can be expected to be operating to undertake routine operations:

- The riser platform and the area within a 500 m radius operational area around the platform
- The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline Licence WA-17-PL and a 1500 m operational area corridor either side of the pipeline
- Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m operational area around the subsea infrastructure.

The Xena-03 Drilling and Tie-Back activity will take place within an Operational Area that includes the Xena-03 well location and the area within a 4000 m radius.

Exclusion zones, which are established for navigational safety and fishing vessels are not allowed to enter, will include:

- The 500 m-radius Petroleum Safety Zone (PSZ) around the platform, and
- A temporary 500 m-radius safety exclusion zone around vessels conducting drilling and installation activities.

An interactive map showing the location of the proposed activities will be available on the Woodside website and will be updated throughout the proposed activities.

Environment that May be Affected (EMBA)

Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could

potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A Consultation Information Sheet is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations Environment Plan

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
Should you require notification prior to, and on completion of, the proposed activities, or have feedback specific to the proposed activities described, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Friday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential).

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.18 Email sent to Chevron, Osaka Gas Gorgon, Tokyo Gas Gorgon and JERA Gorgon (28 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:
- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit

- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. Also attached are the GIS shape files. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	Pluto Facility Operations Environment Plan	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

	Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

We would be grateful if you could please forward this consultation information to your Joint Venture participants Osaka Gas Gorgon, Tokyo Gas Gorgon and JERA Gorgon for feedback.

2.19 Email sent to Western Gas, Exxon Mobil Australia, Shell Australia, BP Developments Australia, Carnarvon Energy, PE Wheatstone, Kyushu Electric Wheatstone, Eni Australia, Finder Energy, Jadestone Energy, KUFPEC Australia, Vermilion Oil & Gas, Santos NA Energy Holdings / Santos Lt / Santos WA Northwest / Santos Offshore / Santos WA

Southwest / Santos BOL / Santos WA PVG, Coastal Oil and Gas, Bounty Oil and Gas, OMV Australia, KATO Energy / KATO Corowa, INPEX Alpha, Beagle No.1, JX Nippon O&G Exploration Australia (28 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L

Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in c. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

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2.20 Email sent to Fox Resources (11 March 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP). As we've been unable to reach Coastal Oil and Gas NL via email, we are reaching out to you, given your role as the key Principal of Coastal Oil and Gas NL.

Please let us know if fxr@foxresources.com.au should be used moving forward for outreach to Coastal Oil and Gas NL for consultation, or if another email is preferred.

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**

Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

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2.21 Email sent Australian Energy Producers (AEP) (27 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

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- Routine inspection, monitoring, maintenance and repair (IMMR)
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- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	Pluto Facility Operations Environment Plan	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in c. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com.au or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.22 Email sent to Shire of Exmouth, City of Karratha, Exmouth Community Liaison Group, Karratha Community Liaison Group, Onslow Chamber of Commerce and Industry (27 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

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- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could

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Activity: Pluto Facility Operations

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	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com.au or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.23 Email sent to Shire of Ashburton (27 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

Woodside is required to manage environmental impacts and risks to the EMBA by its proposed activities to As Low As Reasonably Practicable (ALARP) and to an acceptable level, as required by the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Environment Regulations), through the implementation of the EP. Woodside will submit the proposed EP to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

Preparedness and Response
In the course of developing the EP, Woodside will develop the oil spill preparedness and response position tailored to this activity including the drafting of the Oil Pollution First Strike Plan which details the potential impacts, notifications and response mitigations that may be executed to manage an emergency event. Woodside consults with the relevant jurisdictional authorities and controlling agencies, including the Western Australian Department of Transport (DoT), the Australian Maritime Safety Agency (AMSA) and, in some circumstances, relevant port authorities, during the plan drafting process to inform mitigation management measures in place for the proposed activities. Woodside may also consult with other relevant external emergency management agencies, including LEMC, to ensure emergency management plans are aligned with effective outcomes.

In addition to the jurisdictional authorities and controlling agencies, the plan includes standard emergency notifications to agencies including NOPSEMA, the Department of Climate Change, Energy, the Environment and Water (DCCEEW), the Director of National Parks (DNP), and the WA Department of Biodiversity, Conservation and Attractions (DBCA). Where applicable, notification information for relevant Shires is also included in the Oil Pollution First Strike Plan.

Cultural heritage
Woodside routinely utilises the Department of Planning, Land and Heritage Aboriginal Cultural Heritage Inquiry System as part of the EP development process and includes the results of these inquiry system searches as an appendix to each EP.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	Pluto Facility Operations Environment Plan	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback:

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

As per Woodside's ongoing consultation approach, feedback and comments received from relevant persons continue to be assessed and responded to, as required, throughout the life of an EP, including during its assessment and once accepted, in accordance with the intended outcome of consultation.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

Please let us know if the Shire would like to receive start and end of activity notifications.

2.24 Email sent to Australian Conservation Foundation (ACF), Australian Marine Conservation Society (AMCS), Conservation Council of Western Australia (CCWA), Greenpeace Australia Pacific (GAP), 350 Australia (350A), Australasian Centre for Corporate Responsibility (ACCR), Friends of Australian Rock Art (FARA), Market Forces (27 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

	and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.25 Email sent to Telstra, Vocus (27 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. Also attached is a map of the submarine communications cables in the operational area. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	Pluto Facility Operations Environment Plan	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025

Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

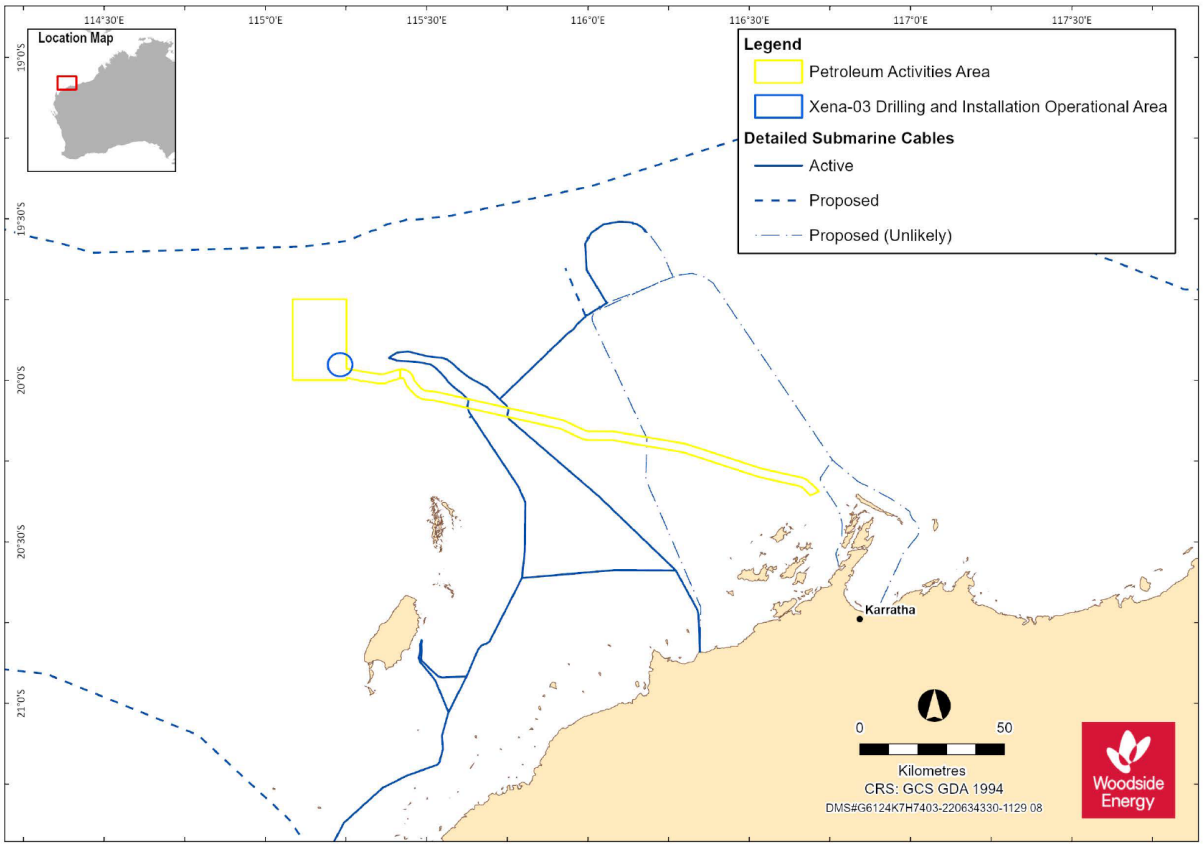
Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.25.1 Submarine Communications Cables



2.26 Email sent to Cape Conservation Group (CCG), Protect Ningaloo, University of Western Australia (UWA), Curtin University, Edith Cowan University (ECU), Murdoch University, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australian Institute of Marine Science (AIMS) (27 February 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025
Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.

	and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: v. Xena tie-in v. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **Wednesday 29 March 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.26.1 Email sent to WAMSI (18 March 2024)

Woodside is planning to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported via a 180 km long export pipeline to the onshore Pluto facility. Operations began in 2012.

The following proposed activities will continue at the Facility:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above.

In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Environment that May be Affected (EMBA)
Following changes to Commonwealth EP consultation requirements, Woodside is now consulting persons or organisations who are located within the EMBA by a proposed petroleum activity. The EMBA is the largest spatial extent where unplanned events could potentially have an environmental consequence. For this EP, it is determined by a highly unlikely release of hydrocarbons to the environment due to a loss of well integrity, loss of pipeline integrity or a vessel collision.

A **Consultation Information Sheet** is attached, which provides additional background on the proposed activities, including summaries of potential key impacts and risks, and associated management measures. These are also available on our website. You can also subscribe to receive updates on our consultation activities by subscribing here.

Activity: Pluto Facility Operations

Environment Plan	**Pluto Facility Operations Environment Plan**	
Summary of activities	Ongoing Operations	Drilling and tie-back
	Continued wet gas and condensate production at the Pluto, Xena and Pyxis reservoir.	Drilling and tie-back of the Xena-03 well into the existing Pluto production systems
Permit Area	Activities will occur within Production License WA-1-IL and WA-34-L.	Activities will occur within Production License WA-34-L
Location	160 km north west of Dampier, Western Australia	190 km west north west of Dampier, Western Australia
Approx. Water Depth (m)	80-960 m	176 m
Schedule	Production Commenced: 2012 Routine Operations: Ongoing	Drilling expected in Q2 2025 Subsea installation expected in Q3 2025

Operational Areas / Exclusion Zones	The riser platform and the area within a 500 m Petroleum Safety Zone (PSZ) around the platform. The export pipeline (P1TL) and associated 6-inch chemical supply line covered by Pipeline License WA-17-PL and a 1500 m corridor either side of the pipeline. Pluto, Xena and Pyxis subsea facilities (including wells, production and pigging manifolds, production jumpers, spools, flowlines and flexible jumpers) and an area within 1500 m around the subsea infrastructure.	The Operational Area includes a radius of 4000 m from the Xena-03 well to allow vessels to undertake drilling activities. Temporary 500 m safety exclusion zone around vessels conducting drilling and installation activities to manage vessel movements.
Infrastructure	Key infrastructure includes, but is not limited to: i. Riser platform i. Pluto A and B flowlines i. Export pipeline (Commonwealth)	Key infrastructure includes, but is not limited to: x. Xena tie-in x. One subsea Xmas tree and wellhead
Vessels	Operations support vessels will be used to undertake IMMR of subsea infrastructure.	Mobile offshore drilling unit (MODU), support and installation vessels.

Feedback
If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **17 April 2024.**

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

NOPSEMA has published a brochure entitled *Consultation on offshore petroleum environment plans – Information for the Community* to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation.

2.27 Email sent to Murujuga Aboriginal Corporation (1 March 2024)

Hi there [Individual 3]

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) plant via a 180 km long export pipeline. The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore central control room.

The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that Murujuga Aboriginal Corporation (MAC) and its members may have in the environment that may be affected (EMBA) by this activity. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are seeking information and guidance from MAC in relation to the following:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Friday 29th March 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement, please let me know as soon as possible. Woodside will continue to take feedback from you for the life of the Environmental Plans.

Consultation Information
The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.

Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me or via the details below:
Woodside Energy - Feedback@woodside.com, by calling 1800 442 977.
NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.
Please also feel free to forward this email and the attached documents to MAC members and other people and/or organisations who you think may be interested. As you are aware, Woodside would be happy to speak with MAC members, the MAC Board, Circle of Elders, office holders and other interested parties with your guidance.
I look forward to hearing from you.

Kind regards

2.28 Email sent to Nganhurra Thanardi Garrbu Aboriginal Corporation (20 March 2024)

Good afternoon

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations Environment Plan for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is in water depths ranging from 80m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia.

Summary of activities:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)of the platform and associated subsea infrastructure.
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above
    - The Xena-03 Drilling and Tie-Back project, which includes drilling one new well (Xena-03) in the Xena field. tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform pre-commissioning and commissioning activities.

Regarding Nganhurra Thanardi Garrbu Aboriginal Corporation. Woodside is seeking to understand the nature of the interests that Members may have in this activity. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Thursday 18th April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy Feedback@woodside.com or by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to Nganhurra Thanardi Garrbu Aboriginal Corporation, Traditional Owners and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Elders, office holders and other interested parties as requested.

I look forward to your response and please feel free to call and send through guidance on next steps.

Kind regards

2.29 Email sent to Buurabalayji Thalanyji Aboriginal Corporation (1 March 2024)

Hi [Individual 4]

I hope this email finds you well.

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) Plant via a 180 km long export pipeline.
The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore Central Control Room.
The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that BTAC and its members may have in the EMBA by this activity. The EMBA is the total area over which unplanned events could have environmental impacts. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Friday 29th March 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement, please let me know as soon as possible.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to Jo Lanagan (Included in this email):

Woodside Energy – Feedback@woodside.com by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to BTAC Members and other people and organisations who you think may be interested as required. Woodside would be happy to speak with BTAC Members, the BTAC Board, elders and office holders and other interested parties.

I will be away on annual leave until 28-March-24, hence including Jo Lanagan in this email.

Kind regards,

2.30 Email sent to Yinggarda Aboriginal Corporation (26 March 2024)

Dear [Individual 5] and [Individual 6] I hope all is travelling well for you both.

I am writing to notify you that Woodside is planning to submit a five-year revision of the Operations Environment Plan for the Pluto Facility Operations that commenced in 2012. Please see further information in this link: Pluto Facility Operations EP

Overview:

The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from 80m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia.

Summary of activities:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR) of the platform and associated subsea infrastructure
- Commissioning and operation of the water handling unit

- Non-routine and unplanned activities and incidents associated with the above
  - The Xena-03 Drilling and Tie-Back project, which includes:
  - drilling one new well (Xena-03) in the Xena field
  - tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform
  - pre-commissioning and commissioning activities

With reference to Yinggarda Aboriginal Corporation (YAC), Woodside is seeking to understand the nature of the interests that YAC Members may have in this activity. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Thursday 25 April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement please also let me know.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

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- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

In addition to contacting me directly, you can also provide feedback directly to:

Woodside Energy Feedback@woodside.com or by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please feel free to forward this email and the attached documents to Yinggarda Traditional Owners and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Elders, office holders and other interested parties as requested.

I look forward to your response and please feel free to call and send through guidance on next steps.

Kind regards

2.31 Email sent to Kariyarra Aboriginal Corporation (6 March 2024)

Good morning [Individual 7]

By way of Introductions. My name is [Individual 8] and am the First Nations Engagement Adviser with Woodside Energy and am emailing updates whilst [Individual 9] is on Leave.

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) Plant via a 180 km long export pipeline.
The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore Central Control Room.
The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that Kariyarra Aboriginal Corporation and its members may have in the EMBA by this activity. The EMBA is the total area over which unplanned events could have environmental impacts. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Wednesday 3rd April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement, please let me know as soon as possible.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
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- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy Feedback@woodside.com , by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to Kariyarra Members and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Kariyarra Elders, office holders and other interested parties.

Please feel free to call and send through guidance on next steps.

Kind regards

2.32 Email sent to Wirrawandi Aboriginal Corporation (5 March 2024)

Good morning WAC

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) Plant via a 180 km long export pipeline.
The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore Central Control Room.
The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that Wirrawandi Aboriginal Corporation (WAC) and its members may have in the EMBA by this activity. The EMBA is the total area over which unplanned events could have environmental impacts. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Tuesday 2nd April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement, please let me know as soon as possible.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)

- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy - Feedback@woodside.com.au, by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to WAC Members and other people and organisations who you think may be interested as required. Woodside would be happy to speak with the WAC, elders and office holders and other interested parties.

I look forward to hearing from you.

Kind regards

2.33 Email sent to Robe River Kuruma Aboriginal Corporation (5 March 2024)

Good morning [Individual 10]

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) Plant via a 180 km long export pipeline.
The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore Central Control Room.
The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that Robe River Kuruma Aboriginal Corporation and its members may have in the EMBA by this activity. The EMBA is the total area over which unplanned events could have environmental impacts. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Tuesday 2nd April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement, please let me know as soon as possible.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy - Feedback@woodside.com.au, by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to Robe River Kuruma Aboriginal Corporation Members and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Robe River Kuruma Aboriginal Corporation Members, the Robe River Kuruma Aboriginal Corporation Board, elders and office holders and other interested parties.

I look forward to hearing from you.

Kind regards

2.34 Email sent to Ngarluma Aboriginal Corporation (1 March 2024)

Wayiba [Individual 11]

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) plant via a 180 km long export pipeline. The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore central control room.

The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that Ngarluma Aboriginal Corporation (NAC) and its members may have in the environment that may be affected (EMBA) by this activity. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are seeking information and guidance from NAC in relation to the following:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Friday 29th March 2024. We sent you a draft consultation agreement today for your review. Jeff has mentioned previously that NAC do not wish for any consultation to take place until this agreement is in place. That being said we will be guided by NAC as to how consultation may proceed in the interim. If there is any support or specific information that you require as part of our engagement, please let me know as soon as possible. Please note, Woodside will continue to take feedback from you for the life of the Environmental Plans.

Consultation Information
The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand

consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me or via the details below:
Woodside Energy - Feedback@woodside.com, by calling 1800 442 977.
NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.
Please also feel free to forward this email and the attached documents to NAC members and other people and organisations who you think may be interested. Woodside would be happy to speak with NAC members, the NAC Board, Elders and office holders and other interested parties.
I look forward to hearing from you.

Kind regards

2.35 Email sent to Yindjibarndi Aboriginal Corporation (6 March 2024)

Good morning [Individual 12]

By way of Introductions. My name is [Individual 8] and am the First Nations Engagement Adviser with Woodside Energy and will be sending through Environment Plans whilst [Individual 13] and [Individual 9] are on Leave.

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations Environment Plan for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from 80m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia.

Summary of activities:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)of the platform and associated subsea infrastructure.
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above
    - The Xena-03 Drilling and Tie-Back project, which includes drilling one new well (Xena-03) in the Xena field tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform pre-commissioning and commissioning activities.

Regarding Ngarluma Yindjibarndi Foundation Ltd. Woodside is seeking to understand the nature of the interests that Members may have in this activity. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Wednesday 3rd April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy Feedback@woodside.com or by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to Ngarluma and Yindjibarndi Traditional Owners and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Elders, office holders and other interested parties as requested.

I look forward to your response and please feel free to call and send through guidance on next steps.

Kind regards

2.36 Email sent to Wanparta Aboriginal Corporation (28 February 2024)

Hi [Individual 14]

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate fromthe Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) Plant via a 180 km long export pipeline.
The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore Central Control Room.
The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that Wanparta Aboriginal Corporation and its members may have in the EMBA by this activity. The EMBA is the total area over which unplanned events could have environmental impacts. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Friday 29th March 2024 and please also advise of your preferred method of consultation. If there is any support or specific

information that you require as part of our engagement, please let me know as soon as possible.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy - Feedback@woodside.com.au, by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to Wanparta Aboriginal Corporation Members and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Wanparta Aboriginal Corporation Members, the Wanparta Aboriginal Corporation Board, elders and office holders and other interested parties.

I look forward to hearing from you.

Kind regards

2.37 Email sent to Yamatji Marlpa Aboriginal Corporation (20 March 2024)

Good afternoon

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations Environment Plan for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is in water depths ranging from 80m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia.

Summary of activities:

- Routine production

- Routine inspection, monitoring, maintenance and repair (IMMR)of the platform and associated subsea infrastructure.
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above
    - The Xena-03 Drilling and Tie-Back project, which includes drilling one new well (Xena-03) in the Xena field. tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform pre-commissioning and commissioning activities.

Regarding Nganhurra Thanardi Garrbu Aboriginal Corporation. Woodside is seeking to understand the nature of the interests that Members may have in this activity. We are interested in hearing:

1. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. We will continue to take feedback from you for the life of the Environmental Plans.

5. We would like to understand how you would like to build a relationship with Woodside Energy.

6. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Thursday 18th April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy Feedback@woodside.com or by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to Nganhurra Thanardi Garrbu Aboriginal Corporation, Traditional Owners and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Elders, office holders and other interested parties as requested.

I look forward to your response and please feel free to call and send through guidance on next steps.

Kind regards

2.38 Email sent to Ngarluma Yindjibarndi Foundation Ltd (6 March 2024)

Good morning [Individual 15]

By way of Introductions. My name is [Individual 8] and am the First Nations Engagement Adviser with Woodside Energy and will be sending through Environment Plans whilst [Individual 13] and [Individual 9] are on Leave.

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations Environment Plan for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview The Pluto platform is in 80 m water depth, and the associated subsea infrastructure is located in water depths ranging from 80m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia.

Summary of activities:

- Routine production
- Routine inspection, monitoring, maintenance and repair (IMMR)of the platform and associated subsea infrastructure.
- Commissioning and operation of the water handling unit
- Non-routine and unplanned activities and incidents associated with the above
    - The Xena-03 Drilling and Tie-Back project, which includes drilling one new well (Xena-03) in the Xena field tie back to the existing Pyxis Hub infrastructure and remotely operated Pluto platform pre-commissioning and commissioning activities.

Regarding Ngarluma Yindjibarndi Foundation Ltd. Woodside is seeking to understand the nature of the interests that Members may have in this activity. We are interested in hearing:

7. How could these activities impact your cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

8. Do you have any concerns about the proposed activities and what do you think we should do about them?

9. Is there anything you would like considered in the Environmental Plans?

10. We will continue to take feedback from you for the life of the Environmental Plans.

11. We would like to understand how you would like to build a relationship with Woodside Energy.

12. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Wednesday 3rd April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement.

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me on the details below:

Woodside Energy Feedback@woodside.com or by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to Ngarluma and Yindjibarndi Traditional Owners and other people and organisations who you think may be interested as required. Woodside would be happy to speak with Elders, office holders and other interested parties as requested.

I look forward to your response and please feel free to call and send through guidance on next steps.

Kind regards

2.39 Email sent to Save our Songlines (26 March 2024)

Hi there [Individual 16] and [Individual 17]

I'm forwarding this information as I understand all communication for [Individual 1] should be directed to you.

Please be advised that Woodside Energy is planning to submit a five-year revision of the Operations EP for the Pluto Facility Operations that commenced in 2012 Pluto Facility Operations EP

Overview

The Pluto platform is in 80m water depth, and the associated subsea infrastructure is located in water depths ranging from ~80 m to 960 m, in Commonwealth waters around 160 km north-west of Dampier, Western Australia. The facility produces wet gas and condensate from the Pluto, Xena and Pyxis reservoirs. The gas and condensate are transported for processing at the onshore liquefied natural gas (LNG) plant via a 180 km long export pipeline. The Pluto platform is a not-normally-manned facility, with remote operation from the Pluto onshore central control room.

The Pluto Facility Operations EP is being revised and resubmitted to integrate drilling, subsea installation, commissioning (drilling and tie-back) and production from the Xena-03 well into the existing Pluto production systems.

Woodside is seeking to understand the nature of the interests that Save Our Songlines (SoS) and its members may have in the environment that may be affected (EMBA) by this activity. The EMBA is set out in the attached Summary Information Sheets and consultation information sheets. We are seeking information and guidance from SoS in relation to the following:

1. How could these activities impact your members cultural values, interests, and activities - does protecting the environment do enough to protect your cultural values?

2. Do you have any concerns about the proposed activities and what do you think we should do about them?

3. Is there anything you would like considered in the Environmental Plans?

4. Whether there are any other individuals, groups, or organisations you think we should talk to?

If you would like to speak with us, please let me know by Friday 26th April 2024 and please also advise of your preferred method of consultation. If there is any support or specific information that you require as part of our engagement, please let me know as soon as possible. Woodside will continue to take feedback from you for the life of the Environmental Plans.

Consultation Information
The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has published a brochure entitled Consultation on offshore petroleum environment plans – Information for the Community to help community members understand consultation requirements for Commonwealth EPs and how to participate in consultation. Please click on the italicised text above to access this document.
Publications below (please see Document Hub | NOPSEMA):

- Brochure: Consultation on offshore petroleum environment plans brochure.pdf (nopsema.gov.au)
- Guideline: Guideline: Consultation in the course of preparing an environment plan (nopsema.gov.au); and
- Policy: Draft policy for managing gender-restricted information PL2098.pdf (nopsema.gov.au).

Feedback can also be made directly to me or via the details below:
Woodside Energy - Feedback@woodside.com, by calling 1800 442 977.

NOPSEMA - Australian Government's National Offshore Petroleum Safety and Environmental Management Authority to communications@nopsema.gov.au or (08) 6188 8700.

Please also feel free to forward this email and the attached documents to SoS members and other people and/or organisations who you think may be interested.

I look forward to hearing from you.

Kind regards

2.40 Email from FARA – 29 March 2024

fara
Friends of Australian Rock Art

[Contact details]

[Contact details]

RE: FARA Relevant Person Consultation on Pluto Facility Operations Environment Plan

1) We refer to your correspondence received on 19 March 2024 regarding Woodside's intention to seek a 5-year extension to the Pluto Facility Operations Environment Plan (Pluto Operations EP) and your request for comment to be. received by 29 March 2024.

FARA's Functions, Interests and Activities

2) As you are aware, FARA's functions, interests and activities relate to the protection and preservation of the rock art and surrounding physical and cultural heritage landscape from the impacts of industrial development, including; direct impacts from industrial development; indirect impacts from industrial emissions; impacts on visitors to the area (including Aboriginal peoples, researchers, and recreational visitors); and future impacts of climate change to this heritage landscape.

3) FARA's current objectives and activities include support for:
   a) the Murujuga Aboriginal Corporation Cultural Management Plan action of "reducing the industrial footprint with an ultimate goal of zero industry on Murujuga";
   b) more recent calls from Traditional Custodians for a moratorium on further industrial development on Murujuga;
   c) urgent protection of the Murujuga cultural heritage landscape under the *Aboriginal and Tores Strait Islander Heritage Protection Act*;
   d) World Heritage Listing of the whole of the Burrup; and
   e) Traditional Custodians to exercise rights to Free, Prior and Informed Consent (FPIC) in relation to industrial development.

   FARA considers the ongoing operation of gas processing facilities, including the processing of Pluto gas contemplated by the Pluto Operations EP to be inconsistent with these objectives.

WINNER Community Organisation

[Contact details]

Indirect consequences of the Pluto Operations EP

4) While it is not clear from Woodside's consultation documents, FARA understands that gas and other hydrocarbons produced from the Pluto gas field will be processed at the Pluto LNG facility and North West Shelf LNG facilities on the Burrup Peninsula. Gas processing at these facilities is the primary cause of industrial air emissions on the Burrup Peninsula which FARA believes is causing irreversible harm to the Murujuga rock art. The physical presence of these facilities presents a significant and ongoing disruption to the cultural heritage landscape and its National and World heritage values. Fugitive emissions of methane, and downstream combustion emissions from gas produced from the Pluto field also contribute to anthropogenic climate change. These are examples of indirect consequences of the Pluto Operations EP.

5) Woodside is required, according to the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth) (the Regulations) and the EPBC Act Indirect Consequences Policy, to consider and address the indirect consequences of the Pluto Operations in the EP.

Relevant person consultation with FARA on the Pluto Operations EP

6) As FARA's functions, interests and activities as described above and elsewhere are affected by these indirect consequences, FARA is a 'Relevant Person' for the purposes of consultation in accordance with regulations (Regulations). As such, FARA has a right to be consulted on the Operations EP for the Pluto Operations EP and seeks to exercise that right.

7) Woodside is required by regs 11A(2) and (3) of the Environment Regulations to:
   a. provide FARA with "sufficient information" to allow it to make an informed assessment of the possible consequences of the activities on its functions, interests or activities; and
   b. provide a "reasonable period" for consultation.

8) The information that has been provided to FARA on the Pluto Operations EP, and the 10-day period provided for feedback do not meet these requirements.

Information requirements for Relevant Person consultation with FARA

9) The Consultation Information Sheet on the Pluto Operations EP provided to FARA and other parties does not mention the impacts and consequences of processing gas and other hydrocarbons from the Pluto gas field on the Burrup Peninsula, or other indirect consequences of the proposed operations. There is no evaluation of the impacts or risks in the consultation document and no indication of what mitigation measures Woodside proposes in respect of these impacts.

10) FARA has previously described to Woodside the nature of information that FARA requires to assess possible consequences of Woodside's gas processing operations on its functions, activities and interests. The following list provides examples of the kinds of information that FARA requires in relation to the Pluto Operations EP.

a) Information on **how the precautionary principle has been applied** by Woodside in the assessment of impacts on the rock art and in developing and applying management responses
b) Information on what **pollution control measures and technology** will be utilised by Woodside at the Pluto and North West Shelf LNG facilities and how this has been selected, including independent feasibility studies and analysis relating to the application of best-available pollution control technology to Woodside's operations;
c) Information on what the **results and outcomes** of these measures will be on the pollution entering the Burrup airshed, including information on what the duration, concentration, and chemical composition of pollution entering to the air shed will be from Pluto gas processed at each facility.
d) Information on the **resultant airborne pollution concentrations** that Woodside expects will occur in the vicinity of petroglyphs which are potentially affected by this pollution, **and relevant exposure levels and duration**, taking into consideration cumulative and synergistic effects where this pollution is combined with pollution from other sources, and prevailing environmental conditions in the airshed.
e) Information detailing what Woodside believes or understands will be the **long-term physical consequences** of its operations on the Murujuga rock art, including the processing of Pluto gas on the Burrup **over the full duration of the proposed Pluto operations.**
f) Description of **what level of impact on the rock art Woodside considers to be as low as reasonably practicable and acceptable**, for the purpose of meeting the regulatory requirement, and how this level of acceptable impact has been determined by Woodside.
g) Information regarding **how Woodside is meeting or intends to meet its statutory obligations** under the WA Aboriginal Heritage Act for the Pluto and North West Shelf LNG facilities, and what authorisations exist under that Act for Woodside's indirect impacts on the Murujuga rock art as a consequence of industrial pollution.
h) Information and disclosure of **rock art monitoring or other studies** undertaken or commissioned by Woodside to investigate the impacts of industrial pollution on petroglyphs, and **any other scientific or technical information** which is relied upon by Woodside to reach the conclusion that ongoing Pluto operations will not have adverse consequences for the rock art.
i) Evidence of Woodside's **understanding and engagement with** peer-reviewed scientific research previously provided to Woodside by FARA and other parties demonstrating impacts of industrial pollution on rock art, and **evidence of consultation** with experts who have undertaken this research, including as Relevant Persons under the regulations.
j) Information on **what specific action will be taken** by Woodside if ongoing scientific monitoring of the rock art demonstrates that industrial pollution, including from the processing of Pluto gas on the Burrup is adversely impacting the rock art, and what the **outcome of this action** will be for the rock art.

k) Information on how current and proposed regulatory regimes for the Pluto and North West Shelf LNG facilities will include **enforceable measures that prevent impacts** from the processing of Pluto gas and other hydrocarbons on the Burrup.
l) Information on the **global and local climate scenarios Woodside expects to occur** if the Pluto operations continue as proposed.
m) Information on what **climate impact scenarios Woodside considers to be acceptable, and what specific verifiable and additional abatement measures** Woodside will take to meet emissions reduction targets to ensure that Woodside's climate impacts are managed to as low as reasonably practicable and acceptable levels.
n) Information on what other stakeholders with similar or overlapping functions, interests or activities to FARA's have been consulted and **how matters raised by such parties have been considered and addressed** by Woodside.
o) Information about how Traditional Owners and Custodians have been provided with opportunities to **exercise rights to Free Prior and Informed Consent** regarding the ongoing Pluto Operations.
p) Information on how ongoing processing of Pluto gas will occur in a way that does not **continue or perpetuate the physical disruption of the Murujuga cultural heritage landscape** (including National and World heritage values) which is currently occurring due to the presence and ongoing operation of Woodside's gas processing operations on the Burrup.
q) Information about **how concerns previously raised by FARA's have been addressed by Woodside** and what operational or other changes have been considered or contemplated in responding to those concerns and requests.

11) This information is required to enable FARA to be consulted as a Relevant Person under the Regulations, because it is essential to understanding the nature of impacts that may occur on the Murujuga rock art and broader physical and cultural landscape of the Burrup, what Woodside has determined are reasonably practicable and acceptable levels of impact, how Woodside has made these determinations, and how Woodside intends to manage its operations to ensure that these outcomes are met as required under the Regulations.

Reasonable period for Relevant Person consultation with FARA

12) In addition to these information requirements, once they are met FARA requires additional time to engage suitably qualified experts to analyse the information and advise FARA on the nature of impacts on FARA's functions, activities and interests. Because this area is a specialist field of science requiring interpretation of specific technical information, it is not reasonable to expect that informed assessment of the possible consequences of the activities on FARA's functions, interests or activities can have occurred within the timeframes that Woodside has stipulated for this EP, even if all information needs were met.

Information previously provided to Woodside by FARA

13) FARA has previously provided Woodside with a number of peer-reviewed scientific reports and other evidence demonstrating impacts on the Murujuga rock art resulting from atmospheric air pollution. Woodside's LNG processing

facilities are the primary source of this atmospheric pollution that is impacting the rock art, and the Pluto Operations EP will cause this pollution to continue for a longer duration and potentially a greater intensity. As such, the information previously provided by FARA to Woodside is relevant to the Pluto Operations EP.

14) FARA has not received satisfactory response to this information and evidence from Woodside in the context of other Relevant Person consultation processes. As such, it is our expectation that previously supplied information and evidence will be addressed by Woodside in the Pluto Operations EP, and that this information and Woodside's response will be made publicly available.

Next Steps

15) FARA reiterates that further consultation must be undertaken by Woodside prior to submitting a draft Scarborough Operations EP to NOPSEMA for approval. If a draft EP is submitted by Woodside, then it is FARA's expectation that the feedback contained in this document and previous submissions from FARA is included in full in the public section of the EP to allow for transparency regarding the inadequacy of consultation with FARA.

16) We look forward to Woodside providing FARA with sufficient information and a reasonable period of time to enable FARA to assess the possible consequences of the Pluto Operations EP on our functions, activities and interests, as part of the relevant person consultation process.

Yours sincerely,

[redacted] [Contact details] [redacted]

[Contact details] [redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

3. ADDITIONAL CONSULTATION

3.1 Email sent to Australian Border Force (ABF), Australian Hydrographic Office (AHO), Australian Maritime Safety Authority (AMSA) Marine Pollution, AMSA Marine Safety, Department of Agriculture, Fishery and Forestry (DAFF), Department of Defence (DoD), Department of Primary Industries and Regional Development (DPIRD), Western Australian Museum, Pilbara Ports Authority, Department of Climate Change, Energy, the Environment and Water (DCCEEW), Director of National Parks (DNP), Department of Industry, Science and Resources (DISR), Department of Energy, Mines, Industry Regulation and Safety (DEMIRS), Chevron, Osaka Gas Gorgon, Tokyo Gas Gorgon and JERA Gorgon, Western Gas, Exxon Mobil Australia, Shell Australia, BP Developments Australia, Carnarvon Energy, PE Wheatstone, Kyushu Electric Wheatstone, Eni Australia, Jadestone Energy, KUFPEC Australia, Vermilion Oil & Gas, Fox Resources, Bounty Oil and Gas, OMV Australia, KATO Energy / KATO Corowa, INPEX Alpha, Beagle No.1, JX Nippon O&G Exploration Australia, Australian Energy Producers (AEP) (18 March 2024)

Woodside previously consulted you on its plans to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia. In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Information on the proposed activities is provided in the email below and in the Consultation Information Sheet which is available on our website.

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **29 March 2024.**

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

3.2 Email sent to North West Slope Trawl Fishery, Western Deepwater Trawl Fishery, Commonwealth Fisheries Association (CFA),

Australian Southern Bluefin Tuna Industry Association (ASBTIA) (18 March 2024)

Woodside previously consulted you on its plans to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia. In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Further information on the proposed activities is provided in the email below and in the Consultation Information Sheet which is available on our website.

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **29 March 2024.**

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

Subject to EP acceptance, please let us know if you would like start and end of notifications for the proposed activity.

3.3 Email sent to Ningaloo Coast World Heritage Advisory Committee (NCWHAC), Shire of Exmouth, City of Karratha, Exmouth Community Liaison Group, Karratha Community Liaison Group, Onslow Chamber of Commerce and Industry, Shire of Ashburton, Australian Conservation Foundation (ACF), Australian Marine Conservation Society (AMCS), Conservation Council of Western Australia (CCWA), Greenpeace Australia Pacific (GAP), 350 Australia (350A), Australasian Centre for Corporate Responsibility (ACCR), Friends of Australian Rock Art (FARA), Market Forces, Cape Conservation Group (CCG), Protect Ningaloo, University of Western Australia (UWA), Curtin University, Edith Cowan University (ECU), Murdoch University, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Vocus, Gascoyne Recreational Marine Users, Recfishwest, Marine Tourism WA, WA Game Fishing Association (19 March 2024)

Woodside previously consulted you on its plans to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia. In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Information on the proposed activities is provided in the email below and in the Consultation Information Sheet which is available on our website.

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **29 March 2024.**

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

3.4 Letter sent to Gascoyne and Pilbara/Kimberley Recreational Marine Users (18 March 2024)

Please direct all responses/queries to:

Woodside Energy (Australia) Pty Ltd
ACN 006 923 879
Mia Yellagonga
11 Mount Street
Perth WA 6000
Australia
T +61 8 9348 4000
www.woodside.com

18 March 2024

1

Woodside previously consulted you on its plans to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

The Pluto platform is in Production Licence WA-1-IL and WA-34-L, located in Commonwealth waters approximately 160 km north west of Dampier, Western Australia. In addition, Woodside proposes to conduct drilling, subsea installation and commissioning (tie-back), and production from the Xena-03 well into the existing Pluto production systems.

Further information on the proposed activities is provided in the Consultation Information Sheet which is available via the QR code below.

If you have feedback specific to the proposed activities described under the proposed EP, we would welcome your feedback at Feedback@woodside.com or 1800 442 977 by **29 March 2024.**

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

Subject to EP acceptance, please let us know if you would like start and end of notifications for the proposed activity.

Regards,

Woodside Energy Feedback

Woodside Energy
Mia Yellagonga
Karlak, 11 Mount Street
Perth WA 6000
Australia

T: 1800 442 977
E: feedback@woodside.com
www.woodside.com

3.5 Email sent to Recfishwest, Telstra, Pilbara Ports Authority, DBCA, AIMS, Santos, DPLH, Department of Transport, AFMA, Finder Energy, ACMA (27 March 2024)

Following our earlier correspondence, please be advised that 4 (four) well location coordinates have been updated as per the table below. There are no other changes to previously provided consultation information, including mitigation and/or management measures.

Structure	Approximate Water Depth (m)	Latitude	Longitude	Petroleum Titles
PYA01 well	~985 m	19°49'40.331"	115°10'34.942"	WA-34-L
PL-PYA02 well	~862 m	19°52'34.882"	115°09'00.645"	
XNA02 well	~180 m	19°57'49.130"	115°13'02.764"	
XNA03 well	~177 m	19°56’28.914”S	115°13’44.302”E	

The updated Consultation Information Sheet for this EP is available on our website and attached to this email. Should you require additional information or have feedback on the proposed activity, please let us know.

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA’s website.

3.6 Email sent to Marine Tourism WA, WA Game Fishing Association, Gascoyne Recreational Marine Users, Vocus, Cape Conservation Groug, Australian Conservation Foundation, FARA, 350A, GAP, AMCS, CCWA, ACCR, Market Forces, CSIRO, UWA, Murdoch, ECU, Curtin, Protect Ningaloo, Cape Conservation Group, Onslow CCI, Karratha CLG, Exmouth CLG, City of Karratha, Shire of Ashburton, Shire of Exmouth, NCWHAC, Australian Energy Producers, Chevron, Osaka Gas Gorgon, Tokyo Gas Gorgon and JERA Gorgon, Western Gas, Exxon Mobil Australia, Shell Australia, BP Developments Australia, Carnarvon Energy, PE Wheatstone, Kyushu Electric Wheatstone, Eni Australia, Jadestone Energy, KUFPEC Australia, Vermilion Oil & Gas, Fox Resources, Bounty Oil and Gas, OMV Australia, KATO Energy / KATO Corowa, INPEX Alpha, Beagle No.1, JX Nippon O&G Exploration Australia, North West Slope Trawl Fishery, Western Deepwater Trawl Fishery, Commonwealth Fisheries Association (CFA), Australian Southern Bluefin Tuna Industry Association (ASBTIA), DEMIRS, DISR, DNP, DCCEEW, Western

Australian Museum, DPIRD, Department of Defence, DAFF, AMSA, AHO, Australian Border Force, (27 March 2024)

Woodside previously consulted you (email below) on its plans to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

Please be advised that 4 (four) well location coordinates have been updated as per the table below. There are no other changes to previously provided consultation information, including mitigation and/or management measures.

Structure	Approximate Water Depth (m)	Latitude	Longitude	Petroleum Titles
PYA01 well	~985 m	19°49'40.331"	115°10'34.942"	WA-34-L
PL-PYA02 well	~862 m	19°52'34.882"	115°09'00.645"	
XNA02 well	~180 m	19°57'49.130"	115°13'02.764"	
XNA03 well	~177 m	19°56’28.914”S	115°13’44.302”E	

The updated Consultation Information Sheet for this EP is available on our website and attached to this email. Should you require additional information or have feedback on the proposed activity, please let us know.

Your feedback and our response will be included in our EP 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 2023* (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA’s website.

3.7 Letter sent to Gascoyne and Pilbara/Kimberley Recreational Marine Users (28 March 2024)

Please direct all responses/queries to:
Woodside Energy Feedback
T: 1800 442 977
E: feedback@woodside.com

28 March 2024

Woodside Energy (Australia) Pty Ltd
ACN 006 923 879
Mia Yellagonga
11 Mount Street
Perth WA 6000
Australia
T +61 8 9348 4000
www.woodside.com

Dear Stakeholder

Woodside previously consulted you on its plans to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

Please be advised that 4 (four) well location coordinates have been updated as per the table below. There are no other changes to previously provided consultation information, including mitigation and/or management measures.

Structure	Approximate Water Depth (m)	Latitude	Longitude	Petroleum Titles
PYA01 well	~985 m	19°49'40.331"	115°10'34.942"	WA-34-L
PL-PYA02 well	~862 m	19°52'34.882"	115°09'00.645"	
XNA02 well	~180 m	19°57'49.130"	115°13'02.764"	
XNA03 well	~177 m	19°56'28.914"S	115°13'44.302"E	

The updated Consultation Information Sheet for this EP is available on our website via the QR code below. Should you require additional information or have feedback on the proposed activity, please let us know.

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA's website.

Regards,

Woodside Energy Feedback

Woodside Energy
Mia Yellagonga
Karlak, 11 Mount Street
Perth WA 6000
Australia

T: 1800 442 977
E: feedback@woodside.com
www.woodside.com

3.8 Email sent to WAMSI (2 April 2024)

Woodside previously consulted you on its plans to submit a five-year revision of the Pluto Facility Operations Environment Plan (EP).

Following our earlier correspondence, please be advised that 4 (four) well location coordinates have been updated as per the table below. There are no other changes to previously provided consultation information, including mitigation and/or management measures.

Structure	Approximate Water Depth (m)	Latitude	Longitude	Petroleum Titles
PYA01 well	~985 m	19°49'40.331"	115°10'34.942"	WA-34-L
PL-PYA02 well	~862 m	19°52'34.882"	115°09'00.645"	
XNA02 well	~180 m	19°57'49.130"	115°13'02.764"	
XNA03 well	~177 m	19°56’28.914”S	115°13’44.302”E	

The updated Consultation Information Sheet for this EP is available on our website and attached to this email. Should you require additional information or have feedback on the proposed activity, please let us know by 17 April 2024.

Your feedback and our response will be included in our EP 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 2023 (Cth). Your feedback may also be used to support other regulatory processes associated with the planned activities (which may or may not be confidential)

Please let us know if you request that particular information that you provide in the consultation not be published. If so, we will make your request known to NOPSEMA so that the information is not included when the EP is published on NOPSEMA’s website.

4. ADVERTS AND SOCIAL MEDIA

NEWSPAPERS

Newspaper	Coverage	Publication dates
The Australian	National	28 February 2024
The West Australian	Regional (WA)	28 February 2024
Pilbara News	Local (WA)	28 February 2024
North West Telegraph	Local (WA)	28 February 2024
Koori Mail	Indigenous	28 February 2024
National Indigenous Times	Indigenous	26 February 2024

PLUTO FACILITY OPERATIONS ENVIRONMENT PLAN

For more than 35 years, Woodside has been developing and operating LNG and oil projects in Australia. Our focus is the safety, reliability, efficiency and environmental performance of our operations and activities.

Woodside consults so that feedback from relevant persons is considered and used to inform the revision of the Pluto Facility Operations Environment Plan.

Our activities

The Pluto facility is a not-normally-crewed facility that has been in production since 2012 and is located offshore in Commonwealth waters approximately 160 km north west of Dampier.

Woodside plans to continue producing wet gas and condensate from the Pluto, Xena and Pyxis reservoirs and is submitting a five-year revision to the operational Environment Plan. The Environment Plan for the Pluto facility will cover routine operations and integrate drilling, subsea installation, commissioning (drilling and tieback) and production from the Xena-03 well into the existing Pluto production systems.

We are seeking input from relevant persons whose functions, interests or activities may be affected by continued operations.

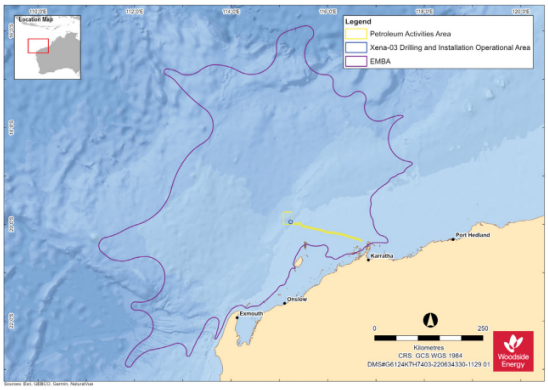
The environment that may be affected (EMBA)

The EMBA is the largest area where activities could potentially have a direct or indirect impact. The broadest extent of the EMBA takes into consideration planned and unplanned activities, and for this Environmental Plan, is determined by modelling a highly unlikely event of a hydrocarbon release to the environment.

The EMBA represents the merged area of many possible modelled paths that a highly unlikely hydrocarbon release could travel if left unmitigated and depending on the weather and ocean conditions at the time of the release. This means in the highly unlikely event a hydrocarbon release does occur, the whole EMBA will not be affected.

We want to hear from you

If you are an individual, organisation or community group and believe your functions, interests or activities may be impacted by our activities, we would like to hear from you by **Wednesday, 29 March 2024.**



Want to know more or provide input?

A feedback form and more information can be found at:
www.woodside.com/what-we-do/consultation-activities

You can also subscribe via our website to receive future information on upcoming activities.

E: Feedback@woodside.com
Toll free: 1800 442 977
woodside.com

Woodside Energy

4.1 The National Indigenous Times (26 February 2024)

Professor Andrew Gunstone.

Allies must be brave & push back

ANDREW GUNSTONE

On January 26, I had my most confronting speaking experience in more than three decades.

I had accepted an invitation from the Anglesea Lions Club to be a keynote speaker at their event.

I advised I would speak on "truth-telling" and provided information on my roles — including co-chair of Reconciliation Victoria and associate deputy vice- chancellor reconciliation at Federation University — and sent links to some of my publications written over several decades.

It was very clear what I would speak about.

I arrived looking forward to having some engaging conversations about truth-telling and reconciliation. Instead, midway through my speech, when I mentioned the word "invasion", many in the audience started aggressively booing and heckling me. These comments included "p... off", "shut up", and "f... off", and were so loud I was forced to halt my speech.

I was even more shocked, though, at the complete lack of support from the club. Rather than explaining to the audience I was an invited speaker, speaking on my area of expertise, and that they could either listen to me or leave, the club's president instead told me I could not continue my speech.

Even more concerningly, he pulled me from the microphone.

As I walked off the stage, I continued to be loudly booed and heckled. I was concerned for my personal safety, with people screaming at me from close quarters.

At no time during this ordeal did anyone from the club intervene to protect me by telling the audience to stop their appalling behaviour.

While several people approached me later, including members of the Anglesea Lions Club, to privately apologise for the actions of the crowd and the club's president, the only person who made a public apology was Peter Yates AM, the other keynote speaker. It was disappointing, though, that none of these people who apologised to me afterwards supported me at the time the crowd and organisers were preventing me from speaking. The club president also later came up to me to apologise for grabbing my arm, but then criticised me for being "political" by using the word "invasion".

This claim was repeated by him, and also made by the local Liberal MP, in news articles. What they both failed to understand, though, was I was not being "political", but simply stating the truth.

"Political", along with "woke", is often used to try to shut down discussions on truth-telling. There have been three news articles about this event. Only the first reached out to me for comment. Of the other two, one included several quotes from the local Liberal State MP, and the second was written by a journalist.

Despite both being at the event, neither talked to me, but instead made hurtful and inaccurate claims, minimised the crowd and organisers' behaviour, and sensationalised rather than sought understanding.

It is important to position this specific event in Anglesea within a broader context.

Several behaviours demonstrated at this event — racism, exclusion, silencing, violence, bystander apathy, white privilege, and white fragility — are directed towards Indigenous peoples every day of the year, very often in far, far worse circumstances.

Non-Indigenous allies must genuinely increase our efforts to strongly advocate against these disgusting, appalling practices. Further, these disgraceful behaviours have considerably worsened following the First Nations Voice to Parliament referendum in October. The Anglesea event is but one example of a clearly observable trend whereby many non-Indigenous opponents of the Voice are trying to create momentum from the referendum defeat to push back against hard-won transformational gains made over the past several decades in reconciliation, truth, and justice.

Local governments are abolishing Welcomes to Country and Acknowledgements of Country.

State political parties are backflipping on previous commitments to engage with treaties and truth-telling.

Patriotic fervour is being whipped up against any organisations that fail to jingoistically support "Australia Day".

Appalling levels of structural and individual racism towards Indigenous peoples, both online and in person, continue to increase.

Indigenous peoples across the country are undertaking inspirational and transformational work on Voice, Treaty, and Truth, including the First Peoples Assembly of Victoria with Treaty, and the Yoorrook Justice Commission with truth-telling.

This extraordinary work, though, along with our ongoing national reconciliation journey, is under considerable threat from these racist and divisive practices.

I strongly urge all non-Indigenous allies to genuinely help push back against these practices, and continue to have brave conversations about reconciliation, truth, and justice.

Professor Andrew Gunstone is a leading authority on reconciliation. He is associate deputy vice-chancellor reconciliation and Professor of Indigenous Studies at Federation University, where he established and leads the National Centre for Reconciliation, Truth, and Justice. He is also co-chair of Reconciliation Victoria and sits on several national reconciliation committees.

4.2 The Koori Mail (28 February 2024)

news

Aurukun honours top citizens

KOOLKAN Aurukun State School principal Baressa Frazer was awarded the Aurukun Citizen of the Year and Police Liaison Officer Chantelle Walmbeng was awarded Junior Citizen of the Year at a ceremony in the community on February 17.

Aurukun Mayor Keri Tamwoy said the annual Aurukun Shire Council awards recognised people who had shown community leadership for the Wik, Wik Waya and Kugu people.

"I congratulate Baressa and Chantelle who are outstanding role models for the youth of Aurukun and are determined that our younger generation will have a better future on their homelands," Mayor Tamwoy said.

"Baressa is a strong, elegant and passionate Wik woman who is a tireless advocate for Aurukun's children.

"She has returned to her community to lead local education as the principal of Koolkan Aurukun State School where she connects teachers and employees to culture and community.

Koolkan Aurukun State School principal Baressa Frazer.

Aurukun's Young Citizen of the Year Chanelle Walmbeng receives her award from Deputy Mayor Craig Koomeeta.

Passion

"Her passion and knowledge of culture, language and community is invaluable, and she teaches both children and adults with a gentle strength.

"Baressa has researched, designed and is implementing a Wik pedagogy at Koolkan Aurukun State School, collaborating with the Language Group, Elders and the APN Rangers to bring this theory into action.

"The work is monumental and is creating a pathway for Aurukun students to successfully learn while keeping their culture alive.

"Chantelle was an active founding member of the PCYC Kang Kang Youth Leadership team where she volunteered her time and was a part of many community initiatives.

"She became the Police Liaison Officer for PCYC Aurukun in March 2023 while completing Year 12, becoming the youngest PLO in Queensland.

"In this role Chantelle has demonstrated a commitment to learn and shows up every day for work on time.

"In her free time she has been attending Koolkan Aurukun State School to assist in the mornings and to support the young people of Aurukun in achieving an education.

"The young leader is speaking at the Say NO to Domestic Violence conference in Cairns this month about her life experiences and the support to reduce domestic violence in the community.

"Chantelle's leadership and willingness to take on new challenges such as the Bronze Duke of Edinburgh Award will ensure she is a force for change in the Aurukun community for years to come."

4.3 The North West Telegraph (28 February 2024)

NORTH WEST Telegraph
Wednesday, February 28, 2024
northwesttelegraph.com.au

AMA backing for Kimberley stance on drink register

SARAH CRAWFORD

WA's peak body for doctors has backed the Kimberley's biggest primary healthcare provider that has decided to not refer patients to the Banned Drinkers Register against their will.

Australian Medical Association WA president Michael Page said he supported, "in general" the stance by Kimberley Aboriginal Medical Service to not refer patients to the BDR.

"Fundamentally our view is that the role of the doctor is to provide judgment-free care and patients should be safe in the knowledge that anything they share with the doctors will be kept confidential," Dr Page said.

"If patients are not secure in the knowledge that the relationship they have with their doctor is sacrosanct it undermines our practice. I think that would be bad for the health of the community."

A revamped BDR was introduced to parts of regional WA in December and gave new powers to police, medical practitioners and social workers to refer people on to the BDR which prohibits them from purchasing takeaway alcohol for three months or more.

Latest figures show 843 people have been placed on the BDR in the Kimberley, Goldfields, Pilbara, Carnarvon and Gascoyne Junction.

Police have placed 586 people on the BDR for alcohol-related offences while a further 257 Banned Drinking Orders have been issued by the Director of Liquor Licensing through barring notices, prohibition orders and voluntary referrals. However, no doctor or social worker has so far referred a patient to Liquor Licensing for a BDO.

Dr Page said there had been "very little to no consultation" with the medical profession before the legislation was introduced. "There are very few if any genuine medical reasons that someone would need to go on a register like that. It is a very heavy-handed way of treating what is a medical problem," he said.

Meanwhile KAMS medical director Dr Lorraine Anderson questioned if Aboriginal people were being disproportionately targeted by the BDR because they were more likely to socialise and drink in public and therefore attract the attention of police.

Dr Anderson stopped short of saying the BDR was racist but said it did not reflect the real nature of problem drinking.

"We are talking about banned drinkers being a reflection of the population of the Kimberley, but we know that's not right. This is targeting the people who are sitting outside and drinking where people can see them and that's, on average, that is the Aboriginal people of the Kimberley."

Dr Anderson said KAMS did not oppose alcohol restriction but that alone was not the answer.

"If if there's a Banned Drinkers Register, it needs to be backed up with a whole pile of infrastructure and a whole pile of money that goes with preventing people from having withdrawals from alcohol," she said.

Kimberley Aboriginal Medical Service director Dr Lorraine Anderson.

Dr Anderson said current alcohol and drug services were already over-stretched including Broome-based Milliya Rumurra, which has 22 beds but needs 12 more to keep up with demand.

"Forget about the Banned Drinkers Register they are already operating at capacity," she said.

"They need funding for more beds, they need capital funding for a bigger building and ongoing funding to run the rehab and provide wrap-around support. They are well-placed to be able to provide low to medium-level detox services but they need the funding to do it."

The Broome Advertiser recently reported on a woman placed on the BDR who had resorted to drinking hand sanitiser because she not buy alcohol.

Minister for Racing and Gaming Paul Papalia said the Government was working on a suite of strategies to combat the problem.

4.4 The Pilbara News (28 February 2024)

Pilbara NEWS
Wednesday, February 28, 2024
pilbaranews.com.au

New digital newspaper, out Nightly

Seven West Media has this week launched Australia's new national digital newspaper, The Nightly.

With a focus on politics and business, The Nightly will be free and publish each weeknight at 6pm AEDT. It will also have a 24/7 news website and app with breaking news alerts and subscriber emails.

SWM WA chief executive Maryna Fewster said the landmark digital news platform would bring quality journalism to Australians for free.

Run from WA and using our time difference, it will have the full backing of the media company, with contributors including Seven stars such as David Koch, Mark Riley, Michael Usher and Gemma Acton.

Sporting stars including AFL great Leigh Matthews and cricketing icons Justin Langer and Mitchell Johnson, will also write for The Nightly.

In an Australian first, every edition of The Nightly's evening digital newspaper will feature two pages of content produced by editors of The New York Times International Report, a branded publication featuring the best articles from The New York Times. Ms Fewster said the free publication had been developed in response to a clear need.

www.thenightly.com.au

Previous Roebourne post shop licensee Garry Bailey retired after more than three decades at the helm. Picture: Pilbara News

NBAC bid to save service

SAM JONES

In a move aimed at preserving essential services for locals, Ngarliyarndu Bindirri Aboriginal Corporation has announced plans to take over the Roebourne post office service effective March 5.

The decision comes in the wake of the post shop's closure on February 28 due to the retirement of its licensee, leaving a void in vital services for Roebourne residents.

NBAC chief executive Francois Langlois told Ngaarda Media the post shop was a vital service for many in the community. "Our plan is to co-locate the post office counter next to our Centrelink offices in the front office and our office," he said.

"We need to do a little bit of refurbishment and redo some work to our premises before that can start.

"Australia Post has been very kind to us in relocating what they call a mobile van which will be able to operate the post office services for the next eight weeks or so until we're finalised and finish all the refurbishment we need to do in preparation for having everything within our premises."

The closure of the post office raised concerns in the community, given its role as a hub for various essential services.

Roebourne residents relied on the post office for banking services, purchasing pay-as-you-go electricity cards, mobile phone transactions, bill payments and receiving crucial government communications.

With the closure, many residents, particularly those less tech savvy, faced challenges accessing these services locally. The transition extends beyond preserving essential services.

NBAC, a 98 per cent self-funded organisation, aims to not only sustain the post office but also contribute to the local economy.

Through its social enterprises, Brida and Handy Hands, NBAC has created more than 200 local jobs, with Indigenous employees making up more than 55 per cent of the workforce. In the last eight years, NBAC has injected more than $60 million in wages directly into the City of Karratha.

4.5 The Australian (28 February 2024)

Putin 'ordered Navalny killed to prevent swap'

THOMAS GROVE

Russian opposition leader Alexei Navalny's death in an Arctic penal colony followed a proposal to trade him and two unnamed American citizens held by Moscow for a Russian hit man imprisoned in Germany, Navalny's foundation said on Monday.

In a video posted on the official YouTube channel of Navalny's Anti-Corruption Foundation, Maria Pevchikh, the group's head of investigations, said he was killed after Russian President Vladimir Putin became aware of the potential swap and acted to prevent it.

Ms Pevchikh said the foundation had been involved in efforts to win Navalny's freedom but didn't provide evidence to back her assertions in her seven-minute statement.

Among the US citizens being held in Russia are Wall Street Journal reporter Evan Gershkovich and former US marine Paul Whelan, both of whom have been designated as wrongfully detained by the US government, which has said it is working to negotiate their release.

Ms Pevchikh said Putin couldn't "tolerate Navalny being free". Navalny, who died on February 16, was Putin's most ardent critic and spent years investigating and exposing alleged corruption by the Kremlin elite. He had a large following across Russia.

US President Joe Biden has said Putin was responsible for Navalny's death, but the Kremlin has denied state involvement.

Kremlin spokesman Dmitry Peskov told the Financial Times that he wasn't aware of any swap agreement. Privately, US and German officials said they made no offer to Putin.

The Journal said in a statement: "We know the US government is taking the efforts to free Evan seriously, and we cannot comment further."

A Whelan family spokesman said he didn't have enough information to comment on what Navalny's foundation had said.

In an interview with former Fox News host Tucker Carlson earlier this month, Putin indicated that he was seeking a swap deal that would allow the repatriation of Vadim Krasikov, an agent of Russia's Federal Security Service, or FSB, who was convicted in 2021 of killing a Chechen dissident in Berlin. After Carlson asked about the possible return of Gershkovich, who was detained by FSB officers last year, Putin said he would consider a swap for an unnamed "patriot" who had killed "a bandit" in a European capital, widely seen as describing Krasikov.

Gershkovich, who was accredited as a foreign correspondent by Russia's Foreign Ministry at the time he was detained, has been held for nearly a year on an FSB allegation that he was engaged in espionage – an accusation the Journal, the US government and his family vehemently deny.

Mr Whelan, a corporate security executive has been held in Russia since late 2018 on espionage charges that he, his family and the US government also vehemently deny. He was convicted in 2020 and sentenced to serve 16 years in a penal colony.

"Putin was clearly told that the only way to get Krasikov is to exchange him for Navalny," Pevchikh said.

She said Putin decided "Since they are willing to offer Krasikov in principle, then I just need to get rid of the bargaining chip. Then offer someone else when the time comes." She said possible deals were being discussed since last year, and referenced a report in the Journal that said Navalny could be part of hostage-exchange talks with the Kremlin.

Pevchikh said she had information that on February 15, talks were in "their final stage". The next day, Russia's prison service said Navalny lost consciousness and later died after he had been let out of his cell in the prison known as Polar Wolf. Authorities later said he had died of natural causes.

On Monday, Navalny spokeswoman Kira Yarmysh said they were in the process of arranging a public memorial event for the politician. After Navalny's body was returned to his mother at the weekend, the question remains whether the Kremlin will allow a public outpouring of sentiment.

Navalny's foundation said the proposal to swap the opposition leader for Krasikov was taken to Putin by Roman Abramovich, a sanctioned Russian oligarch who has acted as a middleman in other prisoner exchanges between Russia and Ukraine.

THE WALLST JOURNAL

Sweden joins NATO, sending a clear message to Russia

GETTY IMAGES

A British soldier during a simulated attack in a NATO military exercise at Drawsko Pomorskie, Poland, on Monday

AFP

Hungarian Prime Minister Viktor Orban in parliament in Budapest; and Swedish leader Ulf Kristersson after the vote

ANNE BEADE
ANDRAS ROSTOVANYI
STOCKHOLM AND BUDAPEST

Hungary has ratified Sweden's bid to join NATO, clearing the final obstacle for an enlargement of the military alliance spurred by Russia's invasion of Ukraine.

The parliamentary vote ends more than a year of delays that left fellow NATO partners furious as Ukraine battled Russian troops.

Swedish Prime Minister Ulf Kristersson hailed a "historic day", while NATO chief Jens Stoltenberg said Sweden would make the alliance "stronger and safer".

Russia's invasion two years ago prompted Sweden and neighbouring Finland to apply to join the bloc, ending a longstanding stance of non-alignment in both countries.

Speaking about Russia's potential reaction at a press conference, Mr Kristersson said: "The only thing we can expect with any certainty is that they don't like Sweden becoming a member of NATO, nor Finland."

While Finland became the 31st member of the alliance last April, Sweden's bid had been held up. Turkey only ratified it last month. Overnight on Monday, Hungary finally followed, with 188 members of parliament voting in favour and six against Sweden's accession.

"Today is a historic day ... Sweden stands ready to shoulder its responsibility for Euro-Atlantic security," Mr Kristersson said on X. Mr Stoltenberg welcomed Sweden as the 32nd NATO ally, saying its "membership will make us all stronger and safer".

People in Sweden also cheered the approval. Jimmy Dahllöf, 35, said Sweden would be "safer ... bringing us closer to our European neighbours".

Earlier on Monday, Hungarian Prime Minister Viktor Orban had asked MPs to approve Sweden's bid. "The Swedish-Hungarian military co-operation and Sweden's accession to NATO will strengthen Hungary's security," he told parliament.

Only the far-right Our Homeland movement was against the ratification. Now that parliament has approved the Nordic nation's bid, the President is expected to sign it in the coming days. Sweden will then be invited to accede to the Washington Treaty and officially become NATO's 32nd member.

"Nordic countries will have a common defence for the first time in 500 years ... we remain friends, and we become allies", Mr Kristersson said.

Though repeatedly saying it supported Swedish membership in principle, Hungary kept prolonging the process by asking Stockholm to stop "vilifying" the Hungarian government. Budapest accused Swedish officials of being "keen to bash Hungary" on rule-of-law issues. After a meeting on Friday between Mr Orban and Mr Kristersson in Budapest, the nationalist Hungarian leader announced that the two had clarified "our mutual good intentions".

Hungary also signed a deal to acquire four Swedish-made fighter jets, expanding its existing fleet of 14 Jas-39 Gripen fighters.

After Russia's invasion of Ukraine, most NATO members were keen to quickly approve the membership bids of both Finland and Sweden. For Sweden, Ankara cited security concerns, before moving ahead with the ratification.

In Hungary's delay, some exports saw a strategy to wring concessions from Brussels to unlock billions of euros in frozen funds.

Others argued it underlined Mr Orban's closeness to the presidents of Russia and Turkey.

AFP

Macron doesn't exclude sending troops to Ukraine

PARIS: French President Emmanuel Macron on Monday announced new steps to boost Ukraine in its fight against the Russian invasion, saying not even the sending of Western ground troops was ruled out to achieve Europe's goal of defeating Moscow.

Speaking after hosting a meeting of two dozen European leaders to discuss Ukraine, Mr Macron painted a grim picture of a Russia whose positions he said were "hardening" both at home and on the battlefield.

"We are convinced that the defeat of Russia is indispensable to security and stability in Europe," he said.

Russia, he said, was showing a "more aggressive attitude not just in Ukraine but in general".

While there was "no consensus" on the sending of Western ground troops to Ukraine, "nothing should be excluded. We will do whatever it takes to ensure that Russia cannot win this war," he said.

Mr Macron said the new coalition would be set up to supply Ukraine with "missiles and bombs of medium and long range to carry out deep strikes".

There was a "broad consensus to do more and quicker", he added. "Nothing can be excluded to achieve our objective. Russia cannot win that war."

German Chancellor Olaf Scholz and Polish President Andrzej Duda were among some 25 European heads of state and government at the conference. Other states sent ministers, with Foreign Secretary David Cameron in Paris for Britain.

AFP

Milei bans they-them from military

BUENOS AIRES: The government of President Javier Milei, a conservative libertarian, has banned gender-inclusive language in Argentina's armed forces.

The purpose of the ban was to "eliminate incorrect language use which can lead to misinterpretation ... affecting the execution of orders and the conduct of military operations," said a resolution published on the defence ministry's X account.

So-called inclusive language was never officially approved in the military, but in 2020 then defence minister Agustin Rossi vowed the government would not disregard "cultural changes in gender relations." This led to such unofficial distinctions as "soldado" for male members of the military and "soldada" for female ones, in line with the Spanish language rule of attaching a gender to every noun – with words ending in "o" generally masculine and in "a" feminine.

There has been a recent trend in Spanish-speaking countries towards more gender inclusive language, for example in the use of plural nouns which are masculine even if a group is composed of mixed genders – think "amigos" (friends) now often referred to as "amig@s" or "amigxs."

The new government directive states that in the military, Spanish must be used "according to the rules fixed by the Royal Spanish Academy and the regulations and manuals in force in the armed forces".

Mr Milei who has described himself as an ultra-libertarian "anarcho-capitalist", holds conservative stances on issues such as abortion and climate change.

He has railed against so-called "gender ideology," a term loosely used by conservatives worldwide to oppose same-sex social rights, abortion and transgender rights. His government has shut down its anti-discrimination agency.

AFP

Anger as Dior runs from HK catwalk

RICHARD LLOYD PARRY

Christian Dior has cancelled a catwalk show in Hong Kong, in another blow to the territory's efforts to re-establish itself as a business and cultural destination following anti-government protests, the arrest of democracy activists and economic difficulties in China.

The fashion show to be held on March 23 at the site of Hong Kong's old airport, Kai Tak, was "indefinitely postponed" on Friday.

"We have just received notification from the organiser that the event will be postponed," a government spokesperson told Reuters. "Postponements of large-scale events often happen. We continue to welcome large-scale events to be held in Hong Kong."

But with no new date set, the abrupt change of plan suggests a loss of confidence by a major luxury brand at a time when Hong Kong's pro-Beijing government is trying to return to normal after five years of political tumult and the pandemic.

Although no reason was given for the cancellation, Dior has had a chequered past with China. Last year it was accused of being racially insensitive after a model using her fingers to pull back her left eye, which was widely interpreted as a "slanted-eye pose".

"If Dior truly respects the Asia market, it should have the basic respect and humbleness, instead of trying to weather publicity crises by pretending it didn't know," state newspaper Global Times said in an editorial. "Such an attitude will eventually cause irreparable damage to its reputation. We hope Dior can face the mistake and give a sincere apology and response to the Asian society and make some clear explanations how it would prevent similar mistakes in the future."

'It's like Hong Kong is being fooled. This will generate a lot of speculation'

DOREEN KONG
HONG KONG POLITICIAN

The crisis came less than two years after Dior angered the Chinese market by running a photo featuring a stern-looking Asian woman with a Dior bag. Critics said then the woman had "spooky eyes" and a "gloomy face". Chinese photographer Chen Man apologised for her "lack of consideration", and Dior, which removed the photo, said it had always respected the feelings of the Chinese people.

Dior was also accused of cultural appropriation when it introduced a skirt and claimed it was an original creation even though it resembled a traditional Chinese design, drawing protests from Chinese consumers.

In November, Louis Vuitton held a similar show for 1000 guests. The Dior show was meant to have been on a similar scale, and to have presented the brand's men's autumn collection designed by Kim Jones, its artistic director.

It had been presented by the government as one of 80 "mega events" intended to impart "joy and pride" to Hongkongers and to increase the territory's prominence as a business and tourist destination, following the pandemic and the suppression of political opposition under the National Security Law.

This month another event in the program, a friendly match featuring Inter Miami football team, ended in anger and controversy after Lionel Messi, the team's main attraction, failed to take part in a match.

Fans paid as much as $HK4880 ($955) for tickets for the game, which was promoted using Messi's image. But after he was ruled out on ground of injury the club's owner, David Beckham, was booed by a jeering crowd.

"Why would there be a delay at such a critical moment?" Hong Kong politician Doreen Kong said to the South China Morning Post of the Dior show.

"The lack of an explanation is not good for Hong Kong. It's like Hong Kong is being fooled. This will generate a lot of speculation. If Hong Kong wants to be a hub of mega events but they are all postponed or the stars don't make an appearance, who will visit Hong Kong for its events?"

THE TIMES

4.6 The West Australian (28 February 2024)

Robert and Penelope King are building their son Julian a granny flat at their home in Claremont.
Picture: Ian Munro

WHY NEW BUILDING BOOST IS A GRAN SLAM

EXCLUSIVE JAKE DIETSCH

Interest in granny flats has exploded, with inquiries increasing 500 per cent since the State Government relaxed rules about building them in a bid to tackle Perth's housing shortage.

Planning Minister John Carey last month announced granny flats will, from April, no longer require council planning approval, can be built on blocks smaller than 350sqm and will be allowed on homes with strata titles.

Council-issued building permits to ensure safety must still be obtained.

Granny Flats WA managing director Mike Nicholls said there had already been uptick of "at least 500 per cent" in inquiries, with 300 per cent the usual number of people signing contracts.

"People who had expressed interest but were concerned about the approval process time, have now been buoyed by the thought that it could be a much faster turnaround," Mr Nicholls said.

"There were perceived barriers and those announcements did spur people towards making the decision to build a granny flat where previously they thought they couldn't."

Mr Nicholls said his company was looking at increasing builds from 80 to 250 a year in the next 12 months — and would hire more staff to do so.

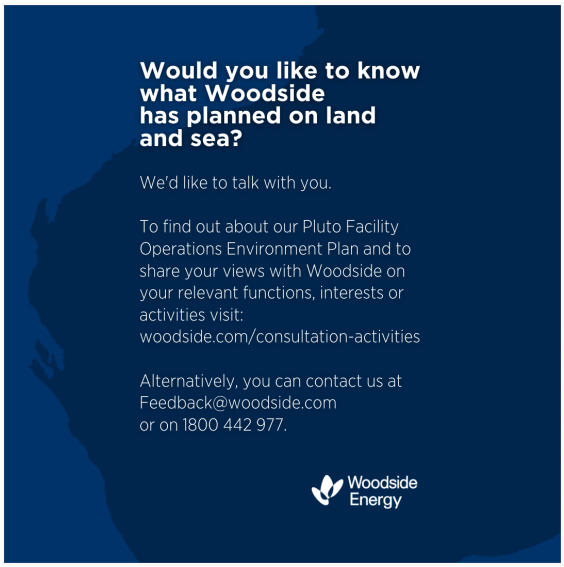
The changes allowing homes with strata to have granny flats and rent them out had especially fuelled demand, he said.

"There has also been a lot of inquiries from people looking

SOCIAL MEDIA

4.7 Facebook tile

4.8 Instagram tile

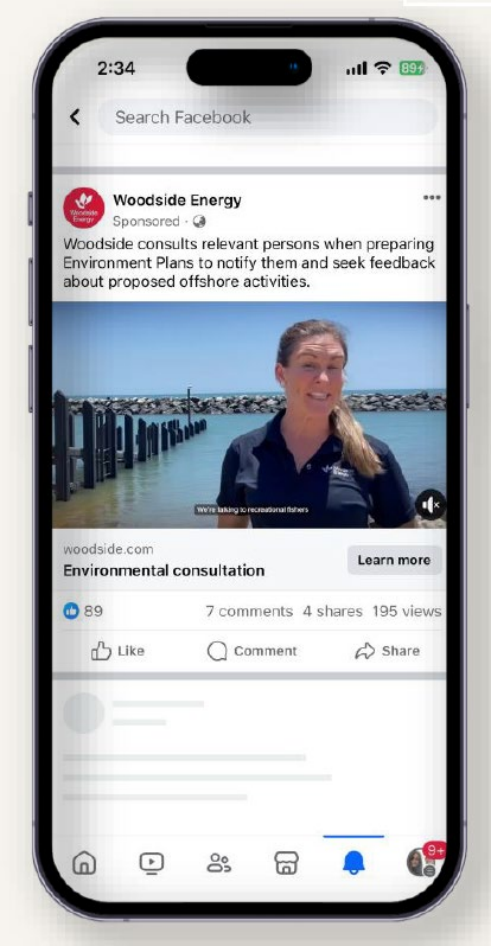


4.9 Social media campaign results

Placement	Impressions	Reach	Frequency	Clicks	CTR
Facebook	823,073	225,402	3.22x	1,554	0.16%
Instagram	309,273	116,860	2.65x	229	0.07%
Total	**1,132,346**	**334,460**	**3.39x**	**1,783**	**0.16%**

4.10 Are you a Relevant Person Social Media Campaign

Are you a Relevant Person Facebook and Instagram - October 2023 onwards



Are you a relevant person?

You may be a relevant person if you or your organisation have functions, interests, or activities that may be affected by an offshore petroleum activity proposed under an environment plan. Watch the short clips below to find out more.

5. COMMUNITY ENGAGEMENT

5.1 Roebourne, Karratha and Dampier Roadshow (22 March – 24 March 2024)

Location	Roebourne, Karratha and Dampier Roadshow
Activity	Community information sessions
Location	22 March 2024 - Woodside Roebourne office 23 March 2024 - Karratha Shopping Centre 24 March 2024 - Dampier Beachside Markets
Date	22 - 24 March 2024
Description of the consultation	Woodside hosted community consultation sessions in Roebourne, Karratha and Dampier to enable community members to understand Woodside's proposed activities and how it may affect them, ask questions, and provide their feedback. Woodside Corporate Affairs, First Nations and Environment representatives were available to answer questions. A number of Environment Plan Consultation Information Sheets were available to attendees including the Pluto Facility Operations Environmental Plan Consultation Information Sheet. An iPad with consultation/feedback subscription prompt was made available with approximately 12 signs people subscribing.
Advertising and invitations	Woodside advertised the sessions to enable individuals to self-identify, become aware of the community consultation, and enable individuals to provide feedback on proposed activities, through the following: • Advertisement in the Pilbara News on 13 March and 20 March (Record of Consultation, reference 5.1.1). • Social - Geotargeted social media campaign advertising in Karratha (Reach 22,095), Port Hedland (reach 26,487), and Roebourne (reach 22,134) (+80 kms) from 6 to 16 September 2023 (Record of Consultation, reference 5.1.3). • Social - organic • An EP consultation banner with QR code (linked to the Consultation Activities page on the Woodside website), Scarborough Project banner were displayed stand along with current EP factsheets. • Hard copy posters were also put up at high traffic areas including Lo's Café in Karratha and the Ieramugadu Store Maya in Roebourne. (Record of Consultation, reference 5.1.2 and 5.1.5).
Estimated number of individuals / organisations consulted	Woodside spoke to many community members, recording 32 meaningful conversations. Over 500 community members (Dampier Community Association) attended the event
Summary of Feedback, Objection or Claim	
• General queries about employment and local content opportunities. • General interest in Pluto Train 2 progress and Scarborough project and trunkline location. • Comments on Red Dog Village accommodation. Woodside staff discussed that the average local economy spend was $120 per person, per week. • Positive commentary to see Woodside active in the community and good sentiment toward the company as a respected local employer. • Interest in taking further information such as the Karratha Community Update (newsletter) and EP newsletter (Let's Talk). Approximately 25 copies of each were distributed over the 3 days. • Woodside social investment activities and community funding opportunities. • Environment Plan awareness building with multiple conversations on "What is an Environment Plan?" and "What is an EMBA?".	

- Query around impacts to whales due to noise from drilling and seismic surveys. Woodside staff discussed whale migration research, vessel whale spotters and the controls that Woodside puts in place during drilling and seismic activities. Community member took consultation information sheets and was referred to the consultation page on the Woodside website for further information and opportunity to provide feedback.
- Query on the location of the Scarborough Energy Project and proximity to the Montebello Islands. Woodside staff discussed that the FPU would be located 201 km from the Montebello Marine Park using the potential risks and controls as per the Scarborough Trunkline Operations (State Waters) Environment Plan consultation information sheet.
- General comment on climate change and the impacts from fossil fuels. Woodside staff advised that Woodside are working on emissions reduction and new energy options including solar power and carbon capture.
- Comment from a Woodside employee partner about Karratha Gas Plant hosting a family day for employees.

Woodside Energy's Assessment of Merits of Feedback, Objection or Claim and its Response

Whilst feedback was received, there were no objections or claims.
The community information sessions were part of Woodside's broader consultation approach to enable self-identification, and provide relevant persons with the opportunity to assess any impacts on their functions, interests or activities, and provide feedback on proposed activities, which is consistent with the intended outcome of consultation (see **Section 5.2**).

5.1.1 Pilbara News (13 and 20 March 2024)

Chance to argue case in political processes

The duo at WA's Parliament House.

KATYA MINNS

Young people in the Pilbara are being called to become the next generation of youth leaders in an opportunity to represent their electorate and participate in democratic processes.

In its 29th year, the 2024 Y WA Youth Parliament program has opened applications for people aged 15-25 who wish to gain experience in government and policy development.

Participants will have the opportunity to draft, debate and advocate for mock youth-focused legislation on topics they're passionate about and present to Members of Parliament.

In 2023, Port Hedland local Erin Hayes joined Karratha's Emer O'Brien to represent the Pilbara electorate, travelling to Perth to present their Bill focusing on sex-based discrimination. "I was in the women's committee and we wrote a Bill on education and health reform talking about menstrual justice, such as providing free period products at a higher standard than what we currently have, and menstrual leave," Ms Hayes said.

"It's an apolitical program so you don't have to express what side of politics you're on, you're more focused on the issues that you're passionate about.

"It's kind of like a really respectful way to have debates."

After first hearing about the program through a teacher's forum at the school where she taught politics, Ms Hayes applied for the 2023 Y WA Youth Parliament and encourages other young people to do the same.

"It was amazing, I got to meet people that were like-minded and got to talk about things we're really passionate about," she said.

"It's given me more experience as I still want to work in politics in some aspects. I think it would be really great if more local people from the Pilbara could participate." More information on how to apply can be found on the Y's Youth Parliament website.

Applications close on March 24.

Emer O'Brien and Erin Hayes during the 2023 Y WA Youth Parliament.

Pilbara NEWS
Wednesday, March 20, 2024
pilbaranews.com.au

Monitoring upped at KHC

The Karratha Health Campus is among the hospitals trialling new security measures.

New 24/7 security support at campus

ROSS MCRAE

The Karratha Health Campus has been selected as one of the pilot sites for the WA Government's $434,000 investment in a state-of-the-art security hub for regional hospitals.

The new security hub, operating out of a State-wide CCTV operations room co-located within the WA Country Health Service Command Centre in Perth, will provide 24/7 real-time monitoring and support for some of the most isolated hospitals in regional WA, including Karratha.

It aims to enhance safety, deter anti-social behaviour, and provide greater support for frontline healthcare staff.

"Any kind of aggressive behaviour towards healthcare staff is completely unacceptable, and the State Government remains committed to doing all we can to keep staff safe at work," WA Health Minister Amber-Jade Sanderson said.

WACHS chief executive Jeff Moffet acknowledged the concerning rise in violence and aggressive incidents against healthcare workers in regional areas, with an average of two assaults a day occurring.

"It's important we continue to do all we can to keep staff and patients safe," he said.

WACHS noted that the pilot sites, such as Karratha, were chosen based on their overall risk profile for incidents at the site, local crime rates, proximity to immediate police response and isolation.

"This specialised technology will be operated around the clock by security specialists and will provide another layer of security for our frontline healthcare workers," Ms Sanderson said.

Mr Moffet said the new advanced security monitoring will complement existing measures such as on-the-ground CCTV, security personnel, duress alarms and access control systems.

Other pilot sites include Hedland, Kununurra, Meekatharra, Collie, Bridgetown and Halls Creek with further sites to be added throughout 2024.

The inclusion of Hedland Health Campus comes in the wake of a high-profile incident in July 2022, when an Aboriginal woman, who was a known suicide risk and had been receiving mental health treatment, took her own life inside the hospital after being left alone in a room, despite staff being aware of her high risk.

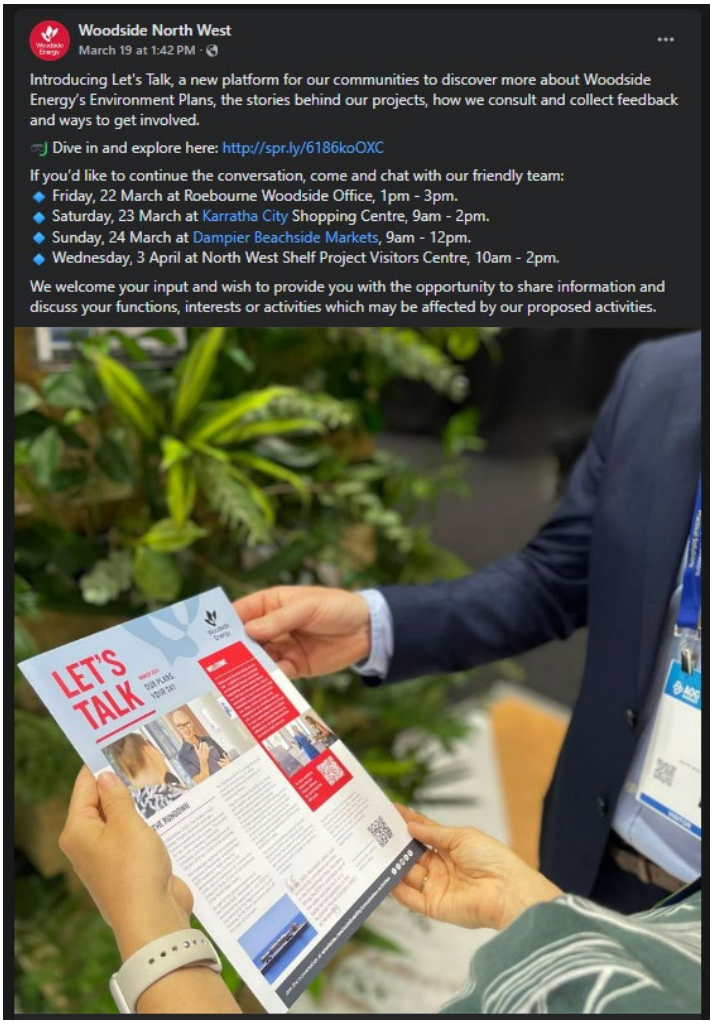
Rural Link AH mental health: 1800 552 002 (toll free) or 1800 720 101 (TTY)
Lifeline: 13 11 14


WACHS chief executive Jeff Moffet.


Health Minister Amber Jade Sanderson.

5.1.2 Poster promotion at Lo's Café (7 March 2024)

5.1.3 Social Media Campaign (19 – 30 March 2024)



Woodside North West
March 30 at 7:00 AM ·

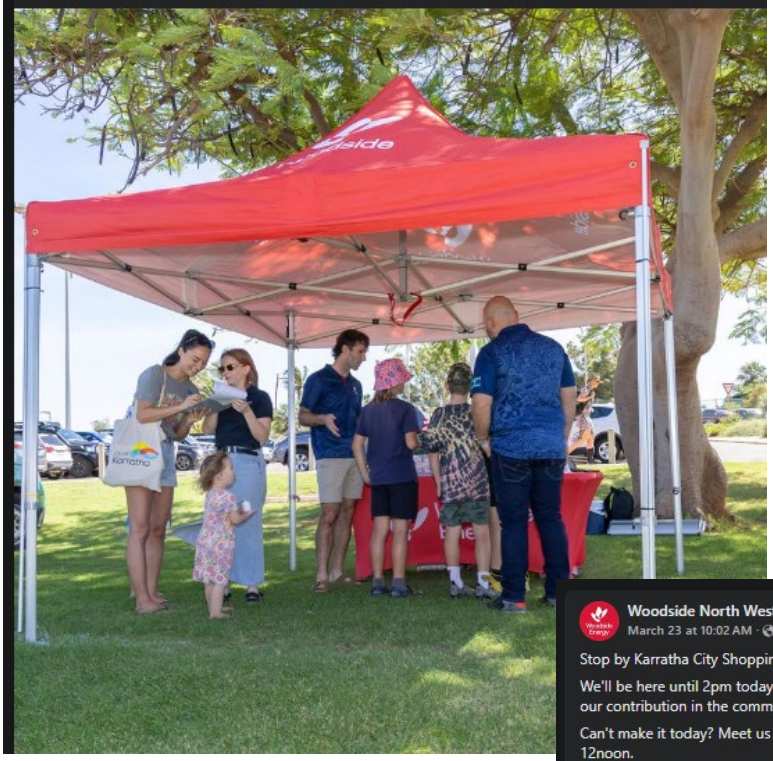
👀 Did you see us out and about last weekend?

We enjoyed chatting with many locals about our planned and proposed activities and operations, our community contribution and employment pathways.

If you have questions about our activities on land and sea, we will be at the North West Shelf Visitor Centre on Wednesday, April 3.

We welcome your input and wish to provide you with opportunities to share information and discuss your functions, activities or interests which may be affected by our proposed activities. Your information could assist us in developing our Environment Plans.

The North West Shelf Visitor Centre will be open from 10am - 2pm Tuesday to Friday these school holidays.



Woodside North West
March 23 at 10:02 AM ·

Stop by Karratha City Shopping Centre and say hello to our friendly team.

We'll be here until 2pm today to share information about our planned and proposed activities, our contribution in the community and employment pathways.

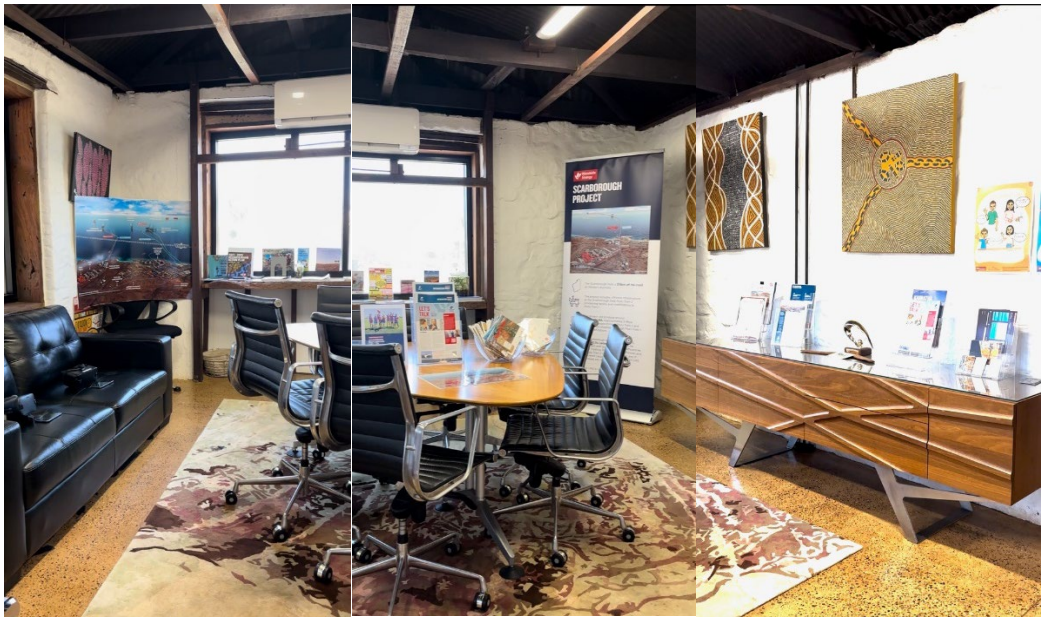
Can't make it today? Meet us at Dampier Beachside Markets tomorrow, Sunday 24 March 9am - 12noon.

We'd like to consult relevant persons in the course of preparing our Environment Plans to notify them, obtain their input and to assist Woodside to confirm current measures or identify additional measures, if any, that may be taken to lessen or avoid potential adverse effects of the proposed activity on the environment.

We welcome your input and wish to provide you with the opportunity to share information and discuss your functions, activities or interests which may be affected by our proposed projects.

5.1.4 Woodside Energy Roebourne Office (22 March 2024)

Inside:



Outside:

5.1.5 Poster promotion at Ieramugadu Store Maya (7 March 2024)

5.1.6 Karratha City Shopping Centre (23 March 2024)

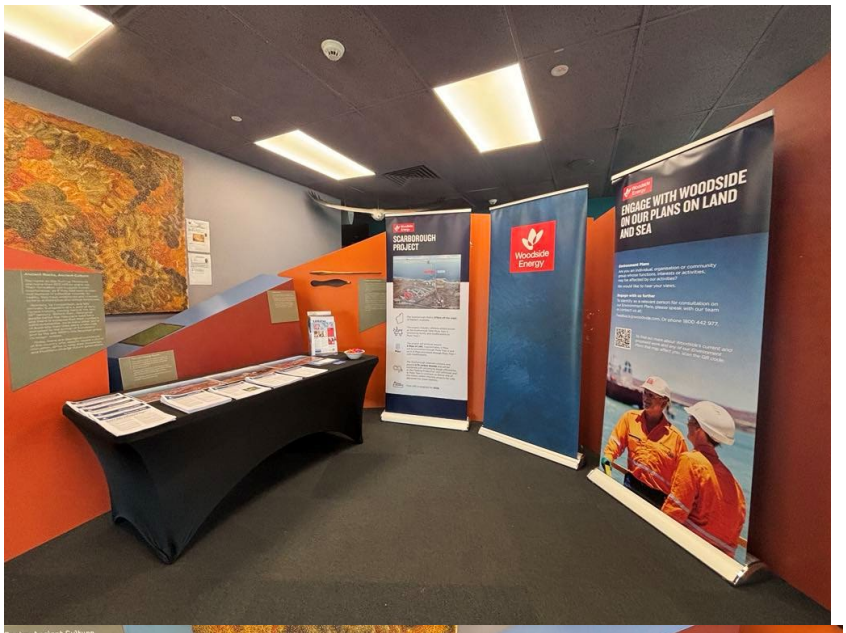
5.1.7 Dampier Seaside Markets (24 March 2024)

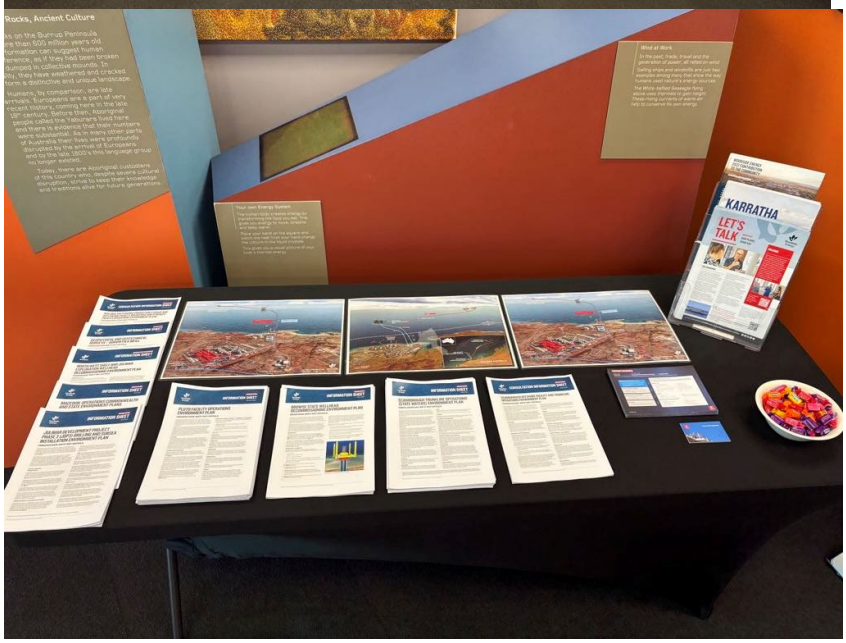
5.2 North West Shelf Visitor Centre (3 and 10 April 2024)

Location	North West Shelf Visitor Centre
Activity	Community information sessions
Location	North West Shelf Visitor Centre
Date	3 April 2024 and 10 April 2024
Description of the consultation	Woodside hosted community consultation at the North West Shelf Visitor to enable community members to understand Woodside's proposed activities and how it may affect them, ask questions, and provide their feedback. Woodside Corporate Affairs representatives were available to answer questions. A number of Environment Plan Consultation Information Sheets were available to attendees including the Pluto Facility Operations EP.
Advertising and invitations	Woodside advertised the sessions to enable individuals to self-identify, become aware of the community consultation, and enable individuals to provide feedback on proposed activities, through the following: • Social - organic • An EP consultation banner with QR code (linked to the Consultation Activities page on the Woodside website), Scarborough Project banner were displayed stand along with current EP factsheets.
Estimated number of individuals / organisations consulted	Woodside spoke to many community members, recording 7 meaningful conversations.
Summary of Feedback, Objection or Claim	
• General queries about gas production by Woodside operated Karratha Gas Plant. • Environment Plan awareness building with multiple conversations on "What is an Environment Plan?" and "What is an EMBA?". • Awareness of the Scarborough Energy Project with queries around location of the FPU, exclusion zones and impacts to marine life.	

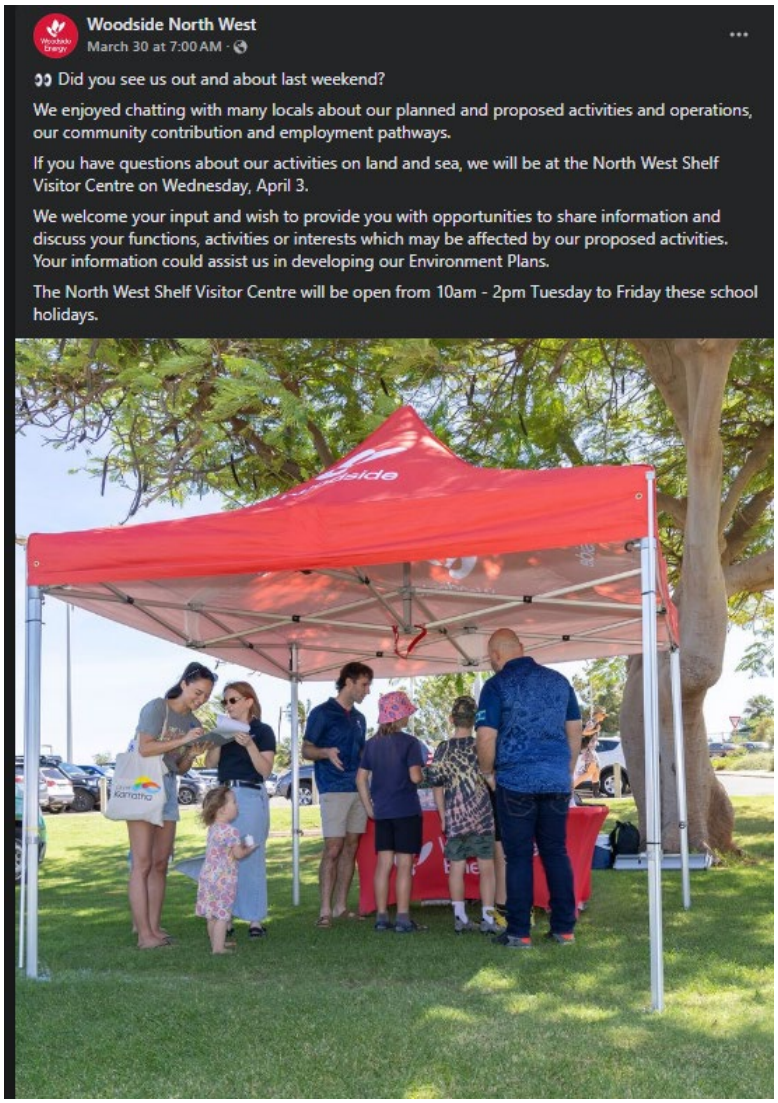
Woodside Energy's Assessment of Merits of Feedback, Objection or Claim and its Response
Whilst feedback was received, there were no objections or claims. The community information sessions were part of Woodside's broader consultation approach to enable self-identification, and provide relevant persons with the opportunity to assess any impacts on their functions, interests or activities, and provide feedback on proposed activities, which is consistent with the intended outcome of consultation (see **Section 5.2**).

5.2.1 North West Shelf Visitor Centre pop-up (3 April 2024)

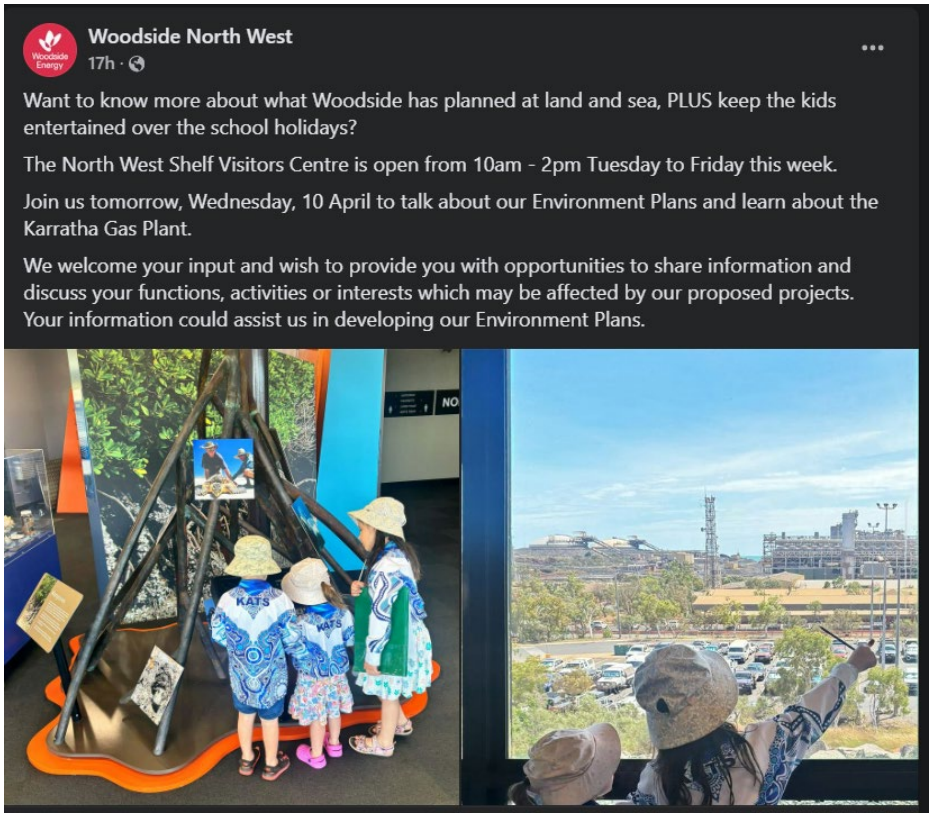




5.2.2 Facebook North West post (30 March 2024)



5.2.3 Facebook North West post (9 April 2024)



5.3 Dampier Beachside Markets (5 May 2024)

Location	Dampier
Activity	Dampier Beachside Markets
Date	5 May 2024
Description of the consultation	Woodside hosted a stand at the Dampier Beachside Markets a community event bringing together local businesses selling local products, a variety of food vendors and community groups. The stand was staffed by members from Woodside's Corporate Affairs and First Nations. Woodside displayed a QR code on the stand, linked to the consultation activities page of the Woodside website. A number of Environment Plan Consultation Information Sheets were available to attendees including the Pluto Facility Operations EP. An iPad with consultation/feedback subscription prompt was made available
Advertising and invitations	Woodside advertised the sessions to enable individuals to self-identify, become aware of the community consultation, and enable individuals to provide feedback on proposed activities, through the following: • Advertisement in the Pilbara News on 24 April and 1 May 2024 (**Appendix F, reference 5.3.1 and 5.3.2**). • Social media posts were published inviting public to attend on Woodside North West Facebook page (**Appendix F, reference 5.3.3 and 5.3.4**). • Advertisement was displayed on community noticeboard at Lo's Café, Karratha • An EP consultation banner with QR code (linked to the Consultation Activities page on the Woodside website), and Scarborough Project banner were displayed at Woodside's stand along with current EP factsheets. (**Appendix F, reference 5.3.6**).
Estimated number of	Over 1000 community members (Dampier Community Association) attended the event Woodside spoke to many community members, recording 10 meaningful conversations

individuals / organisations consulted	
Summary of Feedback, Objection or Claim	
• General queries around employment and volunteer opportunities. • General commentary from community members working at Woodside or on Woodside projects. All positive. • General interest in Browse progress and the future of gas in the energy transition. • Discussion with City of Karratha Councillors. • EP approval process discussed and why we want to talk to community.	
Woodside Energy's Assessment of Merits of Feedback, Objection or Claim and its Response	
Whilst feedback was received, there were no objections or claims. The community information sessions were part of Woodside's broader consultation approach to enable self-identification, and provide relevant persons with the opportunity to assess any impacts on their functions, interests or activities, and provide feedback on proposed activities, which is consistent with the intended outcome of consultation (see **Section 5.2**).	

5.3.1 Pilbara News (24 April 2024)

Pilbara NEWS
Wednesday, April 24, 2024
pilbaranews.com.au
NEWS 13

Woolies admits to underpaying

EMILY WOODS

Woolworths has lauded itself as an "exemplary employer" and "a model accused" in court as the supermarket giant admitted underpaying more than $1 million to about 1200 workers.

Two days after Woolworths' boss was threatened with jail for holding the Senate in contempt, the company faced Melbourne Magistrates Court where it pleaded guilty to more than 1000 charges.

Woolworths is facing a maximum penalty of more than $10 billion over the offending, prosecutors said last week. Barrister Kathleen Crennan, acting for the Wage Inspectorate Victoria, said the regulator was contacted in February 2022 by lawyers for Woolworths after it undertook a review of its payroll systems.

The supermarket chain discovered it was not paying some employees their long service leave entitlements after they left Woolworths, due to discrepancies in how those payments were being calculated.

Ms Crennan said the inspectorate investigated and found the underpayments occurred for former Woolworths and Woolstar workers on 3617 occasions between January 2020 and July 2022. The regulator took the case to court and charged Woolworths for those who were underpaid sums of more than $250, which resulted in about $1m in unpaid leave for 1227 former Victorian staff.

Woolworths' barrister Saul Holt KC admitted it was an "interesting week" to be discussing the supermarket in open court. "But Woolworths is much more than some headlines and a senate inquiry," he said.

He said Woolworths was described as "a model accused" by the prosecution, as it had self-reported and self-investigated the underpayments to the regulator.

"Woolworths is an exemplary employer," he said, adding it was a major employer of young people aged under 25.

Mr Holt said the proposed $10b maximum penalty was "extraordinary" and asked the magistrate not to dole out such a penalty as it could discourage other employers from self-reporting.

Woolworths has since paid back most of the underpaid after alerting them via text message, email and post, and paid those they could not get in contact with into their last known bank account, he said.

Magistrate Nahrain Warda asked why it took so long for Woolworths to discover the payroll issues, given it had changed systems in 2016. "Why is it not until 2020 that the testing is, in essence, to ensure there are no anomalies? One would think that would be ongoing," she said.

"Woolworths can't escape from the fact that over that period those anomalies were not picked up, that should not have occurred and would not have occurred now because we know more," Mr Holt replied. Woolworths will be sentenced April 24.

5.3.2 Pilbara News (1 May 2024)

4 NEWS pilbaranews.com.au Pilbara NEWS Wednesday, May 1, 2024


Gerry Georgatos.

Campaign to let children in care tell their stories

NATASHA CLARK

Suicide prevention expert Gerry Georgatos says it is critical that children in State care are allowed to share their stories with the public through the media.

The death by suicide of a 10-year-old Indigenous boy from the Kimberley in State care earlier this month has prompted Mr Georgatos to pioneer the Let Them Speak campaign.

"The power of the media is second to none; without it, we can't effect change," Mr Georgatos said.

"Governments cannot be swayed unless the narrative is in the public domain."

Under the Children and Community Services Act (2004), it is illegal to broadcast or publish anything that could identify any child who is, or has been, the subject of a protection order.

Though the 10-year-old's death has been widely reported, critical details, such as the child's name, cannot be revealed.

"We can't have deaths happening that we can't speak to, and we skirted the line with this one," Mr Georgatos said.

"We've come close to breaking the law by speaking with publications."

He has been working with the boy's grieving family every day since the loss of their beloved brother and son.

Mr Georgatos said the child's parents had returned clean drug and alcohol samples over the past year. Despite this, he had no contact with his parents for eight months before his death.

"As a suicide prevention researcher, I can argue that a year clean is a powerful protective factor," he said.

"The usual practice is to return kids to their families after the parents have returned clean drug and alcohol testing samples for three to six months.

> My focus is on keeping children safely at home, where this is possible. A recommendation to bring a child into the care of the State is only made as a last resort.
> Sabine Winton

"If that had happened in this case, at the six-month mark, that boy would still be alive today."

However, Early Child Protection and Prevention of Family and Domestic Violence Minister Sabine Winton said it would be inappropriate for a minister to provide comment on an individual case.

"The safety and wellbeing of children is always the highest priority of the Cook Government," she said.

"My focus is on keeping children safely at home, where this is possible.

"A recommendation to bring a child into the care of the State is only made as a last resort and a final decision rests with the Children's Court of Western Australia."

When asked for a response to demands by advocates that the Children and Community Services Act be reformed, Ms Winton said: "It is reviewed every five years."

For Mr Georgatos, the minister's response is unacceptable. He knows the ripple effect that publishing such stories can have.

In 2019, Mr Georgatos obtained permission from the then director-general of the Department of Communities, Michelle Andrews, for a young woman he was supporting, Tah-Shae, to share her experience of being placed in 72 foster homes in a 12-year period with the West Australian.

Tah-Shae detailed the sexual abuse, bullying and neglect she experienced while in State care.

The impact of her story sparked a wider public conversation about the merits of placing children, specifically Indigenous children, in State care.

"The impact of her telling her experiences while in care was an eye-opener to the dire circumstances many endure," Mr Georgatos said.

"Public consciousness gained insight. Without the public understanding (regarding) the gaps and unmet needs, there is less likelihood of addressing systemic disarray."

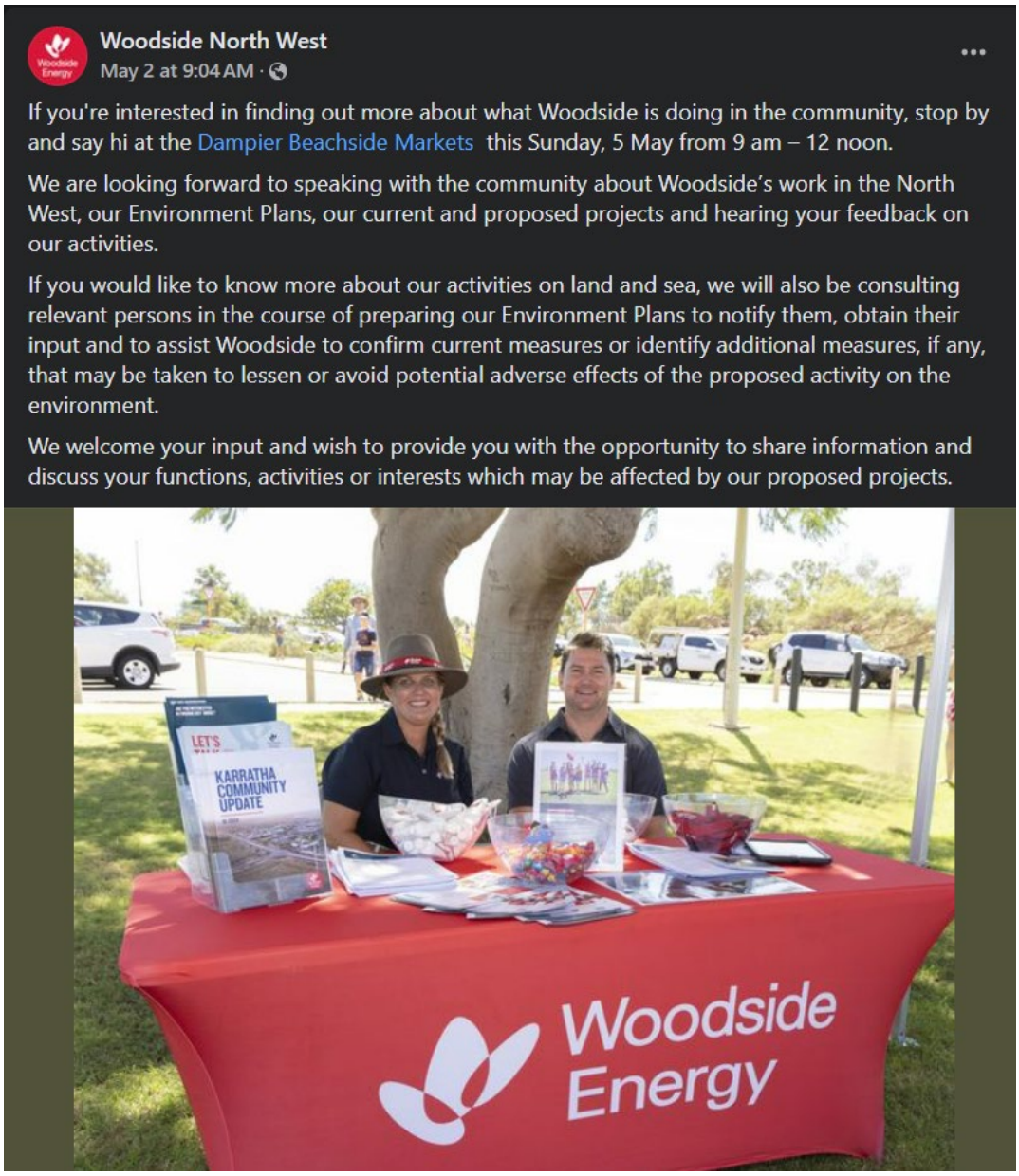
Mr Georgatos remains optimistic about his campaign to open up the State care system to more public scrutiny but admits it needs more support from powerful figures to gain traction.

"The Let Them Speak campaign is in its infancy but has begun," he said. "The next steps must be backed by a multitude of voices across the nation, calling for every State and Territory to reform their laws and guarantee unfettered rights for those affected to speak to the media.

"Everyone should be able to tell their story if they want to. I refuse to accept censorship by omission."

Lifeline 13 11 14

5.3.3 Social Media post (2 May 2024)



5.3.4 Social Media story (3 May 2024)

5.3.5 Lo's Cafe Community notice board (26 April 2024)

5.3.6 Market stand (5 May 2024)

5.4 Exmouth Community Markets (19 May 2024)

Location	**Exmouth**
Activity	**Community markets – Woodside stand**
Date	Sunday, 19 May 2024 (8am to 12pm)
Description of the consultation	Woodside hosted a stand at the Exmouth Community Markets, held at Federation Park. The stand was staffed by Woodside Environment and Corporate Affairs representatives. Woodside displayed a QR code on the stand, linked to the consultation activities page of the Woodside website. Woodside's 'Let's Talk' – a monthly information sheet on the company's Australian activities. In addition, information on the Scarborough Energy Project, Browse to NWS Project, Browse Carbon Capture and Storage (CCS) concept, Woodside's Climate Transition Action Plan, leaflets providing QR codes to Woodside's

	Annual Report and Sustainability , as well as our Reconciliation Action Plan were available. Environment Plan Consultation Information Sheets available to attendees included: • Pluto Facility Operations EP
Advertising and invitations	Woodside advertised the sessions to enable individuals to self-identify, become aware of the community consultation, and enable individuals to provide feedback on proposed activities, through the following: • Geotargeted social media campaign advertising in Exmouth and surrounding areas (+80 kms) from 4 May to 18 May. • Directly inviting local Community Liaison Group • An EP consultation banner with QR code (linked to the Consultation Activities page on the Woodside website) was displayed at Woodside's stand along with the EP factsheets and Project information sheets mentioned above. A selection of images are in this email.
Estimated number of individuals / organisations consulted	Over 300 people attended the markets. Woodside had meaningful conversations with approximately 30 people. These people identified as being Exmouth community members, visitors to Exmouth (residents of the East Coast of Australia, residents of Perth, residents of Karratha), and a few transient backpackers from various overseas locations.

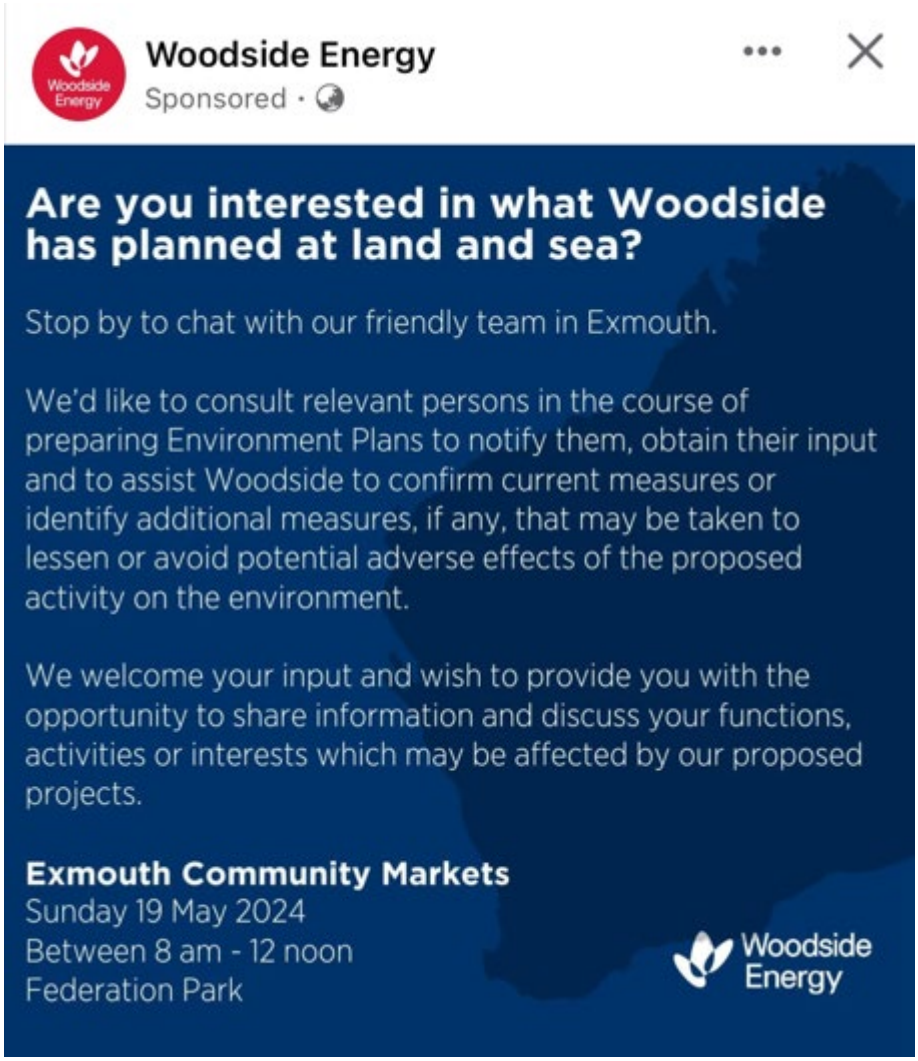
Summary of Feedback, Objection or Claim

- Community members were able to engage with Woodside representatives to understand the proposed activity and how it may affect them, ask questions, and provide their feedback.
- General interest in Woodside activities.
- No specific queries on the EPs.
- Stakeholders identifying themselves as Woodside shareholders interested in project updates, particularly on Scarborough, Browse to NWS Project, as well as the company's climate strategy and climate transition plans.
- Queries from Exmouth residents around employment and local content opportunities.
- General queries on the progress of the Scarborough Energy Project and Browse to North West Project, with two stakeholders seeking more information on Browse CCS
- Queries on Western Australia's domestic gas reservation policy and the existing domestic gas commitments for Woodside's activities.
- Concern from one Exmouth resident with business links to Eastern Australia over the costs of flights between Exmouth and the East Coast.
- General queries on the location of Woodside assets in relation to Exmouth and Woodside's footprint in Exmouth.
- Local residents interested in understanding current social investment programs and opportunities.
- Interest to understand how Woodside undertakes community consultation.
- A transient worker and an Exmouth local expressed a preference for the sunscreen giveaway to be made with reef-safe ingredients.(This feedback has been forwarded to the Woodside focal point)
- One stakeholder expressed their opposition to oil and gas and voiced a desire for companies like Woodside to invest in geo-thermal energy instead.

Woodside Energy's Assessment of Merits of Feedback, Objection or Claim and its Response

Whilst feedback was received, there were no specific objections or claims to a particular Woodside project or activity.

Objections to the resources industry was expressed by two stakeholders.
The community information sessions were part of Woodside's broader consultation approach to enable self-identification, and provide relevant persons with the opportunity to assess any impacts on their functions, interests or activities, and provide feedback on proposed activities, which is consistent with the intended outcome of consultation.

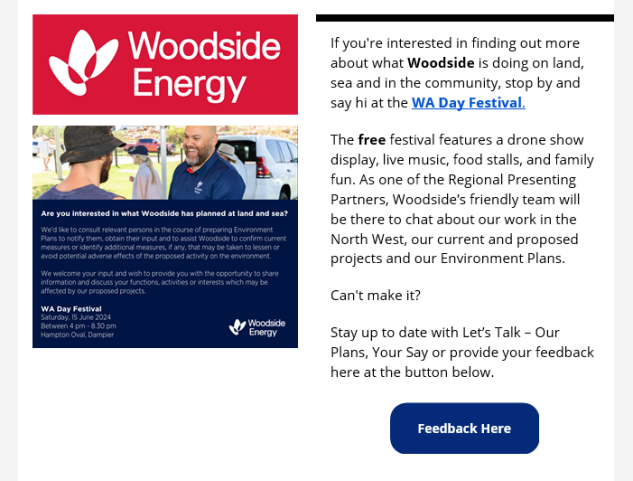


5.5 WA Day Festival (15 June 2024)

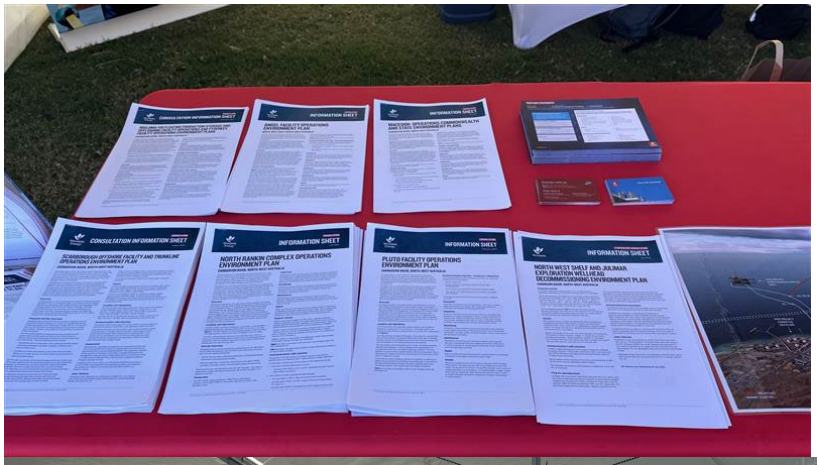
Location	Dampier
Activity	WA Day Festival
Date	15 June 2024
Description of the consultation	Woodside hosted a stand at the WA Day Festival organised by Celebrate WA. The event featured a drone show, food stalls, live music, sideshow stalls and interactive exhibits. The stand was staffed by members from Woodside's Corporate Affairs, First Nations and Environment team. Woodside displayed a QR code on the stand, linked to the consultation activities page of the Woodside website. A number of Environment Plan Consultation Information Sheets were available to attendees including the Pluto Facility Operations EP.
Advertising and invitations	Woodside advertised the sessions to enable individuals to self-identify, become aware of the community consultation, and enable individuals to provide feedback on proposed activities, through the following: • Advertisement in the KDCCI e-newsletter distributed 5 June 2024. • Social media posts were published inviting public to attend on Woodside North West Facebook page (**Appendix F, reference 5.4.1**). • Celebrate WA advertised the event via TV commercials, radio advertisement and in print. • An EP consultation banner with QR code (linked to the Consultation Activities page on the Woodside website) was displayed at Woodside's stand along with current EP factsheets. (**Appendix F, reference 5.4.2**).
Estimated number of individuals / organisations consulted	Over 2000 community members (Celebrate WA) attended the event. Woodside spoke to many community members, recording 15 meaningful conversations.
Summary of Feedback, Objection or Claim	
• General queries around employment and volunteer opportunities. • General positive commentary from community members working at Woodside or on Woodside projects.	

• General interest in Scarborough and Browse progress and the future of gas in the energy transition. • General query around tax contributions. • EP approval process discussed and why we want to talk to community. No concerns raised.
Woodside Energy's Assessment of Merits of Feedback, Objection or Claim and its Response
Whilst feedback was received, there were no objections or claims. The community information sessions were part of Woodside's broader consultation approach to enable self-identification, and provide relevant persons with the opportunity to assess any impacts on their functions, interests or activities, and provide feedback on proposed activities, which is consistent with the intended outcome of consultation (see **Section 5.2**).

5.5.1 Social media posts

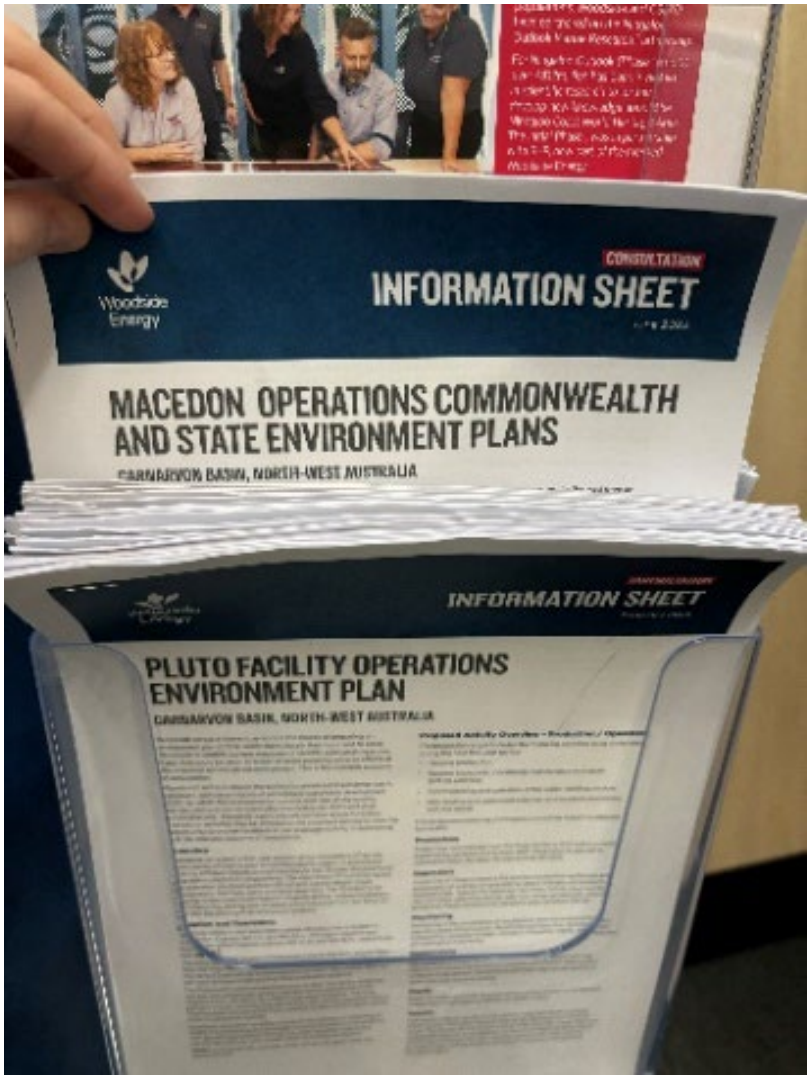


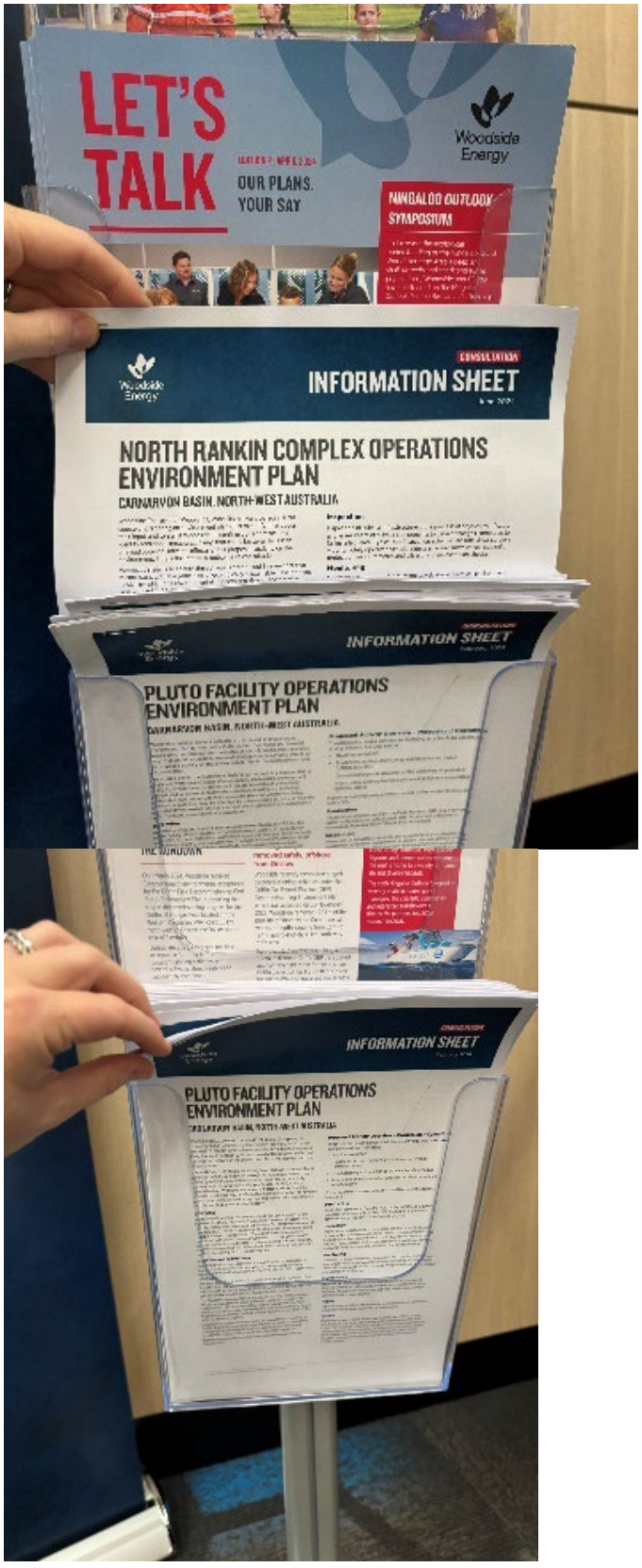
5.5.2 Market stand



5.6 Pilbara Summit (26-27 June 2024)

Location	Karratha
Activity	Pilbara Summit 2024
Date	25-26 June 2024
Description of the consultation	Woodside hosted a stand at Pilbara Summit 2024, a sold-out conference established to raise the profile of issues and opportunities in the Pilbara region. The event provides the opportunity for the Pilbara region's industry, investors, businesses, community, and government representatives to connect. The stand was staffed by members from Woodside's Corporate Affairs, Government Affairs, First Nations, Supply Chain and New Energy teams. Woodside displayed a QR code on the stand, linked to the Let's Talk EP newsletter on the Woodside consultation page of the website. A pull-up banner was on display focusing on engagement on our plans at land and sea with a QR code to the consultation page on the Woodside website. A number of Environment Plan Consultation Information Sheets were available to attendees including the Pluto Facility Operations EP.
Advertising and invitations	No advertising was undertaken. The Vice President for North West Shelf delivered a speech during the conference, which highlighted the important role the that Woodside will continue to play in the energy transition. In addition a presentative from Woodside's CCS team was part of a panel discussion on Decarbonisation – moving to net zero discussing the role of CCS, opportunities for growth, new business and the best approach to renewable and lower carbon industries. Attendees were invited to find out more about Woodside's projects, developments or environment plans by speaking team members on the Woodside conference stand or to visit Woodside's town office based in The Quarter.
Estimated number of individuals / organisations consulted	Over 600 people attended in person event over 2 days
Summary of Feedback, Objection or Claim • Approximately 10 conversations occurred around new energy opportunities and plans, local content, social investment, EMBAs (relating to EPs) and approvals in general. • No feedback was received regarding Woodside's Environment Plans.	
Woodside Energy's Assessment of Merits of Feedback, Objection or Claim and its Response	
This session forms part of Woodside's broader consultation approach to enable self-identification, and provide relevant persons with the opportunity to assess any impacts on their functions, interests or activities, and provide feedback on proposed activities, which is consistent with the intended outcome of consultation (see **Section 5.2** of the EP).	





5.7 Let's Talk – Our Plans, Your Say

Let's Talk Newsletter Hard Copy Distribution – March 2024 Edition

Date	Location	Event (if applicable)
28 February 2024	Karratha	KDCCI Business Breakfast
6 March 2024	Exmouth	Exmouth Chamber of Commerce and Industry office Exmouth Community Liaison Group
7 March 2024	Exmouth	Gascoyne Development Commission office Exmouth Shire office
8 March 2024	Karratha	KDCCI International Women's Day
13 – 15 March 2024	Perth	AOG Energy Conference
22-24 March 2024	Karratha, Dampier, Roebourne	Regional Woodside Environment Plan consultation roadshow
3 April 2024	Karratha	Employees at the Woodside Karratha Gas Plant
10 April 2024	Perth	Meeting with WAFIC
17 April 2024	Karratha	KDCCI Business After Hours
24 April 2024	Perth	Employees at the Woodside MY Building Woodside Annual General Meeting

LET'S TALK

MARCH 2024

OUR PLANS, YOUR SAY

Woodside Energy

WELCOME

Welcome to the first edition of Let's Talk – a platform to stay connected on Woodside Energy's Australian happenings and the stories behind our activities and operations. Dive in and explore to learn more about what Woodside has planned on land and sea; when, where and how we're engaging on our activities; and how you can provide feedback to us. If you or your organisation have functions, interests, or activities that may be affected by our planned activities, we want to hear from you.

To stay updated, subscribe for future editions click here or visit

www.woodside.com/what-we-do/consultation-activities

THE RUNDOWN

In December 2023, The Scarborough Energy Project received secondary Commonwealth environmental approvals for key offshore work scopes. The project is now well underway (over 50% complete) with the commencement of relevant offshore construction activities.

Woodside also received environmental approvals in November and December 2023 enabling in-field works for decommissioning activities at the Griffin (65 km northwest of Onslow) and Stybarrow fields (51 km to the northwest of the North West Cape).

As part of the decommissioning of the Enfield field, Woodside received environmental approvals in July 2023 for the removal of the Nganhurra riser turret mooring (RTM) from the permit area off the coast of Exmouth.

The Nganhurra RTM is a metal structure, about 83 metres long, on which Woodside previously moored an oil producing facility.

The RTM allowed the facility to rotate with weather while moored and also brought subsea production lines from the Enfield oil field to a Floating Production Storage and Offloading facility. Enfield ceased production in November 2018 and the RTM was removed as part of decommissioning activities at the field, which also included the permanent plugging and abandonment of 18 former production wells.

The decommissioning concept for the Nganhurra RTM was matured over more than two years of careful planning and detailed engineering, undertaken in conjunction with a range of specialist contractors.

> In late 2023, Woodside safely and successfully completed activities in the Environment Plan, including lifting the RTM in one piece out of the water and placing it on a barge for transportation to the Australian Marine Complex (AMC) at Henderson.

The RTM is now in its final stages of deconstruction at the AMC, expected to be completed by April 2024. More than 95% of the Nganhurra RTM will be recycled or re-used, supporting local employment and contracting opportunities.

Click here to view the safe removal of Nganhurra Riser Turret Mooring

Join the conversation at **woodside.com/sustainability/consultation-activities**

LET'S TALK

TALKING POINT

Woodside safely completes marine survey

A marine seismic survey conducted by Woodside Energy in December 2023 applied controls to avoid interaction with whales as part of the environment planning process.

Once the Environment Plan for the activity was accepted by the Regulator, Woodside conducted the survey from 2 December to 31 December 2023.

The survey was undertaken with a range of standard and project-specific controls designed to reduce interactions with marine fauna including a dedicated spotter vessel with trained Marine Fauna Observers operating during daylight hours and the use of a Passive Acoustic Monitoring system to detect the presence of vocalising whales.

A shut down zone was in place for whales detected within 2 km of the acoustic source and for sea turtles spotted within 100 m of the acoustic source.

There were also specific controls in place relating to whale species of potential cultural significance, such as pygmy blue whales and humpback whales.

This included an extended 'limits of visibility' shutdown zone if these whale species or large unidentified whales were detected by observers, within their limits of vision.

Weekly project update reports were published on the Woodside website during the survey to provide information on cetacean or marine turtle observations. These reports confirmed that marine fauna continued to move through the area during the survey. They also confirmed that no pygmy blue whale or sea turtles were sighted during the survey.

COMMUNITY SPOTLIGHT

The Scarborough Energy Project

The Scarborough Energy Project will provide a boost to the WA economy and communities, growing jobs and bringing work through the supply chain, with a focus on the Pilbara region.

A second processing train, Pluto Train 2, is being constructed within the existing Pluto LNG facility located near Karratha in the Pilbara Region of Western Australia and is currently set to process about five million tonnes per annum of Scarborough gas. The project is providing various opportunities for local businesses in Karratha. To date, with collaboration from Woodside's construction partner Bechtel, the Scarborough Energy Project has injected more than $90 million locally and contracted over 65 Karratha businesses.

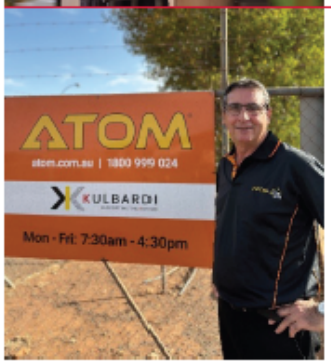
Local business spotlight: ATOM

We're spotlighting local, family-owned business: ATOM. The company name stands for Aqua Terra Oil & Mineral. ATOM has recently been contracted to supply industrial consumables, safety supplies and personal protective equipment products for the Pluto Train 2 construction.

ATOM believes locals serve locals best which is why its 22 employees supporting the project are all local to Karratha. Nearly half of the team are female and there is one Indigenous employee.

The contract has supported ATOM to expand its workforce increasing local employment opportunities.

Terry Klowss, Bechtel's Site Manager for Pluto Train 2 said, "ATOM's 100% local workforce helps us ensure our partnerships are benefiting local people – this is something that is very important to us at Bechtel."



> "Long-term, it's estimated Pluto Train 2 will sustain around 600 roles, once the project is operational, across Western Australia, including 70 residential positions in Karratha."

Like Woodside, ATOM is a nationwide company, with roots in Western Australia. ATOM opened its Karratha branch in 1980. In the same decade, Woodside commissioned the North West Shelf Project.

ATOM also shares Woodside's commitment to invest where we operate, building meaningful relationships and supporting our local community.

Phil Donders, National Team Leader ATOM said, "At ATOM, we believe in investing in the success and sustainability of the communities we operate within. This is why ATOM welcomed the opportunity to support the Pluto Train 2 Project through the supply of industrial consumables and PPE."

With access to more than one million products, ATOM is one of Australia's fastest growing industrial and safety supply business.

Join the conversation at **woodside.com/sustainability/consultation-activities**

COME CHAT WITH US

Woodside consults on our activities. Join us at local North West community events and at our offices so you can talk to us about our operations, decommissioning activities or proposed projects.

If you're interested in what Woodside has planned on land and sea, come and chat to our friendly team. You can find out more and share your feedback about Woodside's work in the North West, our Environment Plans and our current and proposed projects.

Upcoming engagement opportunities

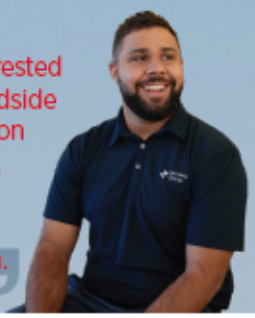
ROEBOURNE
22 March 2024 | 1:00pm – 3:00pm
Woodside Office
39 Roe Street, Roebourne, WA, 6718

KARRATHA
23 March 2024 | 9:00am – 2:00pm
Karratha City Shopping Centre
16 Sharpe Avenue, Karratha, WA, 6714

DAMPIER
24 March 2024 | 9:00am – 12:00pm
Dampier Beachside Markets
Hampton Oval, Dampier, WA, 6713

DAMPIER
3 April 2024 | 10:00am – 2:00pm
North West Shelf Project Visitors Centre
Burrup Road, Dampier, WA, 6713

"If you're interested in what Woodside has planned on land and sea, come and chat to our friendly team."



HAVE YOUR SAY

Woodside consults relevant persons in the course of preparing our Environment Plans. This is to notify them, obtain their input and to assist Woodside to confirm current measures or identify additional measures, if any, that may be taken to lessen or avoid potential adverse impacts of the proposed activity on the environment.

We welcome your input so please contact us if you'd like to discuss your functions, interests or activities which may be affected by our proposed activities.

Environment Plan	Activity Type	Location	Consultation Dates
Pluto Facility Operations	Operations	~190km north-west of Dampier	February – March 2024
North Rankin Complex Operations	Operations	~135 km offshore from Dampier	April – May 2024
Scarborough Trunkline Operations (State)	Operations	~30km north of Dampier	April – May 2024

You can access our consultation information, provide feedback and subscribe for updates by visiting **www.woodside.com/what-we-do/consultation-activities** or click **here.**

PROGRESS SNAPSHOT

You can view Environment Plans for approved projects and activities by visiting: **info.nopsema.gov.au/home/approved_projects_and_activities** or click **here**.

Environment Plan	Activity type	Date Accepted	Status
Stybarrow Decommissioning and Field Management	Decommissioning	8 January 2024	Work intended to commence in 2024
Stybarrow Plug and Abandonment	Decommissioning	21 December 2023	In progress
WA-34-L Pyxis Drilling and Subsea Installation (Revision)	Project	21 December 2023	Work intended to commence in 2024
Griffin State Pre-Decommissioning	Decommissioning	20 December 2023	Completed
Scarborough Seabed Intervention and Trunkline Installation	Project	13 December 2023	In progress
Scarborough WA-61-L and WA-62-L Subsea Infrastructure Installation	Project	8 December 2023	In progress
Scarborough Drilling and Completions	Project	1 December 2023	In progress
Scarborough 4D B1 Marine Seismic Survey	Survey	1 December 2023	Completed
Griffin Gas Export Pipeline Decommissioning	Decommissioning	30 November 2023	In progress
TPA03 Well Intervention	Project	28 November 2023	In scheduling
Griffin Decommissioning and Field Management	Decommissioning	21 November 2023	In progress
Nganhurra Operations Cessation	Decommissioning	27 July 2023	Completed

LET'S TALK

What's an Environment Plan?

A Titleholder must have an accepted Environment Plan (EP) in order to carry out certain petroleum activities. An EP sets out information about the proposed activity, how the activity may potentially impact the environment, measures to mitigate potential risks and impacts to as low as reasonably practical (ALARP) and acceptable levels, a record of consultation undertaken by the Titleholder, preparedness for emergencies and information on how environmental performance will be monitored and reported.

When an EP is being developed, a Titleholder:

- Engages in consultation with relevant persons and organisations.
- Provides information on its activities.
- Engages in dialogue with persons being consulted (where appropriate).
- Responds to claims or objections about the activity.

Consultation is an important part of environmental management.

Consultation on Environment Plans

Consultation provides an opportunity for persons who wish to provide feedback or raise concerns about:

- The potential adverse impacts of the activity on their functions, interests or activities, to seek information about the activity.
- How the Titleholder intends to manage the activity so that the risks and impacts are managed to ALARP and acceptable levels.

Information provided by the relevant person may assist the Titleholder to better put in place measures to manage the risks and impacts of an activity.

Commonwealth Waters

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is Australia's independent regulator for health and safety, structural and well integrity, and environment management for offshore petroleum and greenhouse gas storage activities in Commonwealth waters.

EPs submitted to NOPSEMA for assessment are made available on the NOPSEMA website.

Woodside consults in the course of preparing Commonwealth EPs in accordance with section 25 of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023*. Consultation methodologies are designed to:

- Identify relevant persons.
- Provide them with sufficient information and a reasonable period of time to allow them to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities.
- Assist Titleholders to consider and adopt appropriate measures in response to claims or objections raised during consultation.

Woodside identifies relevant persons for consultation in accordance with section 25 of the Environment Regulations. Alternatively persons who wish to consult can self-identify, in accordance with regulation 25 of the Environment Regulations.

Environment That May Be Affected (EMBA)

The environment that may be affected (EMBA) is the largest area where a petroleum activity could potentially have an environmental consequence (direct or indirect impact). The broadest extent of the EMBA takes into consideration planned activities and unplanned events. Woodside's assessment of relevant persons is based on the EMBA assessed for the activity.

State Waters

The Department of Energy, Mines Industry Regulation and Safety (DEMIRS) is the regulator for activities in State waters in Western Australia. Woodside follows a similar process to identify relevant persons to consult for State EPs. However consultation for State EPs is based on activities in the operational area, not unplanned events in the EMBA. For State EPs, only EP summaries are made public on the DEMIRS website once the EP has been approved.

Are you a Relevant Person?

Recently, Woodside launched an information campaign online and on social media focusing on the Kimberley, Pilbara, Gascoyne and Murchison areas to build a greater understanding of how members of those communities can get involved in consultation and the environmental planning process.

A series of short videos were shared on Woodside's website and on social media with targeted information for different community members including commercial fishers, marine users and traditional custodians.

In the videos, Woodside tells community members about our EPs and asks viewers who might be relevant to our activities to self-identify and participate in consultation.

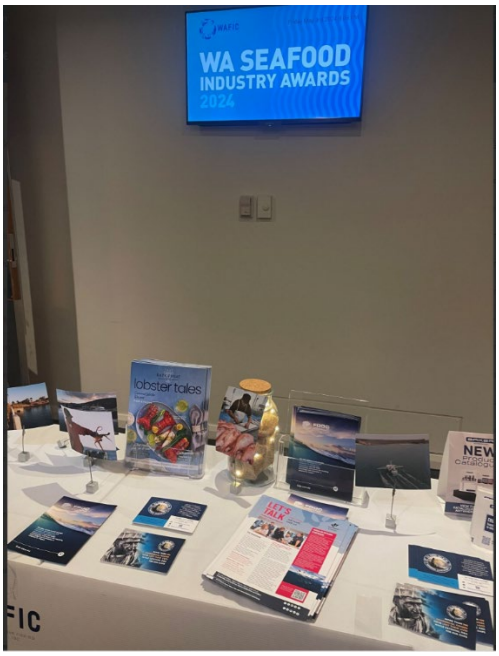
The campaign is still running and provides suggestions as to ways to get into contact with Woodside and learn more about our EPs.

Click here to learn more

Join the conversation at **woodside.com/sustainability/consultation-activities**

Let's Talk Newsletter Hard Copy Distribution – April 2024 Edition

Date	Location	Event (if applicable)
April 2024	Perth	Woodside AGM
April/May/June	Karratha	Woodside Visitor Centre
May 2024	Perth	WAFIC Award Night
May 2024	Karratha	KDCCI Business Breakfast Briefing
May 2024	Karratha	Community markets
May 2024	Karratha	Employees at the Woodside Karratha Gas Plant
May 2024	Onslow	Community information night
May 2024	Exmouth	Community markets
May/June 2024	Perth	Employees at the Woodside MY Building Woodside Annual General Meeting



LET'S TALK

EDITION 2 | APRIL 2024

OUR PLANS, YOUR SAY

Woodside Energy

THE RUNDOWN

On 1 March 2024, Woodside received Commonwealth environmental acceptance for the Griffin Field Decommissioning (End State) Environment Plan, supporting the staged decommissioning program for the Griffin oil and gas field, located off the Western Australian (WA) coast 65 km north-west of Onslow and 94 km north-east of Exmouth.

During late 2023, Woodside received acceptance for other Griffin decommissioning activities, with several activities already safely and successfully completed.

WHAT IS DECOMMISSIONING?

Decommissioning involves managing infrastructure that is no longer required in a timely, safe, and culturally and environmentally responsible manner.

GRIFFIN FIELD – FAST FACTS

- Field discovered 1989
- Production period 1994 – 2009
- Gas produced for the WA domestic gas market - 62 trillion cubic feet
- Barrels of oil produced - 167 million

Griffin gas export pipeline removed safely, offshore from Onslow

Woodside recently completed staged decommissioning activities under the Griffin Gas Export Pipeline (GEP) Decommissioning Environment Plan, which was accepted on 30 November 2023. Woodside removed ~25 km of the pipeline offshore within Commonwealth waters at depths ranging from 52 m to 127 m, approximately 41 km north-west of Onslow.

During production, the 62 km long and 30 cm in diameter Griffin GEP transported gas from the field to the former onshore Griffin gas export facility south of Onslow for use by WA businesses and households.

The decommissioning of the pipeline's WA State waters section and related onshore infrastructure requires separate state approvals. Woodside will engage local stakeholders to understand their views on potential decommissioning options for this pipeline portion.

Woodside is now undertaking a post-removal assessment of the Commonwealth section of the Griffin pipeline to inform future decommissioning activities in the region. Woodside will continue to assess decommissioning options case-by-case, guided by science, consultation, and legislative requirements.

NINGALOO OUTLOOK SYMPOSIUM

To increase the ecological understanding of the Ningaloo Coast World Heritage Area's deep and shallow reefs and shark and turtle populations, Woodside and CSIRO have partnered on the Ningaloo Outlook Marine Research Partnership.

For Ningaloo Outlook (Phase 1 and 2) over A$12million has been invested in scientific research to further develop new knowledge about the Ningaloo Coast World Heritage Area. The initial Phase 1 was in partnership with BHP, now part of the merged Woodside Energy.

The 300 km long Ningaloo Reef is the largest fringing coral reef on the west coast of any continent. With shallow lagoons and deeper waters offshore, the reef is home to a variety of marine life and diverse habitats.

The sixth **Ningaloo Outlook Symposium** recently enabled marine park managers, the scientific community and interested stakeholders to discuss the partnership's 2023 research findings.

Click here to view footage shown at the 2024 Ningaloo Outlook symposium.

To stay updated, subscribe for future editions at
woodside.com/what-we-do/consultation-activities

COMMUNITY SPOTLIGHT

Support for Murujuga

Woodside is proud to be a signatory of Murujuga Aboriginal Corporation's (MAC) Statement of Intent as part of our unwavering support for World Heritage Listing over the Murujuga Cultural Landscape, and our ongoing support for the protection and management of Murujuga's outstanding heritage values. We are committed to and support the protection of Aboriginal cultural heritage and continue to work closely with Traditional Custodians in the areas we operate.

Woodside was one of 11 signatories to the MAC Statement of Intent at a ceremony held at Hearson Cove on Murujuga Country. Other parties to the Statement of Intent included MAC (as the representative body for five Traditional Custodian groups, being Ngarluma, Yaburara, Yindjibarndi, Mardudhunera and Wong-Goo-tt-oo peoples), the Government (Premier, Environment Minister and Aboriginal Affairs Minister), Commonwealth Government (Environment Minister), Rio Tinto, Pardaman, Yara Pilbara, Horizon Power and the City of Karratha.

The Statement of Intent sets out the guiding principles for MAC, government and industry parties to work together to negotiate a cooperative Strategic Head Agreement in relation to the management, protection, and conservation of the Murujuga Cultural Landscape in support of the World Heritage nomination of this landscape.

Woodside takes its responsibility to protect and manage cultural heritage seriously, including through taking reasonable and practical measures across our operations and growth projects to minimise our emissions.

TALKING POINT

Supporting Science at Scott Reef

Out on the edge of Australia's continental shelf sits the north and south reefs and sandy islet of Scott Reef.

Located about 425 km north-west of Broome, to reach Scott Reef a boat would need to travel from the closest point on the WA coast for 270 km across the Indian Ocean.

Scott Reef and other reefs in the Pilbara and Kimberley were considered "poorly understood" by the Australian Institute of Marine Science (AIMS) three decades ago. However, over the last 30 years, more than 50 expeditions by numerous marine scientists have led to extensive research and understanding of Scott Reef.

In 1993, Woodside supported AIMS' extensive survey of coral and fish communities. This led to the establishment of a long-term monitoring program in 1994, which continues today. The Scott Reef coral reef monitoring program is globally one of the few continuous programs providing insight into the health and condition of resident corals and fish.

Woodside partnered with the WA Museum in 1998, contributing to research on oceanography and the biology and ecology of the resident species. The partnership has enabled long-term research to understand the reef's health and how it changes through time. WA Museum scientists visited Scott Reef in 1984 to carry out extensive surveys to sample fauna. Then, in 2006 returned with Woodside's support and catalogued 1,897 marine life species, including 262 new discoveries.

The WA Museum partnership included the Woodside Collection Project, focused on the marine life of the Dampier Archipelago and Kimberley. Over 55,000 specimens were collected and 700 new species were identified as part of the large Australian biodiversity project.

The wide-ranging Scott Reef research projects have revealed important insights into a complex ecosystem and have delivered a wealth of knowledge to support Woodside's long-term environmental planning and management.

Woodside is consulting on the Browse State Wellhead Decommissioning Environment Plan (EP), involving decommissioning options for three historical wellheads in WA State waters, approximately 430 km north of Broome. **View the consultation information sheet.**

In preparing the EP, Woodside's intent is to minimise environmental and social impacts and is seeking stakeholder input to inform Woodside's development of the EP.

Click here to watch Journeys of Discovery - Coral Reefs.

Join the conversation at **woodside.com/what-we-do/consultation-activities**

COMMUNITY CONVERSATIONS

Upcoming engagement opportunities

DAMPIER
5 May 2024 | 9:00am – 12:00pm
Dampier Beachside Markets, Hampton Oval

EXMOUTH
19 May 2024 | 8:00am – 12:00pm
Exmouth Community Markets, Federation Park

Dates and times subject to change.

Woodside is consulting with local communities at local events so you can easily come and chat us to us about our operations, decommissioning activities, or proposed projects.

Recently our team talked with community members at the Karratha Shopping Centre and the Dampier Beachside Markets about Environment Plans for the Scarborough State Trunkline Operations and Pluto Operations. We also meet quarterly with Community Liaison Groups in Karratha and Exmouth where we communicate updates and consult with community members on a range of relevant topics.

If you're interested in what Woodside has planned on land and sea, come and chat to our friendly team and follow the **Woodside North West Facebook page** for updates. You can also read our recent **Karratha Community Update here.**

HAVE YOUR SAY

Woodside consults relevant persons while preparing our Environment Plans to notify them, obtain their input and to assist Woodside to confirm current measures or identify additional measures, if any, that may be taken to lessen or avoid potential adverse impacts of the proposed activity on the environment.

We welcome your input so please contact us if you'd like to discuss your functions, interests or activities which may be affected by our proposed activities.

Environment Plan	Activity Type	Location	Consultation Dates
Browse State Wellhead Decommissioning	Decommissioning	430 km north of Broome	25 March – 3 May 2024
North Rankin Complex Operations	Operations	135 km offshore of Dampier	22 April – 22 May 2024
WA-550-P Exploration Drilling	Exploration	190 km north-west of Dampier	-May – June 2024
Angel Carbon Capture and Storage Geophysical and Geotechnical Surveys	Survey	125 km north-west of Dampier	-May – June 2024
North West Shelf Phase 1 Plug & Abandonment	Decommissioning	~117 km north-west of Dampier	-May – June 2024
Julimar Operations	Operations	160 km north-west of Dampier	-May – June 2024

You can access our consultation information, provide feedback and subscribe for updates by visiting **www.woodside.com/what-we-do/consultation-activities** or click **here.**

PROGRESS SNAPSHOT

Environment Plan	Activity Type	Date Accepted	Status
Griffin Field Decommissioning (End State) (Griffin Field Deviation / Griffin Leave In-situ)	Decommissioning	1 March 2024	In progress
Stybarrow Decommissioning and Field Management	Decommissioning	8 January 2024	In progress
Stybarrow Plug and Abandonment	Decommissioning	21 December 2023	In progress
WA-34-L Pyxis Drilling and Subsea Installation (Revision)	Project	21 December 2023	Drilling to commence around May 2024
Scarborough Seabed Intervention and Trunkline Installation	Project	13 December 2023	In progress
Scarborough WA-61-L and WA-62-L Subsea Infrastructure Installation	Project	8 December 2023	In progress
Scarborough Drilling and Completions	Project	1 December 2023	In progress
Griffin Gas Export Pipeline Decommissioning	Decommissioning	30 November 2023	Completed
TPA03 Well Intervention	Project	28 November 2023	In scheduling
Griffin Decommissioning and Field Management	Decommissioning	21 November 2023	In progress

You can view Commonwealth Environment Plans for approved activities and operations by visiting NOPSEMA's website info.nopsema.gov.au/home/approved_projects_and_activities

LET'S TALK

EMBAs AND OIL SPILL MODELLING

Let's talk about EMBAs – what they are, and just as importantly, what they're not.

When Woodside talks to community members about our activities, we're often asked about the areas marked on our consultation material referred to as the "Environment that May Be Affected" (EMBA).

EMBAs are an important part of preparing the environmental and emergency response strategies that underpin the planning for our offshore activities.

They are produced as part of our extensive oil spill modelling and response planning. They represent the largest spatial area where a petroleum activity could potentially have a direct or indirect environmental impact.

Understanding the EMBA

The EMBA represents the largest, merged area of many potential paths that a highly unlikely oil spill could travel based on predictions around weather, currents, and other conditions at the time. An EMBA is not a predicted impact of a single oil spill, which would be much smaller, and the extent and path of the impact would only be known at the time it occurred.

This means the area the EMBA covers includes locations where planned activities and unplanned events could potentially occur.

Oil Spill Modelling

While offshore oil spills are extremely rare, it is important oil and gas companies are still ready to prepare for and respond to them. There are several different approaches to oil spill modelling, and Woodside uses these in combination for information about where an oil spill could move, how quickly, and the possible effect of using methods to manage a potential oil spill.

To calculate this, our oil spill modelling involves running many (sometimes hundreds) computer simulations of the same scenario to predict the behaviour of oil under different conditions.

Each simulation is subject to a range of variables, including weather and sea conditions, tides, and times of year. In the model, the oil responds to these conditions and behaves differently in each individual simulation.

Every individual simulation is overlayed on top of the next, allowing statistical analysis of the possible area the oil spill could travel in the highly unlikely event that a spill occurs. The smooth boundary drawn around all these computer simulations of the spill creates the EMBA.

The models process the information based on an assumption there is no emergency response, which would of course not be the case in a real emergency.

Oil spill modelling helps us develop our oil spill emergency management plans and assists in preparedness and response planning. Woodside conducts regular emergency response training exercises involving multiple facets of the business so our teams are ready to respond should they ever need to.

The many simulations used to underpin our planning are estimates and predictions only. It is not possible to exactly predict the outcome until the exact weather and other conditions are known if an oil spill event occurs.

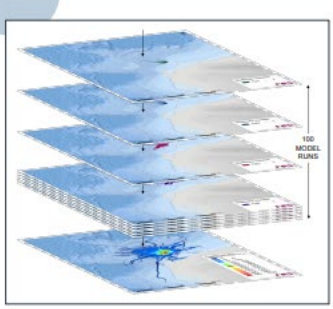


Figure 1: The first stage in EMBA creation is running computer simulations (model runs). Figure 1 shows the model runs for the WA-34-L Pyxis Drilling and Subsea Installation Environment Plan.

Emergency Management Plans

The emergency management plan informed by the oil spill modelling is submitted to both State and Commonwealth regulators for approval along with all other planning documents for our activities.

Woodside, in more than 60 years, has not experienced any significant uncontrolled release of oil or gas to the environment as a result of loss of well control.

Nevertheless, our extensive planning continues, drawing on international good practice, so the impacts and risks associated with our activities are detailed, evaluated and managed to a level that is as low as reasonably practicable.

We are committed to continuous improvement and share our expertise with our peers and take the lessons learned from other operators to incorporate into our management processes.

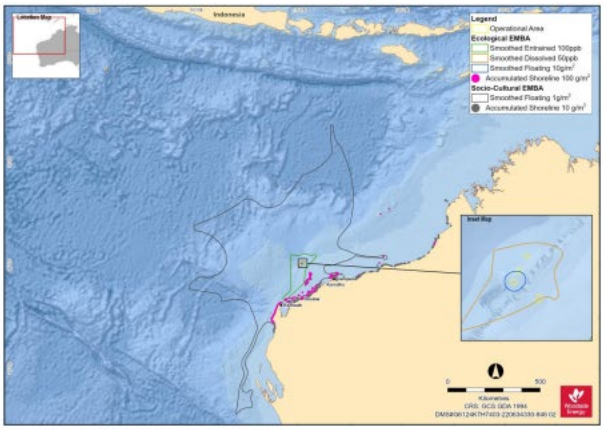
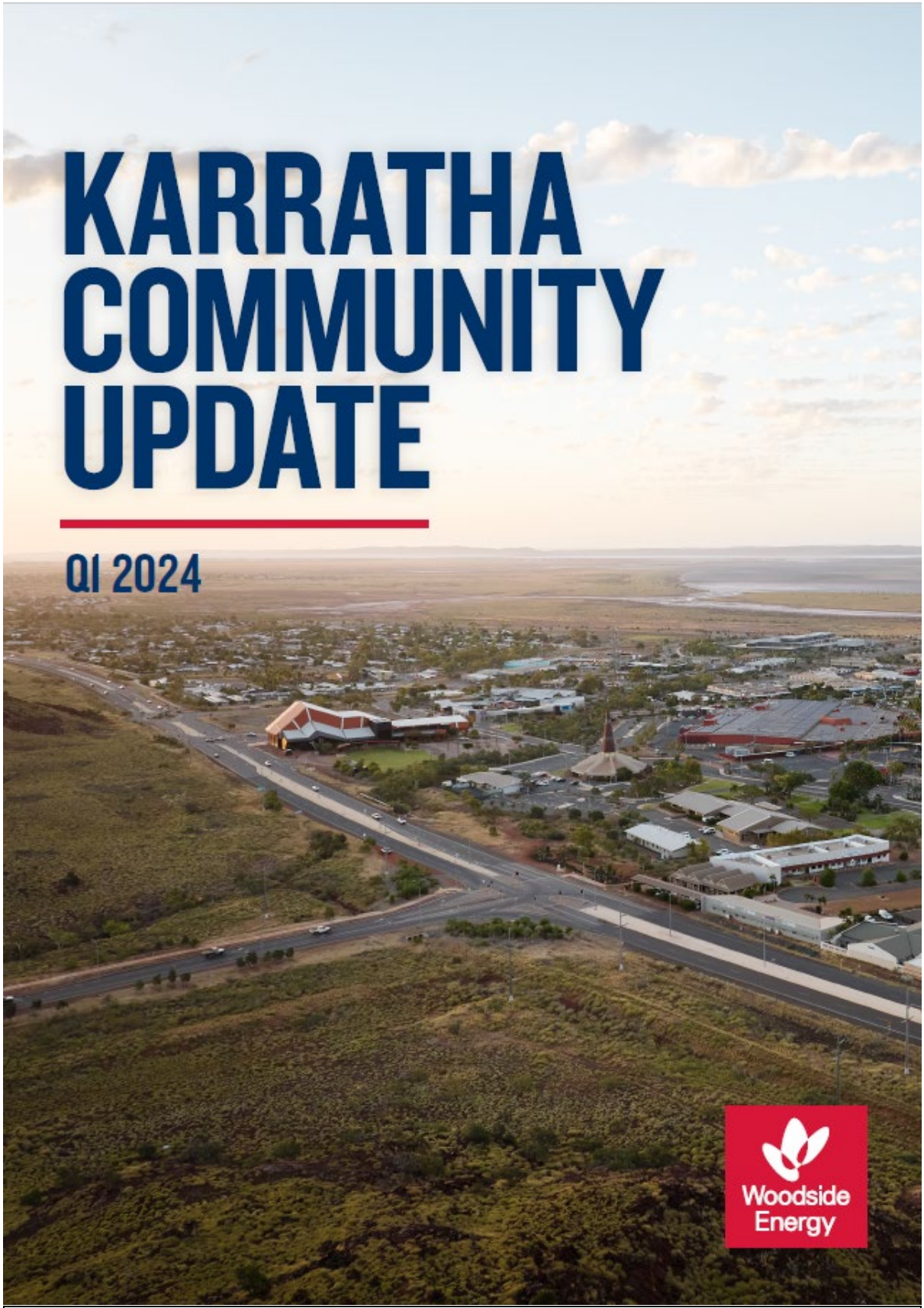


Figure 2: The EMBA is a culmination of all the computer simulations with a smooth boundary. Figure 2 shows the final EMBA for the WA-34-L Pyxis Drilling and Subsea Installation Environment Plan.

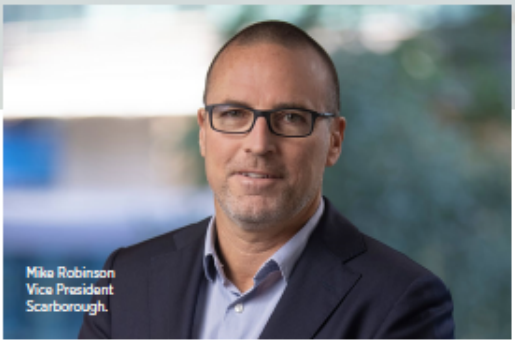
Join the conversation at **woodside.com/what-we-do/consultation-activities**

5.8 Karratha Community Update Newsletter



Woodside Energy recognises Aboriginal and Torres Strait Islander peoples as Australia's first peoples.

We acknowledge the unique connection of the Traditional Custodians to land, waters and the environment where we operate in the City of Karratha. We extend this recognition and respect to First Nations peoples and communities around the world.



Mike Robinson
Vice President
Scarborough.

Graduating apprentices and trainees at Red Earth Arts Precinct.

The Scarborough Energy Project will see gas from the Scarborough fields piped approximately 430 km to be processed onshore at the Pluto LNG facility, where Pluto Train 2 is currently under construction. Scarborough gas will also be processed through the existing Pluto Train 1 plant following modifications, which are expected to commence in late 2024.

The Project is now more than 55% complete[1], and in March 2024, Pluto Train 2 achieved a key milestone, the arrival of the first modules in Karratha. This year, a total of 51 modules will be delivered to Pluto for installation.

This year, Woodside also celebrates its 70th anniversary and the North West Shelf Project marks 40 years of domestic gas production and 35 years of LNG exports from Karratha. Over this period, we have provided reliable energy to Australia and the world from the community we continue to call home. Karratha is where the Woodside story began and the Scarborough Energy Project will build on the legacy of supporting the world's energy needs from this region.

We are proud of the Scarborough Energy Project and what it will deliver for the Karratha community and the nation.

Mike Robinson
Vice President Scarborough

[1] The completion percentage excludes the Pluto Train 1 modifications project.

Celebrating success: Woodside Training Academy Graduation and Awards

The Karratha Gas Plant-based Woodside Training Academy has seen more than 750 apprentices and trainees commence their learning journey with Woodside since it opened its doors in 2010.

The Academy plays an integral role in hosting those who are building their employable skills and experience, supporting the development of local workforce capabilities.

This March, Woodside welcomed 21 apprentices and trainees into roles across its Burrup assets. The Woodside Training Academy Graduation and Awards held at Red Earth Arts Precinct saw the graduating cohort celebrated for their achievements in completing their training. The event also recognised and awarded the outstanding performance of particular individuals throughout their training process. The award recipients were selected for their dedication, commitment and consistent demonstration of Woodside's values.

An additional 33 apprentices, trainees and pre-pathway trainees, including 17 school leavers from the Karratha area, have been recruited by Woodside's training partner, Programmed Training Services and are being hosted by Woodside in 2024. We're proud to have close to 100 apprentices and trainees learning their craft at the Woodside Training Academy and offshore assets this year.

Scan the QR code or click here to get to know a few of Woodside's new team members.

Woodside extends investment in education initiative

Woodside was recently joined in Karratha by the WA Minister for Education Dr. Tony Buti MLA and Kevin Michel MLA to share news of our ongoing collaboration with schools in the local community.

Together with our joint venture partners, we were pleased to announce our extended support for education in the City of Karratha after signing five-year community partnership agreements for the ongoing delivery of the Karratha and Roebourne Education Initiative (KREI).

The extension builds on more than 15 years of investment by the Woodside-operated North West Shelf Project to bridge the gap between the opportunities and resources available to students residing in the Pilbara and their metropolitan peers, and support students on their pathway to employment.

The renewed agreements with the Department of Education and St Luke's College increases funding provided for programming at local high schools and extends that support to primary schools in the community.

The funding will enable the delivery of quality educational opportunities, including ATAR revision seminars, additional STEM curriculum, student leadership programs, employment and career pathway planning, and teacher development.

Western Australia's Minister for Education, Hon Dr Tony Buti MLA, said he is thrilled support for the initiative will continue for years to come, benefitting even more students in the Pilbara.

"It has proved to be a very successful partnership over the years helping many students achieve their best and guiding them to a range of careers," Minister Buti said.

Woodside CEO, Meg O'Neill, said the renewed agreements reflected Woodside's commitment to improving capability and capacity in its host communities.

"The initiative has delivered strong educational outcomes and its success is a testament to what can be achieved when we work collaboratively with a student-centred approach," she said.

Baynton West Primary School Principal Lisa Ledger, WA Minister for Education Hon Dr Tony Buti MLA, Woodside Energy Corporate Affairs Manager North West Amanda Fuery, Pilbara Education Regional Office Program Coordinator Amanda Lawrence, Member for Pilbara Kevin Michel MLA and students from Baynton West Primary School.

Apprentice takes home Citizen of the Year

Meet Rhian. She's a fourth-year, Programmed Electrical Instrumentation Apprentice at Karratha Gas Plant and was recently named the City of Karratha's Citizen of the Year.

Rhian joined the Karratha Volunteer Fire and Rescue Service to meet people and make friends when she first moved to Karratha. She now holds a senior position and is on-call 24/7 with requests for jobs, including road crash rescues, house fires, HAZMAT incidents and assisting the local police.

But Rhian's contribution to the community doesn't stop at fire and rescue. Five years ago, she joined St John Ambulance as an Emergency Medical Technician volunteer.

She's attended more than 800 jobs in and around Karratha, and she also helped at the 2019-2020 Black Summer fire in QLD. Rhian also volunteers at community events like Speedway, Karratha's FeNaCING festival, Santa lolly runs, youth cadets and school visits.

"I just love giving back to the community and helping people in times of need. It's what I enjoy doing in my spare time. Some people play sport. I volunteer," said Rhian.

Electrical Instrumentation Apprentice and City of Karratha Citizen of the Year, Rhian

Indigenous Collegiate leads cargo loading

As the Woodside-operated North West Shelf Project prepares to mark 35 years of delivering LNG cargoes to our international customers, another achievement was recently recognised at Karratha Gas Plant.

In January, an LNG cargo was loaded at Karratha Gas Plant's berths by a team made up entirely of Indigenous employees.

The team consisted of nine members from Storage and Loading, including Operations Support Trainees through to Maintenance Technicians and Supervisors. The vessel was also piloted by Woodside and Australia's first Indigenous master mariner.

Woodside's Indigenous Liaisons Coach, Josh Hill, said the activity demonstrated the progress Woodside has made in creating employment opportunities for First Nation's people.

"It was inspiring to see and reflects Woodside's work to increase Indigenous recruitment and provide career support for members of the Indigenous Collegiate," he said.

Pluto Train 2 modules arriving in Karratha.

Making significant progress on the Scarborough Energy Project

The Scarborough Energy Project's Pluto Train 2 achieved a major milestone with the first three modules now safely installed on site in Karratha.

The modules, which arrived in February 2024, weigh a combined total of more than 4,000 metric tonnes, equivalent to the weight of 30 houses or 24 Boeing 787 Dreamliner aircraft. The modules were transported from Pilbara Ports to the construction site at the existing Pluto LNG facility using 21 specialised hydraulic transporters with 126 axles and 504 wheels.

Our CEO, Meg O'Neill, said the delivery of the first Pluto Train 2 module was a key milestone towards the delivery of the Scarborough Energy Project, which will help meet the growing demand for the low-cost, lower-carbon, reliable energy the world needs today and into the future.

"The safe and timely arrival of the module is a testament to the hard work and dedication of the Woodside team and our lead contractor Bechtel," she said.

The Scarborough Energy Project will contribute significantly to the Australian economy and create thousands of job opportunities during its construction phase.

The Project is already benefiting local Karratha businesses, including almost 30 Indigenous businesses that have been engaged. It is also supporting Woodside's investment in social contribution partnerships that provide positive impacts for those living in the Karratha community.

Scan the QR code or click here to see the arrival of the modules in Karratha .

Local businesses set to benefit from the Scarborough Energy Project

The Scarborough Energy Project, including Pluto Train 2 is providing opportunities for local businesses in Karratha. To date, with collaboration from Woodside's construction partner Bechtel, the Project has injected more than $90 million locally and contracted with close to 70 Karratha businesses.

Local, family-owned business, ATOM is one of these businesses. ATOM was recently awarded a contract to supply industrial consumables, safety supplies and personal protective equipment products for the Pluto Train 2 construction.

ATOM believes locals serve locals best, which is why their 22 employees supporting the project are all local to Karratha. Nearly half of the team are female and there is one Indigenous employee.

The contract has supported ATOM to expand its workforce increasing local employment opportunities.

Long-term, it's estimated Pluto Train 2 will sustain around 600 roles, once the project is operational, across Western Australia, including 70 residential positions in Karratha.

Like Woodside, ATOM is a nationwide company, with roots in Western Australia. ATOM opened its Karratha branch in 1980, where during the same decade, we commissioned the North West Shelf Project.

ATOM also shares Woodside's commitment to invest where we operate, building meaningful relationships and supporting our local community.

Phil Donders, National Team Leader of ATOM said, "At ATOM, we believe in investing in the success and sustainability of the communities we operate within. This is why ATOM welcomed the opportunity to support the Pluto Train 2 Project through the supply of industrial consumables and PPE."

Darren Wilson, ATOM Karratha Branch Manager.

Would you like to know what Woodside has planned on land and sea?

Click here or scan the QR code to subscribe to our newsletter Let's Talk – Our Plans, Your Say and to receive updates on our consultation activities.

APPENDIX G: ONGOING ENGAGEMENT WITH TRADITIONAL OWNERS

Proposed Program of Ongoing Engagement with Traditional Custodians

This Program of Ongoing Engagement with Traditional Custodians ("Program") has been developed to demonstrate Woodside's commitment to ongoing engagement and support of Traditional Custodians' capacity to care for and manage Country, including Sea Country, and has been directly informed by Traditional Custodians' feedback regarding their capacity to engage and consult on Environment Plans.

It is a living document designed to evolve with ongoing consultation and feedback from Traditional Custodians and, at a minimum, will be subject to annual review. In addition to this Program, Woodside will continue to participate in, and support collective industry engagement with Traditional Owners on the development of a future, sustainable, industry wide Program. Through the Program, Woodside actively supports Traditional Custodians' capacity for, and involvement in, ongoing engagement and feedback on environment plans.

The Program has been developed so that Traditional Custodians can, on an ongoing basis, provide Woodside with feedback relating to the possible consequences of an activity to be carried out under an environment plan on their functions, interests and activities as they relate to cultural values. This feedback will be evaluated in conjunction with Traditional Custodians and, where necessary, avoidance or mitigation strategies in will be developed in collaboration with Traditional Custodians. How the Program is implemented with specific Traditional Custodians will depend on their stated needs and priorities

The Program is underpinned by Woodside's First Nations Communities Policy (woodside.com), the objective of which is to ensure Woodside partners and engages with First Nations communities to create positive economic, social and cultural outcomes that leave a lasting legacy. Woodside does this through building respectful relationships and partnerships with First Nations communities where we are active, in the areas where they are most interested in. We acknowledge the unique connection that First Nations communities have to land, waters and the environment.

The Program will include, as agreed with relevant communities, reasonable commitment to:

1. **Support for ongoing dialogue and engagement**

Woodside will support the capacity of Traditional Custodians to participate in ongoing dialogue and engagement about the environment plans and to enable the ongoing and future identification of cultural values potentially impacted by Woodside's activities. Woodside further commits to agreeing consultation protocols with individual Traditional Custodians to ensure the material provided is appropriate in level of detail such that the potential for cultural impact from Woodside activities can be determined and as required measures can be adopted to avoid or minimise impact.

In addition, Woodside will receive feedback on cultural values from an individual person or organisation that identifies as a Traditional Custodian, at any stage during the development and implementation of activities. This feedback will be evaluated, in conjunction with the Traditional Custodian individual or group and if required, control measures will put in place to avoid impacts to cultural values, or where avoidance is not possible, to minimise and mitigate the impacts to an acceptable level.

Where cultural values are identified post activity completion, any controls relevant to value management will be implemented during the next relevant activity.

2. Support for the identification and recording of cultural features

Woodside will support Traditional Custodians to record and articulate their Sea Country values and will invest in cultural assessments codesigned with Traditional Custodians, where required, to inform potential risks to cultural values from our petroleum activities.

This may include supporting cultural mapping by Traditional Custodians to identify and map significant cultural features including archaeological sites and other cultural values. The scoping of the mapping process will be codesigned with Traditional Custodians.

Woodside understands that cultural knowledge remains the intellectual property of Traditional Custodians and will agree with Traditional Custodians at the outset how that information from surveys will be used to feedback into and inform the environment plan's design and implementation.

In addition, Woodside applies the Cultural Heritage Management Procedure 2019, updated in 2023, to the Program which*:*

- provides a process for the identification, protection, and management of Cultural Heritage taking into account relevant standards, in particular, the United Nations Declaration on the Rights of Indigenous Peoples, the Charter for the Protection and Management of the Archaeological Heritage, the Convention for the Safeguarding of the Intangible Cultural Heritage, and the Convention on the Protection of the Underwater Cultural Heritage;
- applies to underwater cultural heritage and, consistent with current practice, provides for the commissioning of (where appropriate) both archaeological and ethnographic assessments of cultural values over the submerged landscape; and
- the process includes the following:
    - early engagement with relevant Traditional Custodians
    - identification of potential heritage, this could include desktop and field surveys undertaken with the Traditional Custodians.
- the development of cultural management strategies; and, where it is determined cultural heritage may be impacted, the development of Cultural Heritage Management Plans codesigned with Traditional Custodians and implemented by Woodside's First Nations team which:
    - focus on avoidance or minimisation of impacts; and
    - provide regular reviews and for inclusion of new information and further development of the Cultural Heritage Management Plan.

Woodside is committed to continue to receive feedback on cultural values for the life of an environment plan, the inclusion of new information and the development of avoidance or mitigation strategies in collaboration with Traditional Custodians. This information will be recorded via the Woodside Management of Knowledge Process and any potential impacts to the accepted Environment Plan evaluated via the Woodside Management of Change Process.

3. Building capacity for the ongoing protection of country

Woodside will support measures to increase the capability and capacity of the Traditional Custodian groups. This is guided by Woodside's Indigenous Affairs Strategy 2019 ("Strategy"), which is designed to enable the building and maintaining of relationships with Traditional Custodians to leave a lasting legacy, including strengthening of Traditional Custodians' capacity to care for and manage Country, including Sea Country. The Strategy was developed with inputs from Traditional Custodians and contains four pillars that direct Woodside's social investment, policies relating to economic development, procurement and employment, and Woodside's agreement making and implementation of agreements. The pillars are:

1. Culture and Heritage Management: support social outcomes through protection, recognition and respect for culture and heritage;
2. Economic Participation: provide training, jobs, and business opportunities;

3. Capability and capacity: ensure strong corporate governance, leadership development and education initiatives to support self-determination; and
4. Safer and Healthier Communities: partner with Aboriginal people and service providers to maximise safer and healthier community outcomes.

Woodside is committed to an ongoing relationship between Woodside and the Traditional Custodian groups. Through consultation with Traditional Custodians Woodside will continue to:

- establish support for Indigenous ranger programs via social investment;
- establish support for Indigenous oil spill response capability via investigating training models;
- establish support for identification and recording of cultural values and the management of that information by Traditional Custodians;
- establish support for programs identified by the Traditional Custodians as important to them and as agreed by Woodside.

4. Support for capacity and capability in relation to governance

Pillar 3 of the Indigenous Affairs Strategy 2019 focuses on ensuring strong corporate governance, leadership development and education initiatives to support self-determination. To enable this, Woodside will support measures to increase the capability and capacity of the Traditional Custodian groups, including in relation to governance and management systems.

The nature of this support will be informed by the individual needs of Traditional Custodian groups, but may include:

- funding or other support for community meetings, particularly where consultation with representative bodies lies outside of that body's core business and cultural authority or mandate needs to be secured,
- resourcing internal expertise so that information is managed consistently and internally, including ensuring appropriate record keeping of consultation to provide stakeholders with a lasting record of discussions, and
- development or upgrade of IT systems to manage information.

5. Program Reporting and Review of Effectiveness

Woodside will undertake an annual review of the Program to assess its effectiveness and adapt the Program accordingly. The annual review will also include an assessment of appropriateness of the methods used to undertake ongoing consultation with Traditional Custodians.
Progress of the Program will be reported annually in line with annual sustainability reporting via the Woodside website.

6. Current Status

Following distribution of this proposed Program, Woodside is now participating in a number of specific ongoing consultation activities with Traditional Custodian Relevant Persons. Specific ongoing activities are tabulated below:

Traditional Custodian Relevant Person	Ongoing Consultation Description	Forward Plan	Estimated Timeframes
Buurabalayji Thalanyji Aboriginal Corporation (BTAC)	BTAC proposed a Collaboration Agreement in May 2023, Woodside agreed in principle, and exchanged correspondence to understand details of the proposal. The Collaboration Agreement would enable support for BTAC to undertake an ethnographic assessment to articulate values, and ensure appropriate cost recovery	Woodside and BTAC have executed a Costs Acceptance Letter. Woodside has developed a Collaboration Agreement which is currently under internal Woodside review. Once settled internally it will be put to BTAC for their consideration.	The draft Collaboration Agreement will be provided to BTAC for consideration in November 2023. Woodside will follow up on a monthly basis for at least six months with BTAC once they are in receipt of the draft proposed Collaboration Agreement from Woodside, or until the Agreement is in place.
Yamatji Marlpa Aboriginal Corporation (YMAC)	In June 2023, YMAC provided Woodside a proposed draft Framework Agreement, and a proposal to fund in-house expertise to support consultation and implement the Collaboration Framework. In July 2023, Woodside agreed in principle to the proposed Collaboration Framework and the funding proposal and requested a meeting to work together on details. Woodside provided the Proposed Program of Ongoing Consultation to complement the proposed Collaboration Framework.	Woodside will continue to communicate with YMAC, seeking to collaborate and reach agreement on the proposed Collaboration Framework and funding agreement. At the point of EP submission, Woodside is seeking a meeting with YMAC at YMAC's earliest convenience.	Woodside will follow up with YMAC on a monthly basis for at least six months, seeking to progress the Collaboration Framework and funding agreement.
Wirrawandi Aboriginal Corporations (WAC)	In August 2023, WAC proposed a Framework Agreement with Woodside to provide a streamlined, formalised approach to consultation between WAC and Woodside. Woodside has confirmed receipt of the proposed framework from WAC.	Woodside is in contact with the WAC CEO and is currently developing a response to the proposed Framework Agreement put forward by WAC. WAC do not object to Woodside progressing environmental plans on the proviso that both parties enter into an Agreement suitable to each party. WAC have suggested a timeframe to settle the Agreement over the next 2-3 months. Woodside will be aiming to reach agreement within a shorter timeframe.	Ongoing Framework Agreement settled in 2023.
Ngarluma Aboriginal Corporation (NAC)	In September 2023, NAC proposed a Joint Working Group to practically manage consultation processes. It was proposed that the group would meet monthly for 2023 and quarterly thereafter, meetings would include NAC CEO and NAC Directors and potentially independent SME/s, the proposal was that Woodside draft a Framework Agreement, and included a request for funding for this approach. Woodside provided in-principle support for the proposal.	Woodside has provided in-principle support for NAC's proposal and is currently developing a draft Framework Agreement which once settled internally will be sent to NAC for their response.	In accordance with NAC's proposed timeframe, Woodside aims to prepare a draft Framework Agreement, settle internally and then meet to discuss in 2023.
Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC)	In a meeting during August 2023, NTGAC proposed a Framework Agreement. This included terms for ongoing	Woodside and NTGAC/YMAC have agreed in writing to develop a Framework Agreement. Woodside have been responding to queries from NTGAC who have passed	Woodside will follow up with NTGAC on a monthly basis for at least six months, seeking to

	engagement such as frequency of consultation, participation, and content. NTGAC has also requested Woodside provide funding for an in-house environmental scientist to review material. Woodside agreed in principle to this approach, and has requested a first draft of the Framework Agreement for consideration. Woodside have agreed to pay for YMAC's in-house scientist to attend NTGAC meetings to advise NTGAC.	information provided by Woodside onto their Environmental Scientist. Woodside are awaiting a proposed draft of a Framework Agreement and general report. YMAC's preference is to prepare the drafts, Woodside have offered to assist with drafting and remain ready to respond on receipt of documents.	progress the Framework Agreement and General report.
Yinggarda Aboriginal Corporation (YAC)	In August 2023, YAC requested Woodside provide a draft Framework Agreement for their consideration. Woodside has provided a draft Framework Agreement to YAC for review.	Woodside's Proposal suggests meeting with YAC every 3 months to progress matters. The Proposal suggests committing to work continuing between meetings with each party nominating focal points. A Scope of Work and schedule of rates is included to re-imburse the cost of ongoing consultation. Woodside's Proposal includes timeframes for anticipated milestones and has suggested the Proposal be in place for an initial 2-year period. Woodside has provided the draft Framework Agreement to YAC; they have advised that they will seek direction from the YAC Board on the proposal.	Woodside will continue following up with YAC on a monthly basis for at least six months, seeking to progress the Framework Agreement.
Robe River Kuruma Aboriginal Corporation (RRKAC)	RRKAC have noted that they are insufficiently resourced to engage further and respond to Woodside regarding EPs. Woodside assesses that a Framework Agreement could address this.	Woodside has on several occasions written to RRKAC offering to fund consultation meetings. Woodside will offer RRKAC a Framework Agreement which will propose funding, scope of work and timeframes to assist with consultation and ongoing consultation. If RRKAC are open to the proposal, it is intended to put forward a draft Framework Agreement to RRKAC within the next 2 months.	Woodside will follow up with RRKAC monthly for at least six months, seeking to progress a Framework Agreement.
Ngarluma Yindjibarndi Foundation Limited (NYFL)	NYFL and Woodside have an existing Agreement in place which enables quarterly communication about Woodside activities. NYFL has said they are working with other First Nations organisation and representative Bodies developing a Framework Agreement.	Woodside has not yet seen a draft of the Framework Agreement. Woodside's expectation is that it will outline principles of engagement, details of resourcing, timeframes to meet agreed outcomes etc. Woodside look forward to receiving a draft Agreement and will engage with NYFL to settle on the details of any proposal.	Woodside will continue to follow up monthly with NYFL for at least six months, seeking to progress a Framework Agreement.
Yindjibarndi Aboriginal Corporation	Yindjibarndi have advised that they are represented by NYFL for consultation on oil and gas matters. NYFL and Woodside have met to discuss the consultation framework to be used by NYFL as representatives of Yindjibarndi. Woodside will seek to use the Framework Agreement proposed by NYFL (above) for ongoing consultation with Yindjibarndi.	Per NYFL above.	Per NYFL above.
Kariyarra Aboriginal Corporation (KAC)	In September 2023 KAC proposed an agreement which would include meeting arrangements, ongoing consultations, specialist advice and contact protocols.	Woodside support funding request that are reasonable and will seek to reach agreement on a funding proposal put forward by KAC. Woodside agrees that a Framework Agreement is a sound tool to set out ongoing consultation with KAC, funding arrangements and social investment opportunities that KAC would want explored. Woodside will propose a first draft of an agreement and put to KAC in the	Woodside will continue to follow up monthly with KAC for at least six months, seeking to progress a Framework Agreement.

		first instance. Woodside will prepare a draft agreement within the next two months to for KAC's consideration.	
Bardi and Jawi Niimidiman Aboriginal Corporation (BJNAC)	In June 2023, BJNAC provided Woodside a draft resourcing protocol for consultation. Woodside noted that the draft protocol was drafted with a focus on land based activities that fall within the BJNAC native title determination, as opposed to offshore activities. In October 2023, BJNAC and Woodside met to review the resourcing protocol, which resulted in some small changes being agreed. BJNAC and Woodside agreed that both organisations were on the same page for ongoing consultation.	Woodside supports funding request that are reasonable.. Woodside agrees that the resourcing protocol is a sound tool to set out ongoing consultation with BJNAC, funding arrangements and employment, training and contracting opportunities that BJNAC want to explore. Woodside is awaiting BJNAC's revised protocol.	Woodside will continue to follow up monthly with BJNAC for at least six months, seeking to progress a Resourcing Protocol.
Karajarri Traditional Lands Association (KTLA)	.On 19 April 2023 and 2 May 2023, KTLA said they would seek funding support from Woodside and were developing paperwork/proposal for sending to Woodside.	Woodside supports funding requests that are reasonable. Woodside is awaiting KTLA's proposal.	Woodside will continue to follow up monthly with KTLA for at least six months, seeking to progress a Framework Agreement.

APPENDIX H: OIL SPILL PREPAREDNESS AND RESPONSE MITIGATION ASSESSMENT

Oil Spill Preparedness and Response Mitigation Assessment for Pluto Facility Operations

Corporate HSE

Hydrocarbon Spill Preparedness

July 2024
Revision 0b

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EXECUTIVE SUMMARY

Woodside Burrup Pty Ltd (Woodside) has developed its oil spill preparedness and response position for the Pluto Facility Operations, 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 an acceptable level. 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 detailed in the Environment Plan (EP). This document then details Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness.

A summary of the key facts and references to additional detail within this document are presented below.

Table 0-1: Summary of the key details for assessment

Key details of assessment	Summary	Reference to additional detail
Worst Case Credible Scenarios (WCCS)	Major Environmental Event-01 (MEE-01): long-term (77-day) subsurface release of Pluto Condensate caused by a loss of well containment from PLA02 well at 19° 54' 48.266" S, 115° 7' 54.151" E. 59,459 m^3 over 77 days of Pluto condensate. 2.53% residual component of 1504.3 m^3	Section 2.2.
	MEE-02b: loss of containment of the export pipeline at a location near-shore, releasing 607 metric tons (662 standard m^3) of Pluto condensate, with gas, over 8 hours at 20° 21' 0.81" S, 116° 42' 12.41" E. 0.5 % residual component of 3.31 m^3	
	Credible Scenario-05 (CS-05): Loss of vessel containment releasing 1000 m^3 of Marine Gas Oil (MGO) over 1 hour at the PLA platform 19° 59' 46.5" S 115° 22' 5.6" E. 5% residue of 50 m^3	
Hydrocarbon properties	**Pluto Condensate** Pluto Condensate (API 70.9) contains a high proportion (~68% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. The unweathered mixture has a dynamic viscosity of 0.7032 cP. The pour point of the whole oil (< 15 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the Northwest Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 67.97% of the oil mass should evaporate within the first 12 hours (BP < 180°C); a further 18.48% should evaporate within the first 12-24 hours (180°C < BP < 265 °C); and a further 10.05% should evaporate over several days (265 °C < BP < 380 °C). **Eris-1 Condensate** Eris-1 Condensate (API 41.3) contains a high proportion (~[66% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. The unweathered mixture has a dynamic viscosity of 0.4.922 cP. The pour point of the whole oil (< 15 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the Northwest Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about 14.97% of the oil mass should evaporate within the first 12 hours (BP < 180°C); a further	Section 6.7 of the EP Appendix A of the Oil Pollution First Strike Plan

<table>
<tr><td></td><td colspan="4">48.43% should evaporate within the first 12-24 hours (180°C < BP < 265 °C); and a further 26.6% should evaporate over several days (265 °C < BP < 380 °C).

Marine Gas Oil

Marine Diesel Oil (MGO) is typically classed as an International Tanker Owners Pollution Federation (ITOPF) Group I/II oil. Group I oils are non-persistent and tend to dissipate completely through evaporation within a few hours and do not normally form emulsions.

From modelling results it is predicted that around 6% of the release will be subject to a fairly rapid evaporation when on or around the surface of the water and around 95% in total is available to evaporate over time. It is predicted only 50m^3 of product would remain after several days from the bunkering scenario and there is no predicted shoreline contact or accumulation.</td><td></td></tr>
<tr><td>Modelling results</td><td colspan="4">Stochastic modelling

A quantitative, stochastic assessment has been undertaken for credible spill scenarios to help assess the environmental risk of a hydrocarbon spill.

A total of 100 replicate simulations were completed for the modelled condensate scenarios and 200 for the MGO 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.</td><td>Section 2.3</td></tr>
<tr><td></td><td colspan="4">Deterministic modelling

Deterministic modelling was then undertaken for scenario MEE-02b as the worst-case credible scenario (WCCS) to contact shoreline receptors to establish the following for response planning purposes:

• Minimum time to commencement of oil accumulation at any shoreline receptor (at a threshold of 100 g/m^2)
• Maximum cumulative oil volume accumulated at any individual shoreline receptor (at concentrations in excess of 100 g/m^2)
• Maximum cumulative oil volume accumulated across all shoreline receptors (at concentrations in excess of 100 g/m^2)

Stochastic modelling has been included below for MEE-01 and CS-05 to inform spill contact.</td><td></td></tr>
<tr><td></td><td></td><td>MEE-01: loss of well containment from PLA02 well - 59,459 m^3 loss of Pluto condensate over 77 days</td><td>MEE-02b: Hydrocarbon release the export pipeline – 607 tonnes 662 standard m^3) of Pluto condensate over 8 hours</td><td>CS-05: Loss of vessel containment releasing 1000 m^3 MGO over 1 hour</td><td></td></tr>
<tr><td></td><td>Minimum time to floating hydrocarbon contact with the offshore edge(s) of any shoreline receptor polygon (at a concentration of 10 g/m^2)</td><td>Day 1 (1 hour) at Montebello Marine Park</td><td>No contact at this threshold</td><td>Day 1 (1 hour) at Montebello Marine Park</td><td></td></tr>
<tr><td></td><td>Minimum time to shoreline contact (above 100 g/m^2)</td><td>No contact at any of the assessed thresholds</td><td>Day 1 (21 hours) at Dampier Archipelago (9 m^3) (Run 48, Q2)</td><td>No contact at any of the assessed thresholds</td><td></td></tr>
<tr><td></td><td>Largest volume ashore at any single</td><td>No contact at any of the</td><td>9 m^3 at Dampier Archipelago (day</td><td>No contact at any of the</td><td></td></tr>
</table>

	Response Protection Area (RPA) (above 100 g/m^2)	assessed thresholds	1, 21 hours) (Run 48, Q2)	assessed thresholds	
	Largest total shoreline accumulation (above 100 g/m^2) all shorelines	No contact at any of the assessed thresholds	9 m^3 at Dampier Archipelago (day 1, 21 hours) (Run 48, Q2)	No contact at any of the assessed thresholds	
	Minimum time to entrained/dissolved hydrocarbon contact with the offshore edges of any receptor polygon (at a threshold of 100 ppb)	Day 2 (34 hours) at Montebello Marine Park	Day 1 (22 hours) at Dampier Archipelago (Run 37, Q1)	Day 1 (1 hour) at Montebello Marine Park	
Net Environmental Benefit Analysis	Operational monitoring, source control, shoreline protection and deflection, shoreline clean-up, oiled wildlife response, are all identified as potentially having a net environmental benefit (dependent on the actual spill scenario) and carried forward for further assessment.				Section 4
ALARP evaluation of selected response techniques	The evaluation of the selected response techniques shows the proposed controls reduced the risk to an ALARP and an acceptable level for the risk presented in Section 2, without the implementation of considered additional, alternative or improved control measures.				Section 7

1 INTRODUCTION

1.1 Overview

Woodside Burrup Pty Ltd (Woodside) has developed its oil spill preparedness and response position for the Pluto Facility Operations, 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 2023 (Cth) (Environment Regulations) relating to hydrocarbon spill response arrangements.

- The Pluto Facility Operations Environment Plan (EP)
- Oil Pollution Emergency Arrangements (OPEA) (Australia)
- The Pluto Facility Operations Oil Pollution Emergency Plan (OPEP) including
  - First Strike Plan (FSP)
  - relevant operations plans
  - relevant Tactical Response Plans (TRPs)
  - relevant supporting plans
  - data directory.

1.3 Scope

This document 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 an acceptable level. 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 detailed in the EP. This document then details Woodside's decisions and techniques for responding to a hydrocarbon release event and the process for determining its level of hydrocarbon spill preparedness. It should be read in conjunction with the documents listed in Table 1-1. The location of the PAP is shown in Figure 3-1 of the EP.

1.4 Oil spill response document overview

The documents outlined in Table 1-1 and Figure 1-1 are collectively used to manage the preparedness and response for a hydrocarbon release.

The Oil Pollution First Strike Plan (FSP) contains a pre-operational Net Environmental Benefit Analysis (NEBA) summary, detailing 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 operational monitoring and the operational NEBA (Section 4). Planning, coordination and resource management are initiated by the Corporate Incident Management Team (CIMT). 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 confirm 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.

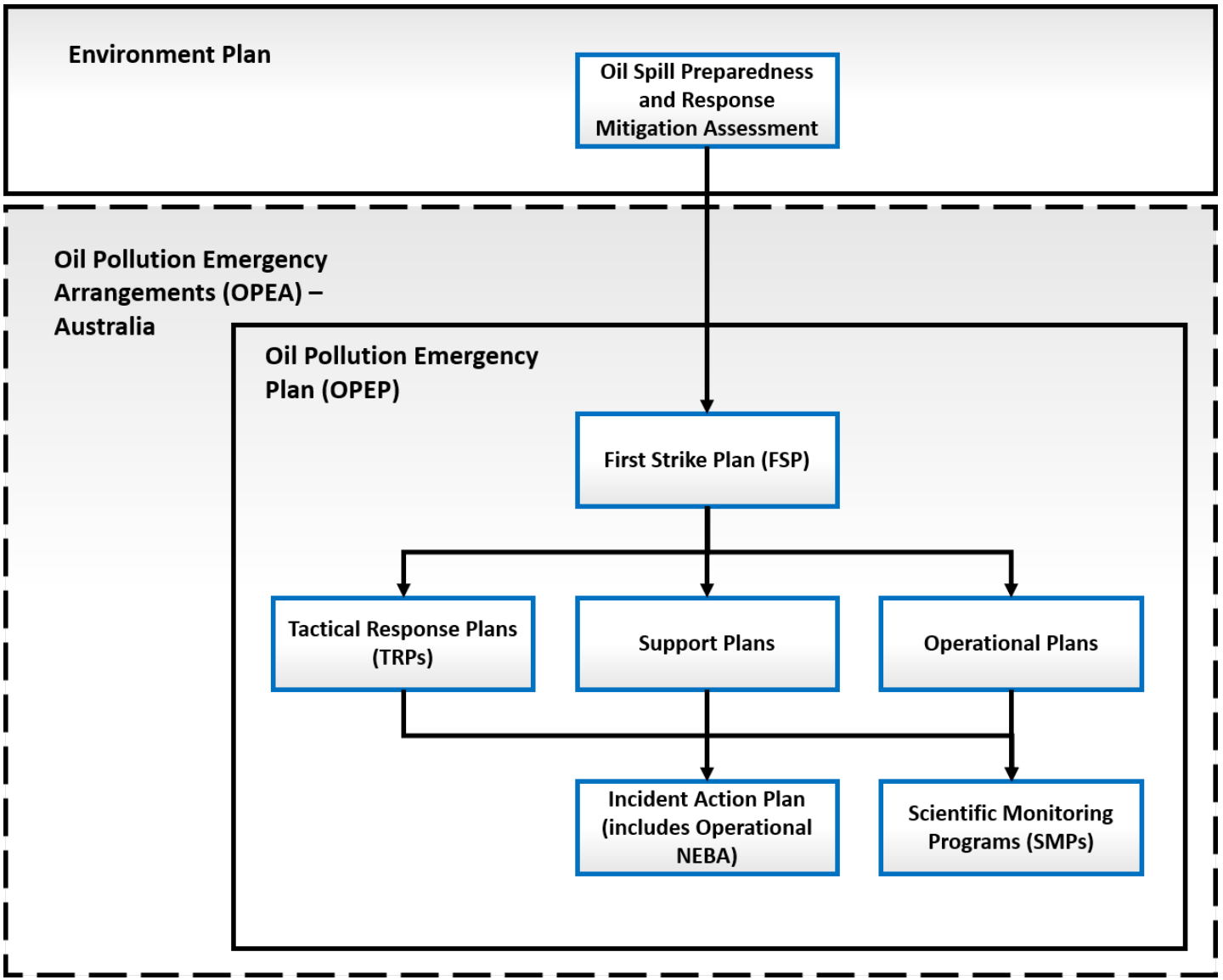

Figure 1-1: Woodside hydrocarbon spill document structure

Table 1-1: Hydrocarbon Spill preparedness and response – document references

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
Pluto Facility Operations Environment Plan (EP)	Demonstrates that potential adverse impacts on the environment associated with the Pluto Facility Operations (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 4 (Identification and evaluation of environmental risks and impacts, including credible spill scenarios). EP Section 6 (Performance outcomes, standards and measurement criteria). EP Section 7 (Implementation strategy – including emergency preparedness and response, and Reporting and compliance).	
Oil Pollution Emergency Arrangements (OPEA) Australia	Describes the arrangements and processes adopted by Woodside when responding to a hydrocarbon spill from a petroleum activity.	Regulatory agencies Woodside internal	All	
Oil Spill Preparedness and Response Mitigation Assessment for the Pluto Facility Operations (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 Management Team (CIMT): 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.	
Pluto Facility Operations Oil Pollution First Strike 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 Plans are intended to be the first document used to provide immediate guidance to the responding	Site-based IMT for initial response, activation and notification. CIMT for initial response, activation and notification. CIMT: Control function in an ongoing spill response for activity-specific response information.	Initial notifications and reporting required within the first 24 hours of a spill event. 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	

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
	Incident Management Team (IMT).		modelling, aerial surveillance and oil spill tracking buoy details.	
Operational Plans	Lists the actions required to activate, mobilise and deploy personnel and resources to commence response operations. 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.	CIMT: Operations and Logistics Sections for first strike activities. CIMT: Planning Section 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 needed once the resources arrive. Details on how to implement resources to undertake a response.	Operational monitoring Source Control Emergency Response Planning Guideline Vessel Shipboard Oil Pollution Emergency Plan (SOPEP) Protection and deflection Shoreline clean-up Oiled wildlife response Scientific monitoring program
Tactical Response Plans	Provides options for response techniques in selected RPAs. Provides site, access and deployment information to support a response at the location.	CIMT: Planning Section to help develop IAPs, and Logistics Section 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 Pluto Facility Operations oil spill response, refer to ANNEX E: Tactical Response Plans.
Support Plans	Support Plans detail Woodside's approach to resourcing and the provision of services during a hydrocarbon spill response.	CIMT: Operations, Logistics and Planning Sections.	Technique for mobilising and managing additional resources outside of Woodside's immediate preparedness arrangements.	Logistics Support Plan Aviation Support Plan Marine Support Plan Waste Management Plan – Australia Health and Safety Support Plan

Document	Document overview	Stakeholders	Relevant information	Document subsections (if applicable)
				Hydrocarbon Spill Responder Health Monitoring Guidelines People and Global Capability (Surge Labour Requirements) Support Plan Stakeholder Engagement Support Plan Guidance for Hydrocarbon Spill Claims Management

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 details 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 Pluto Facility Operations Oil Pollution First Strike Plan then summarises the outcome of the response planning process and provides initial response guidance and a summary of ongoing response activities, if an incident were to occur.

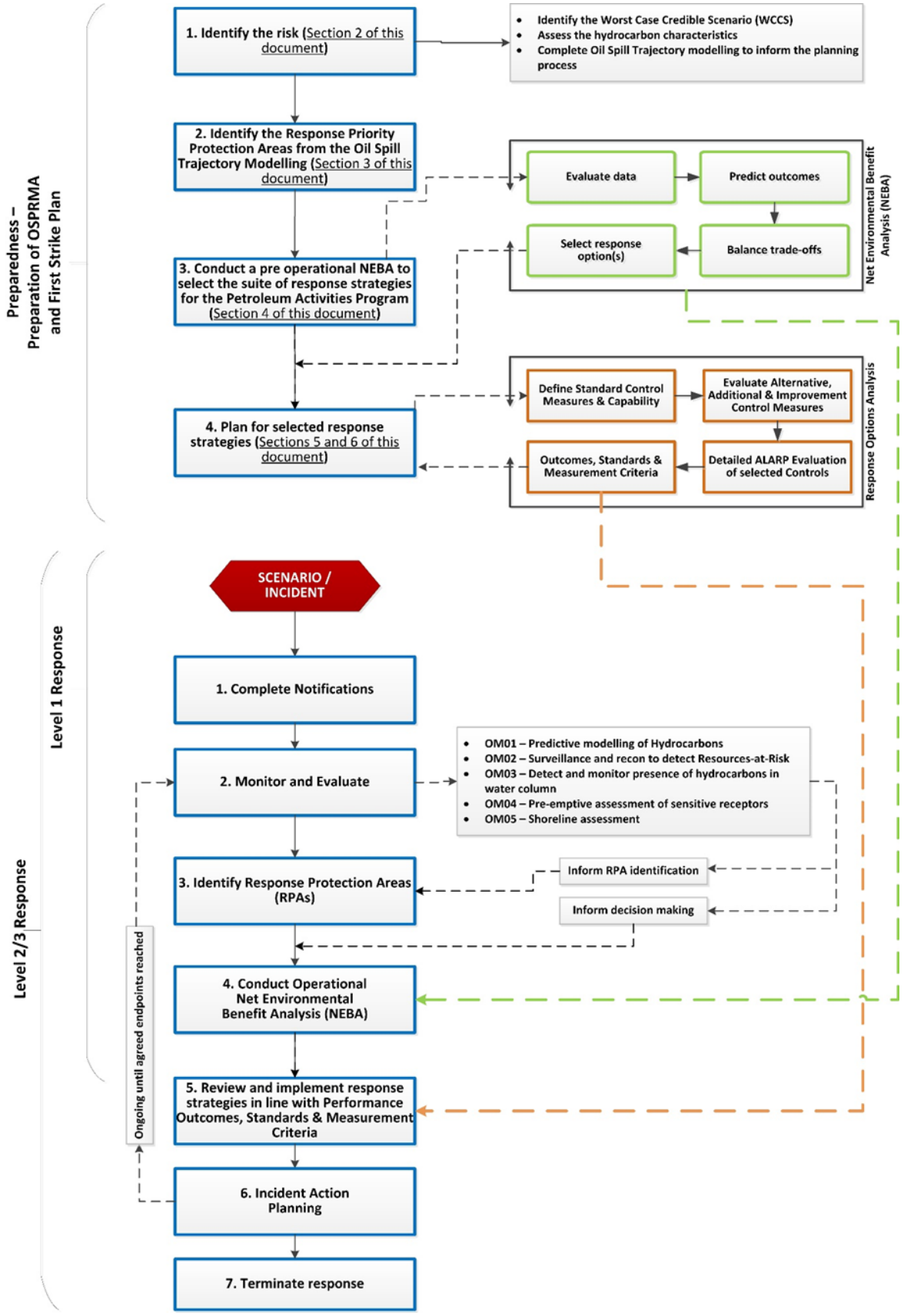

Figure 2-1: Response planning and selection process

2.1 Response planning process outline

This document is expanded below to provide additional context on the key steps in determining capability, evaluating ALARP and hydrocarbon spill response requirements.

Section 1. INTRODUCTION

Section 2. RESPONSE PLANNING PROCESS

- identification of worst-case credible scenario(s) (WCCS)
- spill modelling for WCCS.

Section 3. IDENTIFY RESPONSE PROTECTION AREAS (RPAs)

- areas predicted to be contacted at concentration >100 g/m^2.

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 confirm 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

2.1.1 Response Planning Assumptions

Figure 2-2 illustrates the initial steps of a response to an oil spill event and, where available, the indicative timing. For the latter stages, the timing will be specific to the selective response option.

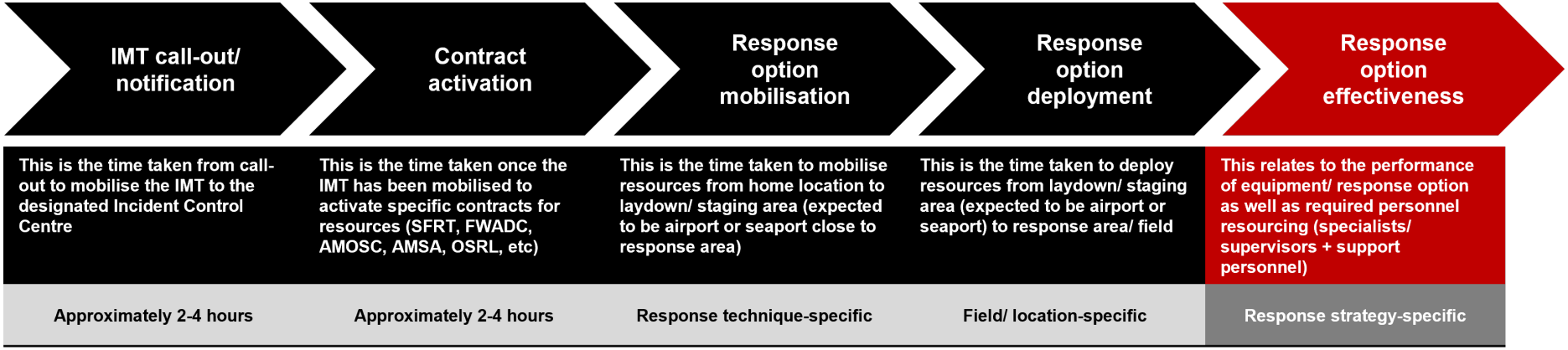

Figure 2-2: Response planning assumption – timing, resourcing and effectiveness

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 4 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. Six 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(s) for the activity are 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(s), 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(s).

The LOWC scenario at PLA02 platform (MEE-01) has been modelled and is considered to determine the WCCS for source control response planning purposes. Although the release volumes are smaller for the trunkline subsea release (MEE-02b), this results in larger shoreline loading and has therefore been selected for response planning and scaling of the shoreline response.

Table 2-1: PAP credible spill scenarios

Credible Spill Scenarios	Scenario selected for planning purposes	Scenario description	Maximum credible volume released (liquid m^3)[1]	Incident level	Hydrocarbon type	Residual proportion	Residual volume (m^3)
CS-01	No	A long-term (64-day) release of Eris-1 condensate caused by a loss of well containment during drilling at the Xena-03 well. The release occurring at the sea surface for 5 days, evolving to release from seabed level for the remaining 59 days	Spilled volume: 46,631 m^3 (1880 m^3 at the surface, 44,751 m^3 subsea) Release depth: 0 m for 5 days, 178 m for 59 days	3	Eris-1 Condensate	Surface: 10.01% Seabed: 3.39%	Surface: 4,666.78 m^3 Seabed: 1,580.79 m^3
MEE-01 (WCCS)	Yes	A long-term (77-day) subsurface release of Pluto Condensate caused by a loss of well containment from PLA02 well	Spilled volume: 59,459 m^3 Release depth: 829 m Spill duration: 77 Days	3	Pluto Condensate	2.53%	1504.31 m^3
MEE-02a	No	Loss of containment of the export trunkline at 29 km from Pluto A	Spilled volume: 479 metric tons (632 standard m^3) Release depth: 78 m Spill duration: 8 hours	1/2	Pluto Condensate	0.5%	3.16 m^3
MEE-02b (WCCS)	Yes	Loss of containment of the export trunkline at a location near-shore	Spilled volume: 607 metric tons (662 standard m^3) Release depth: 41 m Spill duration: 8 hours	1/2	Pluto Condensate	0.5%	3.31 m^3
CS-05	No	Loss of vessel containment at the PLA platform	Spilled volume: 1000 m^3 Release depth: surface Spill duration: 1 hour	1/2	MGO	5.0%	50 m^3

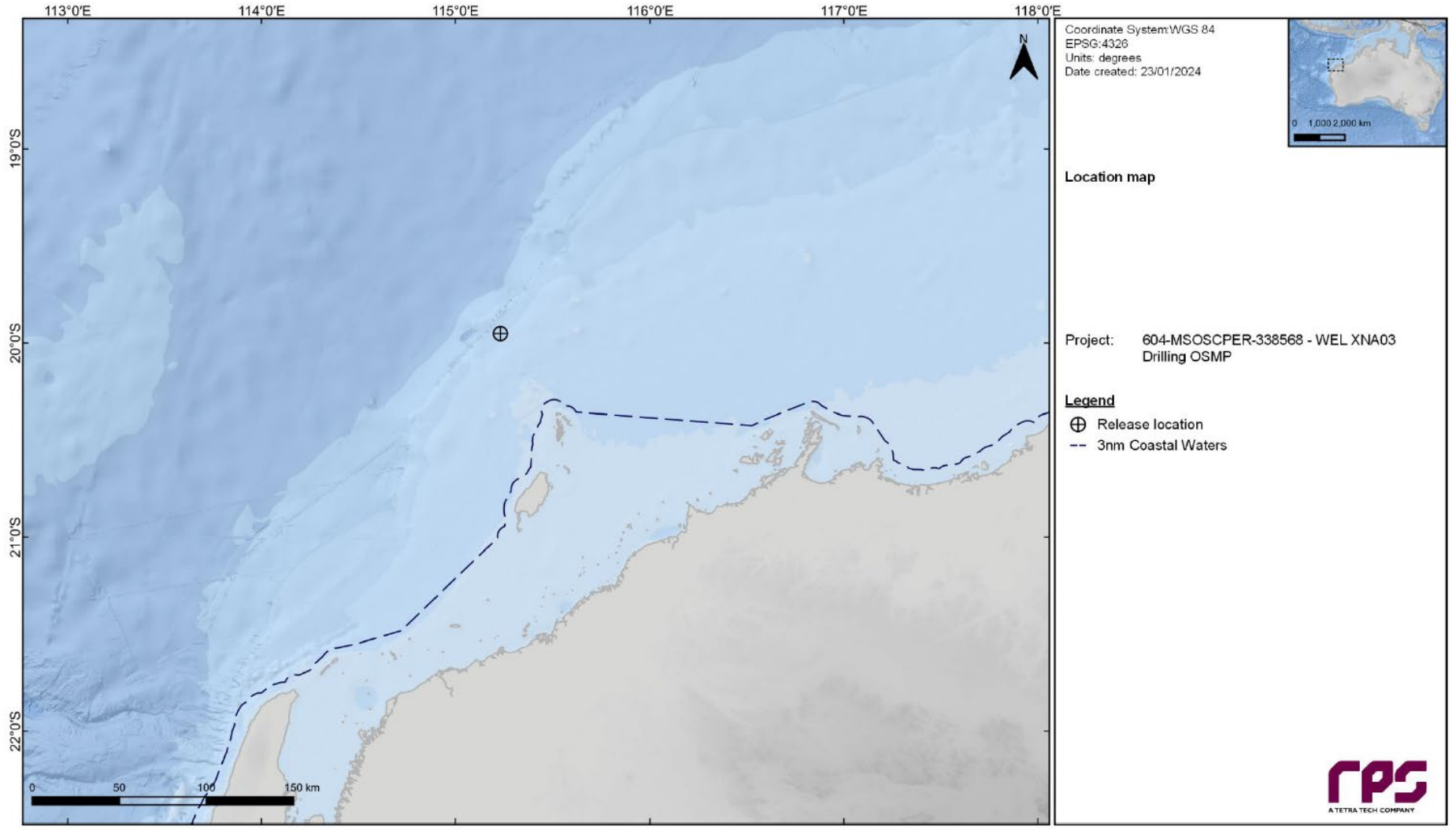

Figure 2-3: Location of CS-01 – A release of Eris-1 condensate (46,631 m^3) caused by a loss of well containment during drilling at the Xena-03 well

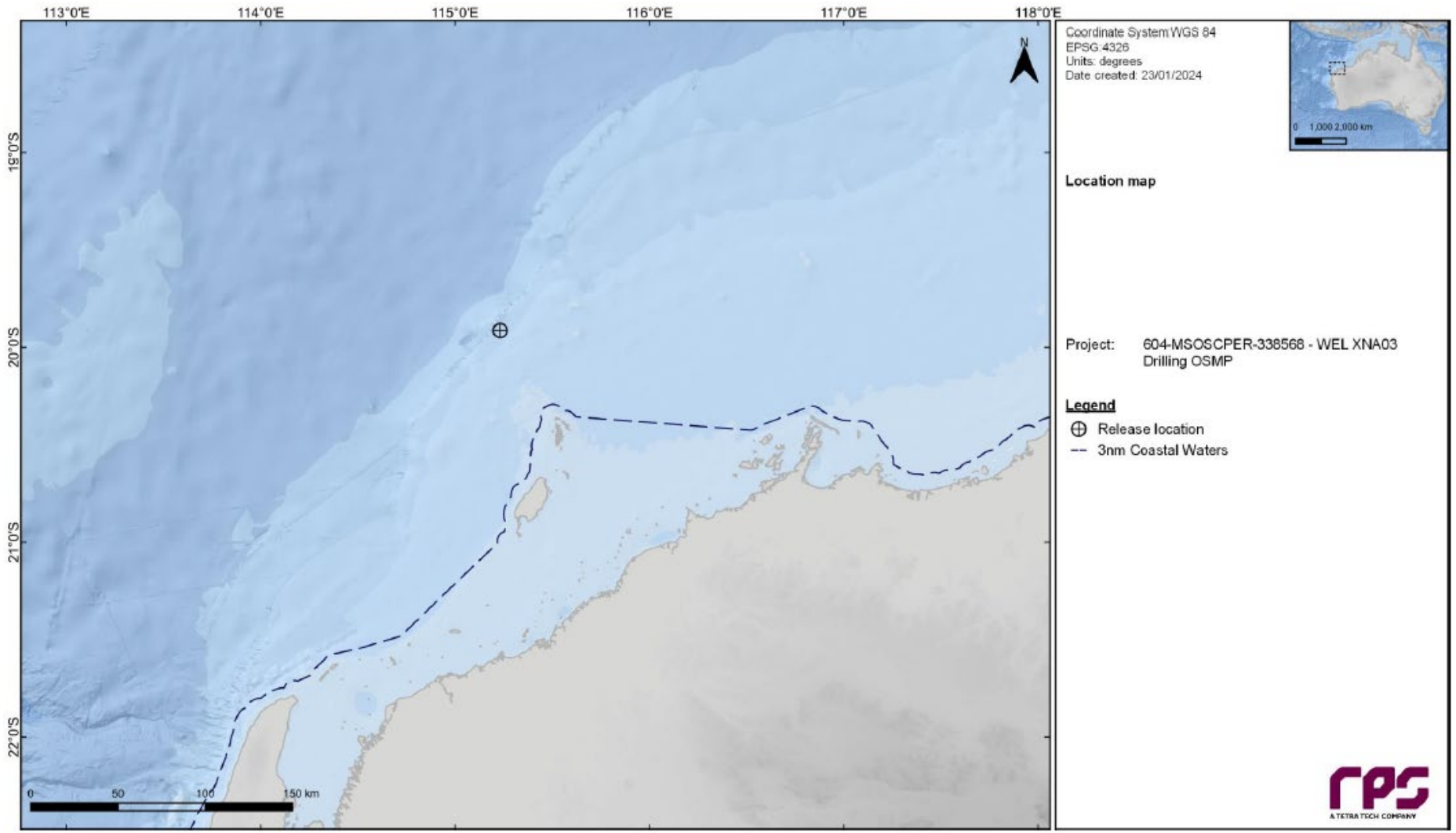

Figure 2-4: Location of MEE-01 – A subsurface release of Pluto Condensate (59,459 m^3) caused by a loss of well containment from PLA02 well

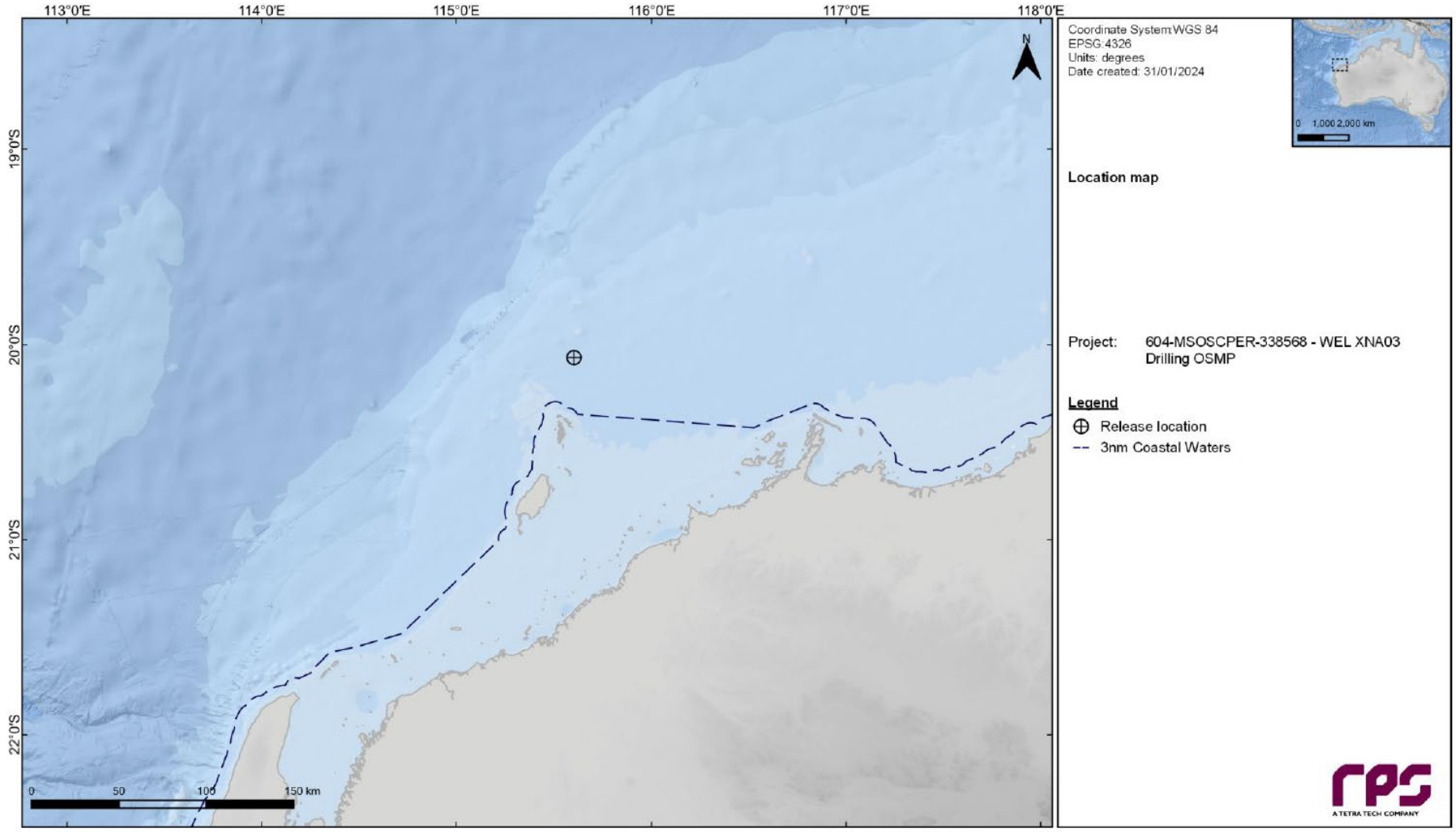

Figure 2-5: Location of MEE-02a – Loss of containment of the export trunkline at 29 km from Pluto A, releasing 479 metric tons of Pluto condensate, with gas, over 8 hours

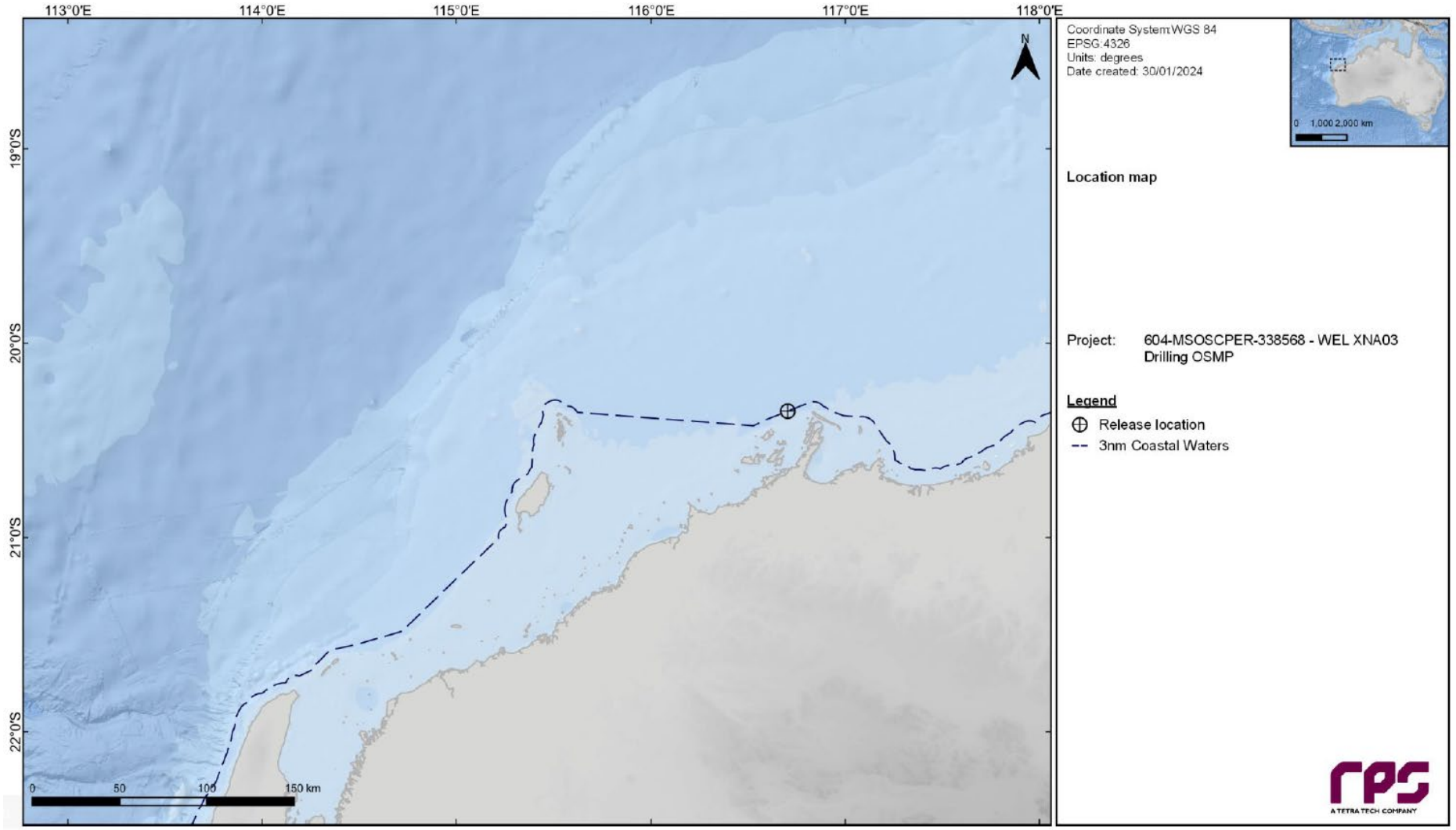

Figure 2-6: Location of MEE-02b- Loss of containment of the export trunkline at the State Water boundary (3nm), releasing 607 metric tons of Pluto condensate, with gas, over 8 hours.

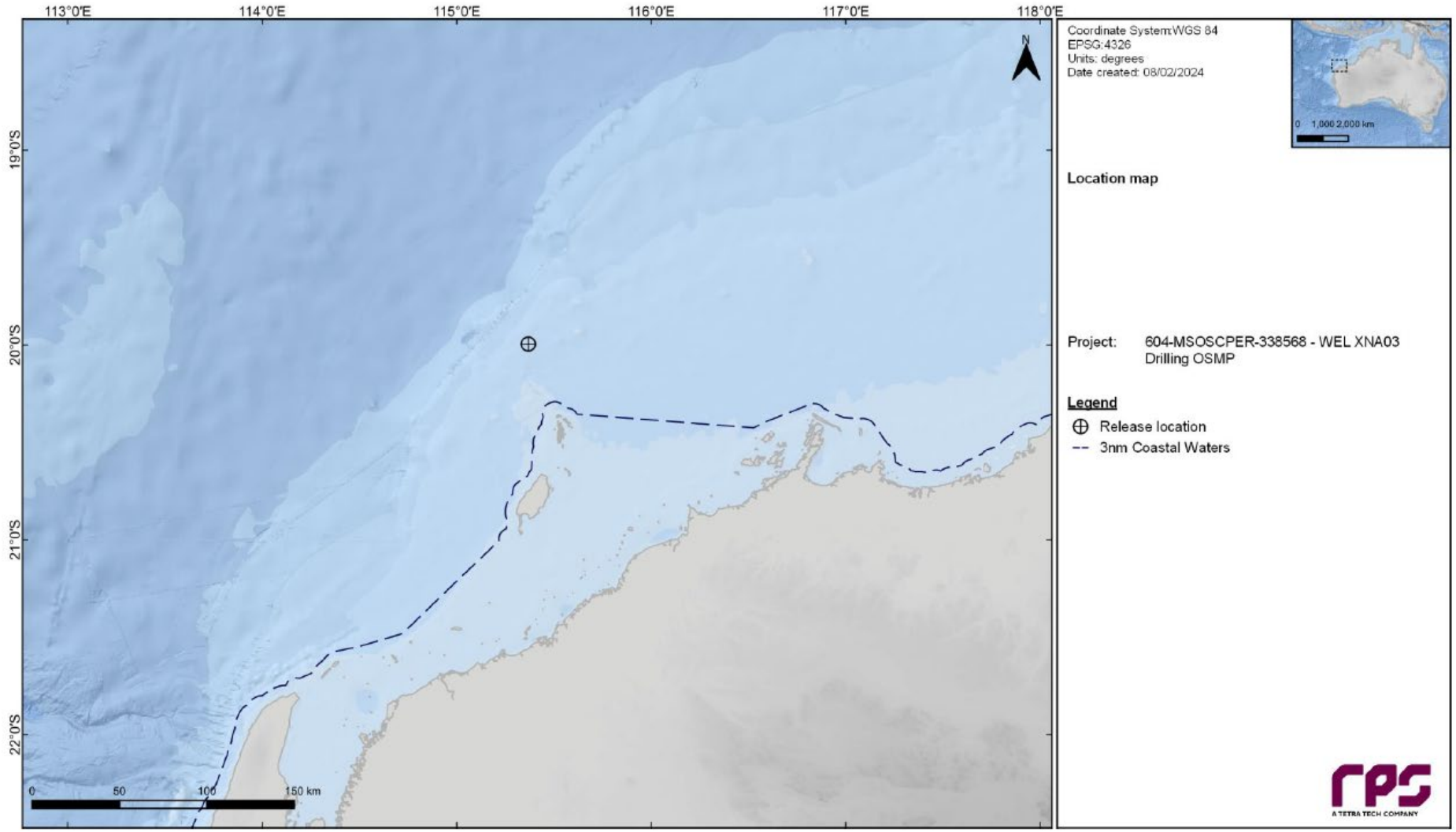

Figure 2-7: Location of CS-05 – Loss of vessel containment at the PLA platform, releasing 1000 m^3 of Marine Gas Oil (MGO) over 1 hour

2.2.1 Hydrocarbon characteristics

Hydrocarbon characteristics, including modelled weathering data and ecotoxicity, are included in Section 6.7.3 of the EP.

Pluto Condensate – Operations activities (MEE-01, MEE-02a and MEE-02b)

Pluto Condensate (API 70.9°) contains a relatively high proportion (~68% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds are expected to persist in the marine environment.

The unweathered mixture has a dynamic viscosity of 0.7032 cP. The pour point of the whole oil (<15 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere. Evaporation rates will increase with temperature, but in general about ~68% of the oil mass should evaporate within the first 12hours (BP < 180 °C); a further ~19% should evaporate within the first 12-24hours (180°C < BP < 265 °C); and a further ~10% should evaporate over several days (265 °C < BP < 380°C).

Soluble aromatic hydrocarbons contribute approximately 9.83% by mass of the whole oil, with a large proportion (6.93%) in the C4-C10 range of hydrocarbons. These compounds will evaporate slowly, leaving the potential for dissolution of a proportion of them into the water.

Eris-1 Condensate – Tie-back activities (CS-01)

Eris-1 Condensate (surface API 41.3°, seabed API 58.2°) contains a relatively high proportion (~66% by mass) of hydrocarbon compounds that will not evaporate at atmospheric temperatures. These compounds are expected to persist in the marine environment.

The unweathered mixture has a dynamic viscosity of 0.4.922 cP at the surface and 0.68 cP at the seabed. The pour point of the whole oil (<15 °C) ensures that it will remain in a liquid state over the annual temperature range observed on the North West Shelf. The mixture is composed of hydrocarbons that have a wide range of boiling points and volatilities at atmospheric temperatures, and which will begin to evaporate at different rates on exposure to the atmosphere.

Evaporation rates at the surface will increase with temperature, but in general about ~15% of the oil mass should evaporate within the first 12hours (BP < 180 °C); a further ~49% should evaporate within the first 12-24hours (180°C < BP < 265 °C); and a further ~27% should evaporate over several days (265 °C < BP < 380°C). Evaporation rates at the seabed will increase with temperature, but in general about 65.99% of the oil mass should evaporate within the first 12hours (BP < 180 °C); a further 21.6% should evaporate within the first 12-24hours (180°C < BP < 265 °C); and a further 9.02% should evaporate over several days (265 °C < BP < 380°C).

Soluble aromatic hydrocarbons contribute approximately 9.85% (surface) and 9.84% (seabed) by mass of the whole oil, with a large proportion (6.72%) in the C4-C10 range of hydrocarbons. These compounds will evaporate slowly, leaving the potential for dissolution of a proportion of them into the water.

Marine Gas Oil

Marine Gas Oil (MGO) is typically classed as an International Tanker Owners Pollution Federation (ITOPF) Group I/II oil. Group I oils are non-persistent and tend to dissipate completely through evaporation within a few hours and do not normally form emulsions.

From modelling results it is predicted that around 6% of the release will be subject to a fairly rapid evaporation when on or around the surface of the water and around 95% in total is available to evaporate over time. It is predicted only 50 m^3 of product would remain after several days from the bunkering scenario and there is no predicted shoreline contact or accumulation.

2.3 Hydrocarbon spill modelling

Oil spill trajectory modelling (OSTM) tools are used for environmental impact assessment and during response planning to understand spatial scale and timeframes for response operations. Woodside recognises there is a degree of uncertainty related to the use of modelling data and has subsequently utilised conservative approaches to volumes, weathering, spatial areas, timing and response effectiveness to scale capability to need.

The Oil Spill Model and Response System (OILMAP) and Integrated Oil Spill Impact Model System (SIMAP) models are both used for stochastic and deterministic trajectory modelling. They have been developed over three decades of planning, exercises, actual responses, several peer reviews, and validation studies. OILMAP was originally derived from the United States Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Type A model (French et al. 1996), for assessing marine transport, biological impact and economic damage that was also used under the United States Oil Pollution Act 1990 Natural Resource Damage Assessment (NRDA) regulations. Notable spills where the model has been used and validated against actual field observations include, Exxon Valdez (French McCay 2004), North Cape Oil Spill (French McCay 2003), along with an assessment of 20 other spills (French McCay and Rowe, 2004). In addition, test spills designed to verify fate, weathering and movement algorithms have been conducted regularly and in a range of climate conditions (French and Rines 1997; French et al. 1997; Payne et al. 2007; French McCay et al. 2007).

Further to this, the algorithms have been updated using the latest findings from the Macondo/Deepwater Horizon well blowout in the Gulf of Mexico and validated according to the Deepwater Horizon (DWH) oil spill in support of the NRDA (Spaulding et al. 2015; French McCay et al. 2015, 2016). Finally, the OILMAP and SIMAP models have been used extensively in Australia to prosecute pollution offences, predict discharge locations and likely spill volumes based on weathering and surveillance observations, and has been used as expert witness evidence in Australian court proceedings, aiding the prosecution to determine spill quantum estimates.

2.3.1 Stochastic modelling

Quantitative, stochastic assessments have been undertaken for the credible spill scenarios (refer to Table 2-1) to help assess the environmental consequences of a hydrocarbon spill.

A total of 100 replicate simulations were completed for each of the scenarios to test for trends and variations in the trajectory and weathering of the spilled oil, with an even number of replicates completed using samples of metocean data that commenced within each calendar quarter (25 simulations per quarter). Further details relating to the assessments for the scenarios can be found in Section 6 of the EP.

2.3.1.1 Environmental impact thresholds – Environment that May Be Affected (EMBA) and hydrocarbon exposure

The outputs of the stochastic spill modelling are used to assess the potential environmental impact from the credible scenarios. The stochastic modelling results are used to delineate areas of the marine and shoreline environment that could be exposed to hydrocarbon levels exceeding environmental impact threshold concentrations. The summary of all the locations where hydrocarbon thresholds could be exceeded by any of the simulations modelled is defined as the EMBA and is discussed further in Section 6 of the EP. As the weathering of different fates of hydrocarbons (surface, entrained and dissolved) differs due to the influence of the metocean mechanism of transportation, a different EMBA is presented for each fate within the EP.

A conservative approach – adopting accepted accumulation thresholds for impacts on the marine environment – is used to define the EMBA. These hydrocarbon thresholds are presented in Table 2-2 below and described in Section 6 of the EP.

Table 2-2: Summary of thresholds applied to the stochastic hydrocarbon spill modelling to determine the EMBA and environmental impacts

Hydrocarbon	Surface hydrocarbon (g/m^2)	Dissolved hydrocarbon (ppb)	Entrained hydrocarbon (ppb)	Accumulated hydrocarbon (g/m^2)
Condensate	10	50	100	100
Diesel	10	50	100	100

2.3.2 Deterministic modelling

Woodside uses deterministic modelling results to evaluate risks and impacts and response capability requirements. These results are provided in both shapefile and data table format with each row of the data table representing a 1 km^2 cell. This cell size has been used as it represents the approximate area a single containment and recovery operation or surface dispersant operation (single sortie or vessel spraying) can effectively treat in one ten (10) hour day. Smaller cell sizes have been considered but would not change the response need as the potential distance between cells would not allow multiple cells to be treated per day by

response operations. Additionally, a 1 km^2 cell is expected to allow averaging of threshold concentrations and mass across the spatial extent to represent a conservative approach (patches of oil and windrows) to response planning that simulates operational monitoring feedback in a real event.

Deterministic modelling was carried out on CS-01 and CS-02 as the WCCSs and used for response planning purposes. A sample of the deterministic results is provided below as an indication of the data format and content.

- Column A and B provide the latitude and longitude of the cell
- Column C is the elapsed time since the release occurred
- Column D represents the average concentration across the cell in g/m2
- Column E represents the viscosity of the hydrocarbon in centistokes (cSt) at sea surface temperature
- Column F and G represents the mass of hydrocarbon across the entire cell in kg and tons respectively.

Table 2-3: Example deterministic modelling data

Latitude	Longitude	Time_hour	Conc_gm^2	Visc_cSt	Mass_kg	Mass_tons
A	B	C	D	E	F	G
-19.711226	115.814366	6	6.413877	81.007389	6429.693282	6.413877
-19.702194	115.814366	6	1.740181	81.300190	1744.571745	1.740181
-19.720258	115.823922	6	1.869578	76.440503	1874.078751	1.869578
-19.711226	115.823922	6	51.471109	80.668490	51597.969472	51.471109
-19.702194	115.823922	6	4.734574	80.068396	4746.515274	4.734574
-19.720258	115.833477	6	4.879617	58.780817	4891.356945	4.879617
-19.711226	115.833477	6	36.161301	70.992921	36250.382543	36.161301

The deterministic modelling data provides an indication of the response need by displaying the potential surface area and volume treated or recovered by response operations. Existing capability is reviewed to approximate the surface area and volumes that can be treated or removed and a range of alternate, improved and additional options to reduce risks and impacts to ALARP are considered.

Woodside recognises no single response technique will treat all available subsea or surface oil and a combination of response techniques will be required for the identified scenario. Even with the significant resources available to Woodside through existing capability and third-party resources, the primary offshore response techniques of surface dispersant application and containment and recovery will only treat or recover a minor proportion (<30%) of the available surface hydrocarbons based on previous response experience.

Woodside is committed to a realistic, scalable response capability commensurate to the level of risk and able to be practically implemented and feasibly sustained.

2.3.3 Response planning thresholds for surface and shoreline hydrocarbon exposure

Thresholds to determine the EMBA are used to predict and assess environmental impacts and inform the Scientific Monitoring Program (SMP), however they do not appropriately represent the thresholds at which an effective response can be implemented. Additional response thresholds are used for response planning and to determine areas where response techniques would be most effective. The deterministic modelling is then used to assess the nature and scale of a response.

In the event of an actual response, existing deterministic modelling would be reviewed for suitability and additional modelling would be conducted using real-time data and field information to inform IMT decisions.

The deterministic spill modelling outputs are presented at response planning thresholds for surface hydrocarbons for the WCCS. Surface spill concentrations are expressed as grams per square metre (g/m^2). The thresholds used are derived from oil spill response planning literature and industry guidance and are summarised below.

2.3.3.1 Surface hydrocarbon concentrations

Table 2-4: Surface hydrocarbon thresholds for response planning

Surface hydrocarbon threshold (g/m^2)	Description	Bonn Agreement Oil Appearance Code	Mass per area (m^3/km^2)
>10	Predicted minimum threshold for commencing operational monitoring[1]	Code 3 – Dull metallic colours	5 to 50
50	Predicted minimum floating oil threshold for containment and recovery and surface dispersant application [2]	Code 4 – Discontinuous true oil colour	50 to 200
100	Predicted optimum floating oil threshold for containment and recovery and surface dispersant application	Code 5 – Continuous true oil colour	>200
Shoreline hydrocarbon threshold (g/m^2)	**Description**	**National Plan Guidance on Oil Contaminated Foreshores**	**Mass per area (m^3/km^2)**
100	Predicted minimum shoreline accumulation threshold for shoreline assessment operations	Stain	>100
250	Predicted minimum threshold for commencing shoreline clean-up operations	Level 3 – Thin Coating	200 to 1000

The surface thickness of oil at which dispersants are typically effective is approximately 100 g/m^2. However, substantial variations occur in the thickness of the oil within the slick, and most fresh crude oils spread within a few hours, so that overall the average thickness is 0.1 mm (or approximately 100 g/m^2) (ITOPF, 2011). Additionally, the recommended rate of application for surface dispersant is typically one-part dispersant to 20 or 25 parts of spilled oil. These figures assume a 0.1 mm slick thickness, averaged over the thickest part of the spill, to calculate a litres/hectare application rate from vessels and aircraft. In practice this can be difficult to achieve as it is not possible to accurately assess the thickness of the floating oil.

Some degree of localised over-dosage and under-dosage is inevitable in dispersant response. An average oil layer thickness of 0.1 mm is often assumed, although the actual thickness can vary over a wide range (from less than 0.0001 mm to more than 1 mm) over short distances (International Petroleum Industry Environment Conservation Association [IPIECA] 2015).

Guidance from the Australian Maritime Safety Authority (AMSA, 2020) indicates 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-fold increase in capability on day 2 to achieve the same level of performance.

Further guidance from the European Maritime Safety Authority (EMSA) states spraying the 'metallic' looking area of an oil slick (Bonn Agreement Oil Appearance Code (BAOAC) 3, approximately 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.

[1] Operational monitoring will be undertaken from the outset of a spill whether or not this threshold has been reached. Monitoring is needed throughout the response to assess the nature of the spill, track its location and inform the need for any additional monitoring and/or response techniques. It also informs when the spill has entered State Waters and control of the incident passes to statutory authorities e.g. Western Australia Department of Transport (WA DoT) or AMSA.

[2] 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.

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 Strategies: A Guide for Spill Response Planning in Marine Environments 2013 (NOAA 2013).* This guide outlines advice for response planning across all common techniques, including surface dispersant spraying and containment and recovery. It states 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 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, 2014a and 2014b).

Figure 2-8 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. Windrows, 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 50 g/m^2 was chosen as an average/equilibrium thickness (50 g/m^2 is an average of 50% coverage of 0.1 mm 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 windrows).

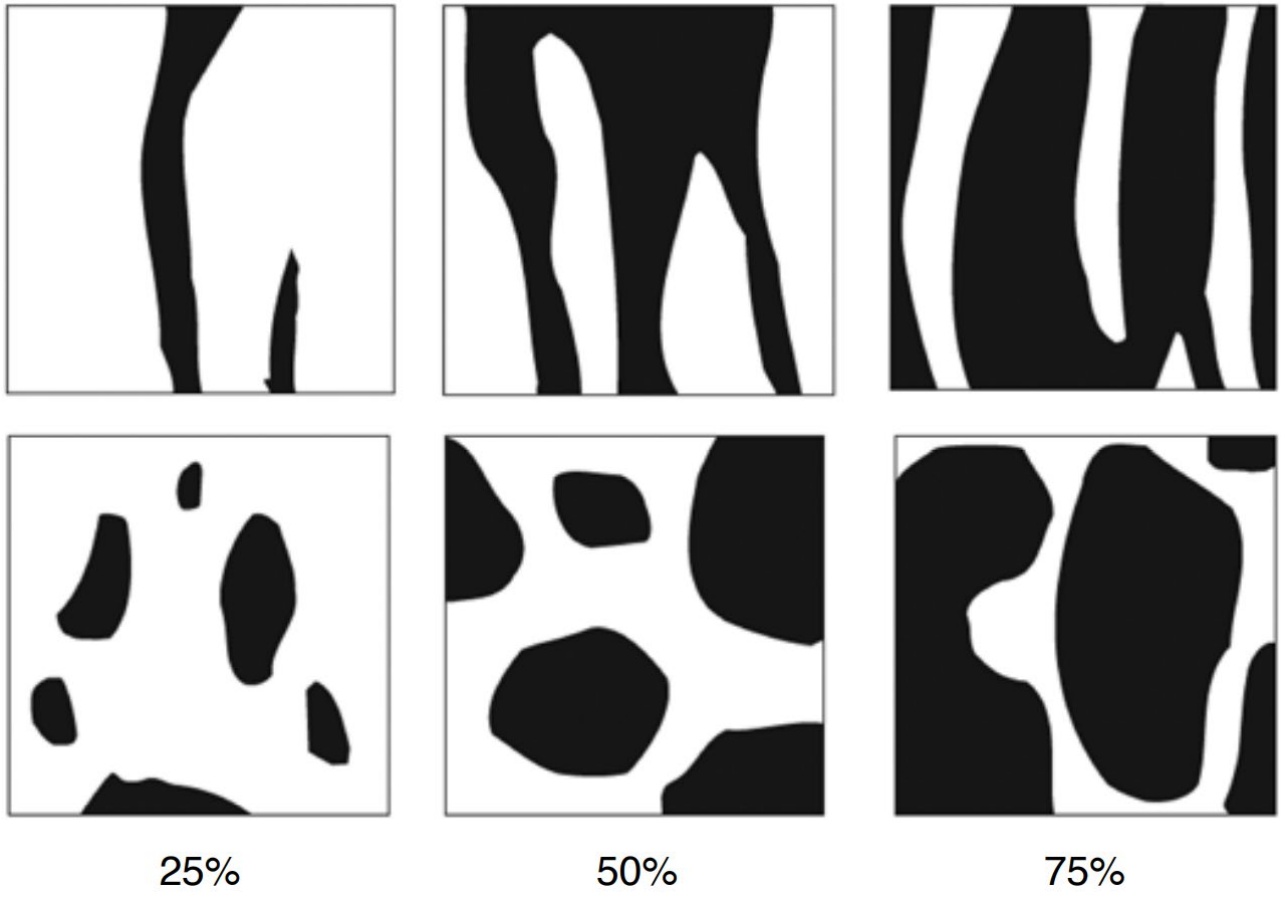

Figure 2-8: Proportion of total area coverage (AMSA, 2014)

Figure 2-9 illustrates the general relationships between on-water response techniques and slick thickness. Windrows, 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.

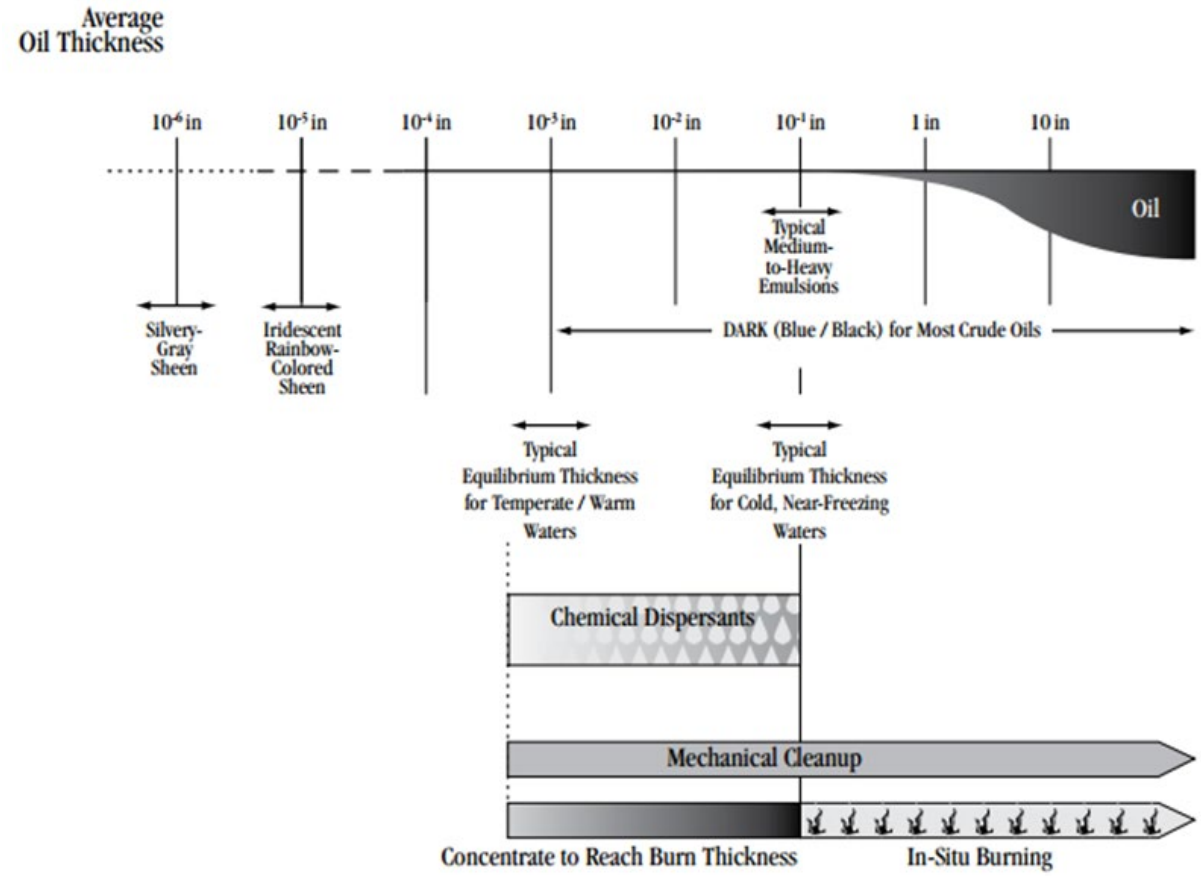

Figure 2-9: Oil thickness versus potential response options (from Allen and Dale 1996)

Wind and waves influence the feasibility of response operations, dropping the effectiveness significantly because of entrainment and/or splash-over as short-period waves develop beyond two to three feet (0.6 to 0.9 m) in height. Waves and wind can also be limiting factors for the safe operation of vessels and aircraft.

Effective dispersion requires a threshold amount of surface mixing energy (typically a few knots of wind and a light chop) to be effective. At higher wind and sea conditions, dispersant evaporation and wind-drift will limit chemical dispersion application effectiveness and there is a point (~25-kt winds, 10-ft waves) at which natural dispersion forces become greater, particularly for light oils. Because of droplet size versus slick thickness constraints and application dose-rate limitations, dispersants work best on slick thicknesses of a few thousandths (approximately 50 g/m^2) to hundredths of an inch (approximately 250 g/m^2). Improved dispersants, higher dose rates, and multiple-pass techniques may extend the thickness limitation to 0.1 inch (2.5 mm) or more.

As offshore response operations (surface dispersant and containment and recovery) are intended to be undertaken at the thickest part of the slick, 50 g/m^2 and 100 g/m^2 (aligning with the lower limit of BAOAC 4 and midpoint of BAOAC 5) have been utilised by Woodside in deterministic modelling to identify the most likely locations for surface dispersant application and containment and recovery operations.

2.3.3.2 Surface hydrocarbon viscosity

Table 2-5: Surface hydrocarbon viscosity thresholds

Surface viscosity (cSt)	Description	European Maritime Safety Authority	Viscosity at sea temperature (cSt)
5000*	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	5000-10,000

*Measured at sea surface temperature

Further to the required thickness for surface dispersant application and containment and recovery to be deployed effectively as outlined above, changes to viscosity will also limit the treatment of offshore response techniques. As outlined in the EMSA Manual on the Applicability of Oil Spill Dispersants (EMSA, 2012), guidance around changes to viscosity and likely effectiveness of surface dispersant application is provided.

This includes the following statements: “It has been known for many years that it is more difficult to disperse a high viscosity oil than a low or medium viscosity oil. Laboratory testing had shown that the effectiveness of dispersants is related to oil viscosity, being highest for modern ‘Concentrate, UK Type 2/3’ dispersants at an oil viscosity of about 1000 or 2000 mPa (1000 – 2000 cSt) and then declining to a low level with an oil viscosity of 10,000 mPa (10,000 cSt). It was considered that some generally applicable viscosity limit, such as 2000 or 5000 mPa (2000 – 5000 cSt), could be applied to all oils.”

However, modern oil spill dispersants are generally effective up to an oil viscosity of 5000 mPa (5000 cSt) or more, and their performance gradually decreases with increasing viscosity; oils with a viscosity of more than 10,000 cSt are in most cases, no longer dispersible. Guidance from CEDRE (EMSA, 2012) also indicates products with a range of 500 – 5000 cSt at sea temperature are generally possible to disperse, while 5000 – 10,000 cSt at sea temperature above pour point are sometimes possible to disperse, with products beyond 10,000 cSt at sea temperature below pour point are generally impossible to disperse.

To support decision making and response planning, a threshold of 10,000 cSt at sea temperature was chosen as a conservative estimate of maximum viscosity for surface dispersant spraying operations.

Spills of Pluto Condensate and MGO will not reach the 10,000 cSt threshold for the duration of the spill and dispersant is thus not deemed to provide a net environmental benefit for a spill arising from this PAP. The thresholds described above are compared with the modelling results for the WCCS (Table 2-6).

2.3.4 Spill modelling results

Details of the scenario and modelling inputs and results are included along with deterministic and stochastic modelling results in Table 2-6.

The selected deterministic runs used to represent the WCCS are:

- Minimum time to floating hydrocarbon contact with the offshore edge(s) of any shoreline receptor polygon (at a threshold of 10 g/m^2).
- Minimum time to commencement of hydrocarbon accumulation at any shoreline receptor (at a threshold of 100 g/m^2).
- Maximum cumulative hydrocarbon volume accumulated at any individual shoreline receptor (at a threshold of 100 g/m^2).
- Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors (at a threshold of 100 g/m^2).
- Minimum time to entrained/dissolved hydrocarbon contact with the offshore edges of any receptor polygon (at a threshold of 100 ppb).

Table 2-6: Worst case credible scenario modelling results

Scenario description	Results				
	CS-01 (stochastic)	**MEE-01 (stochastic)**	**MEE-02a (stochastic)**	**MEE-02b (deterministic)**	**CS-05 (stochastic)**
WCCS – total volume released Refer to Section 2.2.1 for detailed hydrocarbon characteristics	Hydrocarbon release of Eris-1 condensate caused by a loss of well containment during drilling at the Xena-03 well Total released - 46,631 m^3 over 64 days Surface – 1,880 m^3 over 5 days Subsurface – 44,751 m^3 over 59 days	Hydrocarbon release of Pluto condensate caused by a loss of well containment from PLA02 well during operations. Subsurface – 59,459 m^3 over 77 days (WCCS)	Hydrocarbon release caused by a loss of containment of the subsea export pipeline at 29 km from Pluto A, releasing 479 metric tons of Pluto condensate, with gas, over 8 hours. Subsurface – 479 metric tons (632 standard m^3) over 8 hours	Hydrocarbon release caused by a loss of containment of the export pipeline at the State Water boundary (3nm), releasing 607 metric tons of Pluto condensate, with gas, over 8 hours. Subsurface – 607 metric tons (662 standard m^3) over 8 hours (WCCS)	Hydrocarbon release of MGO cause by a loss of vessel containment following a vessel collision at the PLA platform 1000 m^3 over one hour (WCCS)
WCCS – residual volume remaining post-weathering	Surface – 10.01% residue Subsurface – 3.39% residue	2.53% residue	0.5% residue	0.5% residue	5% residue
Location	19° 57’ 5.5” S 115° 13’ 4.38” E	19° 54’ 48.266” S 115° 7’ 54.151” E	20° 3’ 55.1” S 115° 36’ 1.1” E	20° 21’ 0.81” S 116° 42’ 12.41” E	19° 59’ 46.5” S 115° 22’ 5.6” E
Modelling results					
Surface area of hydrocarbons (>50 g/m^2)	*Not available from stochastic modelling*	*Not available from stochastic modelling*	*Not available from stochastic modelling*	No contact at this threshold	*Not available from stochastic modelling*
Surface area of hydrocarbons (>50 g/m^2 and <15,000 cSt)	*Not available from stochastic modelling*	*Not available from stochastic modelling*	*Not available from stochastic modelling*	No contact at this threshold	*Not available from stochastic modelling*
Minimum time to floating hydrocarbon contact with the offshore edge(s) of any shoreline receptor polygon (at a concentration of 10 g/m^2)	Day 2 (43 hours) at Montebello Marine Park	No contact at this threshold	Day 1 (1 hour) at Montebello Marine Park	No contact at any of the assessed thresholds	Day 1 (1 hour) at Montebello Marine Park
Minimum time to commencement of hydrocarbon accumulation at any shoreline receptor (at a concentration of 100 g/m^2)	No contact at any of the assessed thresholds	No contact at any of the assessed thresholds	No contact at any of the assessed thresholds	Day 1 (21 hours) at Dampier Archipelago (9 m^3) (Run 48, Q2)	No contact at any of the assessed thresholds
Maximum cumulative hydrocarbon volume accumulated at any individual shoreline receptor (at a concentration of 100 g/m^2).	No contact at any of the assessed thresholds	No contact at any of the assessed thresholds	No contact at any of the assessed thresholds	9 m^3 at Dampier Archipelago (day 1, 21 hours) (Run 48, Q2)	No contact at any of the assessed thresholds
Maximum cumulative hydrocarbon volume accumulated across all shoreline receptors contacted by accumulated hydrocarbons (at a concentration of 100 g/m^2)	No contact at any of the assessed thresholds	No contact at any of the assessed thresholds	No contact at any of the assessed thresholds	9 m^3 at Dampier Archipelago (day 1, 21 hours) (Run 48, Q2)	No contact at any of the assessed thresholds
Minimum time to entrained/dissolved hydrocarbon contact with the offshore edges of any receptor polygon (at a threshold of 100 ppb)	Day 1 (13 hours) at Montebello Marine Park	Day 2 (34 hours) at Montebello Marine Park	Day 1 (1 hour) at Montebello Marine Park	Day 1 (22 hours) at Dampier Archipelago (Run 37, Q1)	Day 1 (1 hour) at Montebello Marine Park
The full list of response protection areas (RPAs) predicted from modelling is available in Table 3-1					

From the above modelling results, Run 37, Q1 and Run 48, Q2 deterministic results for MEE-02b have been used as the basis for response planning and are included in Section 4.2

From analysis of the stochastic and deterministic results, modelling predicts the following:

- The subsea release results in insufficient concentrations for effective surface dispersant and containment and recovery operations due to rapid spreading and weathering of the surface oil. Furthermore, the spill is predicted to move beyond the pre-defined Zone of Application for surface dispersants including movement into WA State waters by approximately Day 1.
- The release results in sufficient concentrations for effective shoreline response at a few receptors.
- Weathering predictions for the release indicate a low residual portion of hydrocarbons (0.5%).
- Response operations cannot be implemented if the safety of response personnel cannot be guaranteed. Safety circumstances that limit the execution of this control measure include volatile concentrations of hydrocarbons in the atmosphere, high winds (>20 knots), waves and/or sea states (>1.5m waves) and high ambient temperatures.

3 IDENTIFY RESPONSE PROTECTION AREAS

In a response, operational monitoring programs (OMPs) – 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.

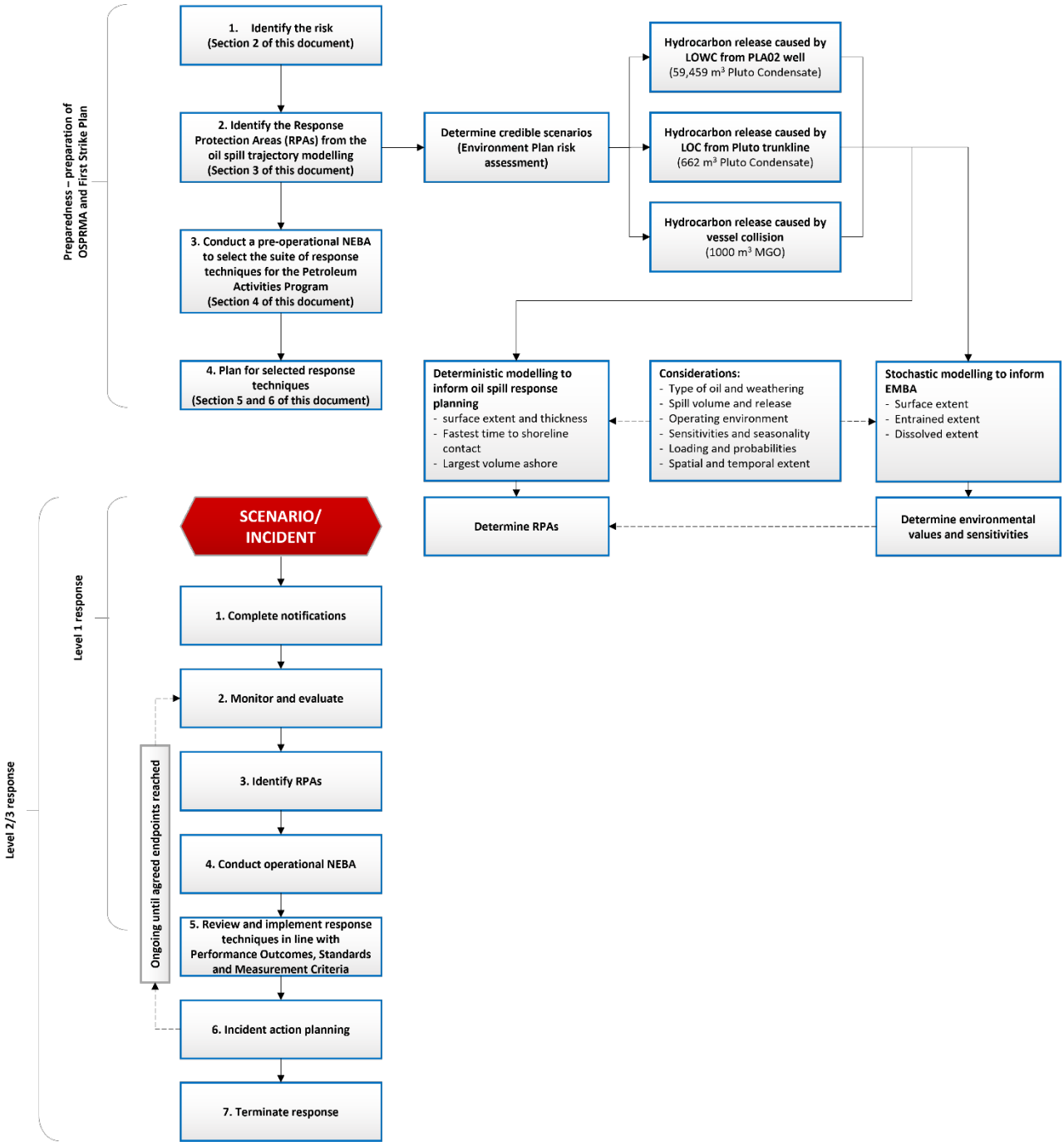

Figure 3-1: Identify Response Protection Areas (RPAs) flowchart

3.1 Identified sensitive receptor locations

Section 4 of the EP includes the list of sensitive receptor locations that have been identified by stochastic modelling as meeting the requirements outlined below:

- receptors with the potential to incur surface, entrained or shoreline accumulation contact above environmental impact thresholds
- receptors within the EMBA which meet any of the following:
  - 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

RPAs have been 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 2.3.3**). The figures outlined in Table 3-1 are the combined results of the individual worst-case runs and do not indicate a single worst case credible scenario (where the timings and volumes are all expected from one release).

From the identified sensitive receptors described in Section 6 of the EP, only those which a shoreline response could feasibly be conducted (accumulation > 100 g/m^2 for shoreline assessment and/or contact with surface slicks >10 g/m^2 for operational monitoring) have been selected for response planning purposes. 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 RPAs potentially contacted from stochastic modelling (as per EMBA definition) (see Section 4 of the EP). Other RPA 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) includes the results from the stochastic modelling to allow consideration of all feasible response techniques 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) from deterministic modelling

Response protection area	Conservation status	IUCN protection category	Minimum time to shoreline contact (above 100 g/m^2) in days [3]	Maximum shoreline accumulation (above 100 g/m^2) in m^3 [4]
Cape Bruguieres	National Heritage Property	N/A	32 hours (4 m^3)	4 m^3 (32 hours)
Dampier Archipelago	Nature reserve and National Heritage Place	IUCN Ia – Strict Nature Reserve IUCN II – National Park IUCN IV – Habitat/Species Management Area IUCN VI – Multiple Use Zone	21 hours (9 m^3)	9 m^3 (21 hours)
Cohen Island	Nature reserve	IUCN Ia – Strict Nature Reserve	30 hours (<1 m^3)	5 m^3 (31 hours)
Keast Island	Nature reserve	IUCN Ia – Strict Nature Reserve	32 hours (3 m^3)	3 m^3 (32 hours)
Legendre Island	Nature reserve	IUCN Ia – Strict Nature Reserve	22 hours (6 m^3)	6 m^3 (22 hours)

[3] This volume and time represent the first time to contact on defined shoreline polygon and the maximum volume ashore for that 24 hour period.
[4] This volume and time represent the maximum volume ashore on defined shoreline polygon for any 24 hour time period

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.

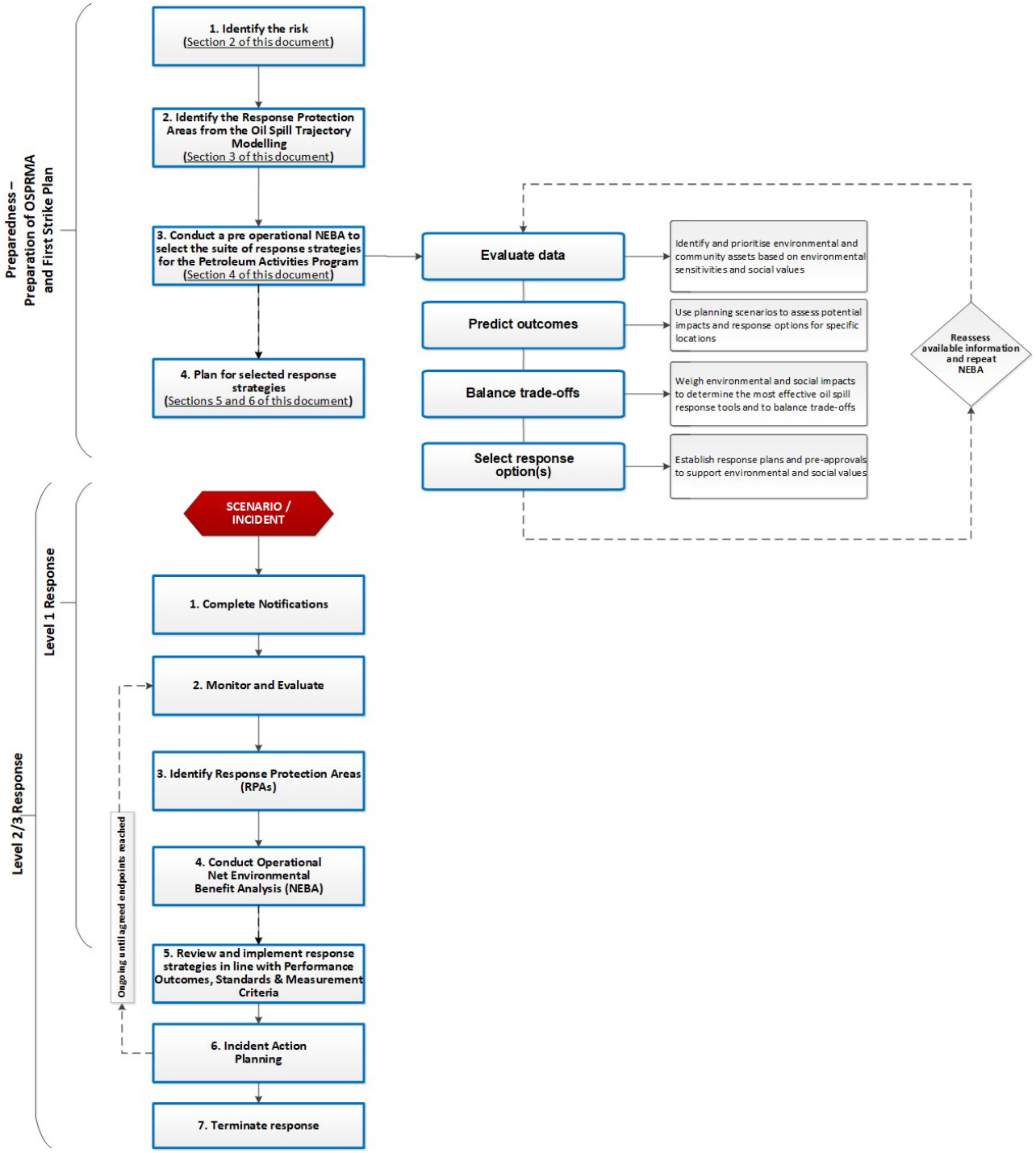

Figure 4-1: Net Environmental Benefit Analysis (NEBA) flowchart

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 and the surface concentrations (**Table 2-4** and **Table 3-1**) 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 using 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.

4.2.1 Define the scenario(s)

Woodside uses scenarios identified from the risk assessment in the EP to assess potential impacts and response options for specific locations. The WCCS is then selected for deterministic modelling and is used for this pre-operational NEBA. Outlier locations with potential environmental impacts, selected from the stochastic modelling may also be included for assessment. Response thresholds and deterministic modelling are then used to assess the feasibility/effectiveness and scale of the response. Modelling results are available in **Table 2-4** and **Table 3-1**.

4.3 Stage 2: Predict Outcomes

Woodside uses planning scenarios to assess potential impacts and response options for specific locations. Locations with potential environmental impacts, selected from the stochastic modelling are included for assessment. Response thresholds and deterministic modelling are then used to assess the feasibility/ effectiveness of a response.

4.4 Stage 3: Balance trade-offs

Woodside considers environmental impacts and response feasibility/ effectiveness 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 feasibility/ effectiveness 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.

4.5.1 Determining potential response options

The available response techniques based on current technology can be summarised under the following headings:

- Operational monitoring
- Source control
  - Remotely operated vehicle (ROV) intervention
  - debris clearance and/or removal
  - capping stack

  - containment dome
  - relief well drilling
- Source control via vessel SOPEP
- Subsea dispersant injection
- Surface dispersant application:
  - aerial dispersant application
  - vessel dispersant application
- Mechanical dispersion
- In-situ burning
- Containment and recovery
- Shoreline protection and deflection:
  - protection
  - deflection
- Shoreline clean-up:
  - Phase 1 – mechanical clean-up
  - Phase 2 – manual clean-up
  - Phase 3 – final polishing
- In-situ burning
- Oiled wildlife response (including hazing).

Support functions may include:

- Waste management
- Post spill/ scientific monitoring

Table 4-1, Table 4-2,

Table 4-3 include scenario-specific assessments of feasible response options and justification for the exclusion of inappropriate options. These options are evaluated against the scenario parameters including oil type, volume, characteristics, prevailing weather conditions, logistical support, and resource availability to determine deployment feasibility.

A shortlist of the feasible response options is then carried forward for the ALARP assessment. This assessment will typically result in a range of available options, that are deployed at different areas (at-source, offshore, nearshore and onshore) and different times during the response. The NEBA process assists in prioritising which options to use where and when, and timings throughout the response.

Table 4-1: Response technique evaluation – loss of well containment

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: Pluto condensate (MEE-01) and Eris-1 Condensate during tie-back (CS-01)				
Techniques feasible during operations phase (MEE-01)				
Operational Monitoring	Will be effective in tracking the location of the spill, informing when it has entered State waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques. • OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill. • OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill. • OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk. • OM05 Shoreline assessment – once OM02, OM03 and OM04 inform which RPAs have been impacted.	Monitoring of a condensate spill is a feasible response technique and an essential element of all spill response incidents. Outputs will be used to guide decision making on the use of other monitoring/response techniques and providing required information to regulatory agencies including AMSA and Western Australia Department of Transport (WA DoT).	**Yes**	Monitoring the spill will be necessary to: • validate trajectory and weathering models • determine the behaviour of the oil in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • provide regulatory agencies with required information.
Source control via blowout preventer (BOP) intervention using ROV and hotstab	Not applicable – production wells do not have blowout preventers in place and thus intervention and/or hotstab are not feasible response techniques.	Not applicable – production wells do not have blowout preventers in place and thus intervention and/or hotstab are not feasible response techniques.	**N/A**	Not applicable – production wells do not have blowout preventers in place and thus intervention and/or hotstab are not feasible response techniques.
Source control via debris clearance and capping stack	Controlling a loss of well containment at source via capping stack would be an effective way to limit the quantity of hydrocarbon entering the marine environment.	Capping the Pluto well is considered feasible based on worst-case discharge rates. Though all capping stack deployment technologies are unproven, in the event of a loss of well containment, the use of a proven subsea deployment method such as a heavy lift vessel, which is more commonly used in industry, is a more reliable and, in turn, ALARP approach. If environmental conditions permit (wind speed, wave height, current and plume radius), deployment of a capping stack would be attempted with a heavy lift vessel. Woodside maintains several frame agreements with various vessel service providers and maintains the ability to call off services with a capping stack and debris clearance agreement. The location of suitable vessels for capping stack deployment are monitored monthly. Consideration to mobilise the capping stack from the supplier on a suitable vessel but then hand over to another vessel to conduct the capping activity will also be made to meet response time frames. Landing force analysis through computational fluid dynamic (CFD) modelling confirms the ability to land the capping stack on the Xmas tree.	**Yes**	Conventional/vertical capping stack deployment with a heavy lift vessel will be attempted at the discretion of the vessel master on the day, giving due regard to the safety of the vessel and crew. Circumstances that limit the safe execution of this control measure include lower explosive limit (LEL) concentrations, volatile concentrations of hydrocarbons in the atmosphere, weather window, waves and/or sea states and high ambient temperatures.
Source control via relief well drilling	A loss of well containment is predicted to be over 77 days for MEE-01. Relief well drilling will be a feasible option to stop the release.	For a loss of well containment, relief well drilling will be a feasible means of controlling a loss of well containment event.	**Yes**	Relief well drilling is a feasible technique employed to control a loss of well containment event. Relief well drilling is a widely accepted and utilised technique.
Subsea dispersant injection	Application of subsea dispersant may reduce the scale and extent of hydrocarbons reaching the surface and thus may reduce spill volumes contacting predicted RPAs. SSDI can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons. Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals and fish, which may be otherwise unaffected. Entrained oil plume likely to be increased resulting in greater spatial extent of entrained oil.	The goal of SSDI is to decrease the volume of oil that rises to the water surface and to reduce exposure to floating and entrained/dissolved oil. Based on the stochastic modelling analysis, no shoreline accumulation is predicted to occur following a LOWC of condensate during drilling or operation activities. The use of SSDI would not be required in order to deploy a capping stack and unnecessary use of SSDI would increase the complexity of SIMOPS operations around the wellhead. Given the preceding information and that there is conflicting evidence on the efficacy of SSDI, despite the considerable amount of research and experimental work completed since the Deepwater Horizon spill (Quigg et al. 2021), the use of SSDI is considered unwarranted and would not provide net environmental or safety benefits.	**No**	Due to the modelling predicting no shoreline exposure at RPAs, together with the minimal surface exposure and this technique not being required to facilitate other source control techniques, the use of SSDI is not deemed appropriate. The application of subsea dispersant would unnecessarily introduce additional chemical substances to the marine environment and further increase exposure of subsea ecosystems to entrained hydrocarbons.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Surface dispersant application	Application of surface dispersant would likely reduce the volumes of hydrocarbons contacting sensitive surface receptors. Dispersant can also enhance biodegradation and may reduce volatile organic compounds (VOCs) in some circumstances therefore reducing potential health and safety risk to responders. Dispersant can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons. Subsurface oil plume likely to increase in size resulting in greater spatial extent of entrained oil. Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which otherwise may have been unaffected.	Surface dispersants are not generally considered a feasible response technique when applied to thin surface films such as condensate, as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with surface dispersant, including surface slicks with Bonn Agreement Oil Appearance Codes (BAOAC) 1-3. Modelling LOWC spill for the Pluto Facility Operations drilling project predicts that floating oil will be prone to rapid spreading and evaporation and will not reach the required threshold (>50 g/m^2) for surface dispersant to be effective within any RPA. The volatile nature of condensates modelled (Eris-1 and Pluto) is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon spill, thus this response technique is deemed unsuitable for this activity.	**No**	Condensate will rapidly evaporate and disperse, resulting in spill thicknesses too thin to effectively treat with surface dispersant. The use of surface dispersant could unnecessarily introduce additional chemical substances to the marine environment.
Mechanical dispersion	Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages.	Although the technique is feasible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly. The volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. Additionally, any vessel used for mechanical dispersion activities would be contaminated by the hydrocarbon and could potentially cause secondary contamination of unimpacted areas when exiting the spill area. The decontamination of a vessel used for mechanical dispersion activities would result in additional quantities of oily waste requiring appropriate handling and treatment.	**No**	Given the limited benefit of mechanical dispersion over natural wind and wave action, secondary contamination and waste issues, and the associated safety risk of implementing the response for this activity, this strategy is deemed unsuitable.
In-situ burning	In-situ burning is only effective where minimum slick thickness can be achieved and where calm metocean conditions can be ensured. Use of this technique would also cause an increase the release of atmospheric pollutants.	There is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which would be difficult to achieve. Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles.	**No**	The safety concerns and the predicted low effectiveness associated with implementing an in-situ burning response outweigh the potential environmental benefit.
Containment and recovery	Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5. It has the potential to reduce the magnitude, probability, extent, contact and accumulation of hydrocarbon on shorelines receptors when suitable encounter rates can be achieved. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by removing oil before further natural entraining/dissolving of hydrocarbons occurs.	Modelling of a LOWC spill of either Eris-1 or Pluto condensate for the Pluto Facility Operations drilling project predicts that floating oil will be prone to rapid spreading and evaporation and will not reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within any RPA. The volatile nature of condensates is also likely to lead to unsafe conditions near release location.	**No**	Containment and recovery would be an ineffective response technique as it requires a hydrocarbon thickness of BAOAC 4-5 with a 50-100% coverage of 100-200 g/m^2. Modelling does not predict any surface hydrocarbons above 50 g/m^2, thus this response strategy is considered ineffective.
Shoreline protection and deflection	Shoreline protection and deflection can be effective at preventing contamination of sensitive resources and can be used to corral oil into slicks thick enough to skim effectively.	Stochastic modelling predicted that no shoreline receptors would be contacted by hydrocarbons at any threshold in the event of a LOWC from the Pluto Facility during drilling or operation activities. Therefore, shoreline response strategies, such as shoreline protection and deflection, are not applicable as hydrocarbons are unlikely to accumulate on the shoreline.	**No**	The modelling undertaken predicts no contact to any shoreline receptor at any threshold following a LOWC scenario.
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.	Stochastic modelling predicted that no shoreline receptors would be contacted by hydrocarbons at any threshold in the event of a LOWC from the Pluto Facility during drilling or operation activities. Therefore, shoreline response strategies are not applicable as hydrocarbons are unlikely to accumulate on the shoreline.	**No**	The modelling undertaken predicts no contact to any shoreline receptor at any threshold following a LOWC scenario.
Oiled wildlife	Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination.	In the event that wildlife are at risk of contamination, oiled wildlife response will be undertaken in accordance with the Oiled Wildlife Response Operational Plan as and where required. In addition, any rehabilitation could only be undertaken by trained specialists. Due to the likely volatile atmospheric conditions surrounding a Pluto Condensate spill, response options may be limited to hazing to ensure the safety of response personnel.	**Yes**	This technique may prevent impact to and/or treat oiled wildlife providing net environmental benefit.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Additional techniques feasible during tie-back activities (CS-01)				
Source control via blowout preventer (BOP) intervention using ROV and hotstab	Controlling a loss of well containment at source via BOP intervention would be the most effective way to limit the quantity of hydrocarbon entering the marine environment.	In the event of the worst-case scenario with a loss of well containment during drilling and tie-back activities, remotely operated vehicle (ROV) operations to locally operate the BOP would be attempted.	**Yes**	The use of source control intervention via ROV may be feasible during drilling and tie-back activities (depending on local concentration of atmospheric volatiles) and would reduce quantity of hydrocarbons entering the marine environment.
Source control via debris clearance and capping stack	Controlling a loss of well containment at source via capping stack would be an effective way to limit the quantity of hydrocarbon entering the marine environment.	Woodside will have a project specific source control emergency response plan (SCERP) for the Xena-03 tie-back activities which will include an assessment of capping stack landing feasibility. Woodside maintains several frame agreements with various vessel service providers and maintains the ability to call off services with a capping stack and debris clearance agreement. The location of suitable vessels for capping stack deployment are monitored monthly. The supply arrangements and reliability to achieve the required mobilisation time will be revalidated prior to spud. Consideration to mobilise the capping stack from the supplier on a suitable vessel but then hand over to another vessel to conduct the capping activity will also be made to meet response time frames.	**Yes**	Conventional/ vertical capping stack deployment may be feasible during the tie-back activity phase. This would be considered, at the discretion of the vessel master on the day, giving due regard to the safety of the vessel and crew and factors that may influence a safe deployment such as plume radius and acceptable environmental conditions e.g. wind speed, wave height, current and plume radius.
Source control via relief well drilling	A loss of well containment is predicted to be over 64 days for CS-01. Relief well drilling will be a feasible option to stop the release.	For a loss of well containment, relief well drilling will be a feasible means of controlling a loss of well containment event.	**Yes**	Relief well drilling is a feasible technique employed to control a loss of well containment event. Relief well drilling is a widely accepted and utilised technique.

Table 4-2: Response technique evaluation – loss of containment from subsea export pipeline

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: Pluto condensate (MEE-02b)				
Operational Monitoring	Will be effective in tracking the location of the spill, informing when it has entered State Waters, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques. • OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill. • OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill. • OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk. • OM05 Shoreline assessment – once OM02, OM03 and OM04 inform which RPAs have been impacted.	Monitoring of a Pluto condensate spill is a feasible response technique and an essential element of all spill response incidents. Outputs will be used to guide decision making on the use of other monitoring/response techniques and providing required information to regulatory agencies including AMSA and Western Australia Department of Transport (WA DoT).	**Yes**	Monitoring the spill will be necessary to: • validate trajectory and weathering models • determine the behaviour of the oil in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • provide regulatory agencies with required information.
Source control via emergency shutdown (ESD) valves	Controlling a loss of containment at source via the ESD valves is an effective way to reduce the amount of hydrocarbon released into the marine environment in the event of a hydrocarbon release.	In the event of the worst-case scenario with a loss of containment from the export pipeline, the use of ESD valves would be attempted.	**Yes**	Source control from the facility will be the main technique employed to control a loss of containment event of the export pipeline.
Source control via ROV	Controlling a loss of containment at source via ROV would an effective way to actuate the subsea valves in the event of a hydrocarbon release.	In the event of the worst-case scenario with a loss of containment from the export pipeline, the use of ROV operations to actuate the subsea vales would be attempted in the event of failure of valve operation.	**Yes**	Source control via ROV will be a secondary technique employed in the event that ESD valves are not effective.
Surface dispersant application	Application of surface dispersant would likely reduce the volumes of hydrocarbons contacting sensitive surface receptors. Dispersant can also enhance biodegradation and may reduce VOCs in some circumstances therefore reducing potential health and safety risk to responders.	Surface dispersants are not generally considered a feasible response technique when applied to thin surface films such as condensate, as the dispersant droplets tend to pass through the surface films without binding to the hydrocarbon. EMSA (2010) recommends thin layers of spilled hydrocarbons should not be treated with surface dispersant, including surface slicks with Bonn Agreement Oil Appearance Codes (BAOAC) 1-3.	**No**	Pluto Condensate will rapidly evaporate and disperse, resulting in spill thicknesses too thin to effectively treat with surface dispersant. The use of surface dispersant could unnecessarily introduce additional chemical substances to the marine environment.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
	Dispersant can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons. Subsurface oil plume likely to increase in size resulting in greater spatial extent of entrained oil. Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which otherwise may have been unaffected.	Modelling of a Pluto Condensate spill for the Pluto Facility Operations drilling project predicts that floating oil will be prone to rapid spreading and evaporation and will not reach the required threshold (>50 g/m^2) for surface dispersant to be effective within any RPA. The volatile nature of Pluto Condensate is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon spill, thus this response technique is deemed unsuitable for this activity.		
Mechanical dispersion	Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages.	Although the technique is feasible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly. The volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. Additionally, any vessel used for mechanical dispersion activities would be contaminated by the hydrocarbon and could potentially cause secondary contamination of unimpacted areas when exiting the spill area. The decontamination of a vessel used for mechanical dispersion activities would result in additional quantities of oily waste requiring appropriate handling and treatment.	**No**	Given the limited benefit of mechanical dispersion over natural wind and wave action, secondary contamination and waste issues, and the associated safety risk of implementing the response for this activity, this strategy is deemed unsuitable.
In-situ burning	In-situ burning is only effective where minimum slick thickness can be achieved and where calm metocean conditions can be ensured. Use of this technique would also cause an increase the release of atmospheric pollutants.	There is a limited window of opportunity in which this technique can be applied (prior to evaporation of the volatiles) which would be difficult to achieve. Furthermore, this technique may be prevented from being undertaken due to personnel safety issues arising from predicted high local concentrations of atmospheric volatiles.	**No**	The safety concerns and the predicted low effectiveness associated with implementing an in-situ burning response outweigh the potential environmental benefit.
Containment and recovery	Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5. It has the potential to reduce the magnitude, probability, extent, contact and accumulation of hydrocarbon on shorelines receptors when suitable encounter rates can be achieved. It also has the potential to reduce the magnitude and extent of contact with submerged receptors by removing oil before further natural entraining/dissolving of hydrocarbons occurs.	Modelling of a Pluto Condensate spill for the Pluto Facility Operations drilling project predicts that floating oil will be prone to rapid spreading and evaporation and will not reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within any RPA. The volatile nature of Pluto Condensate is also likely to lead to unsafe conditions near release location.	**No**	Containment and recovery would be an ineffective response technique as it requires a hydrocarbon thickness of BAOAC 4-5 with a 50-100% coverage of 100-200 g/m^2. Modelling does not predict any surface hydrocarbons above 50 g/m^2, thus this response strategy is considered ineffective.
Shoreline protection and deflection	Shoreline protection and deflection can be effective at preventing contamination of sensitive resources and can be used to corral oil into slicks thick enough to skim effectively.	If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate surface hydrocarbons are moving toward shorelines, pre-emptive assessments of sensitive receptors at risk (OM04) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills). For MEE-02b, deterministic modelling predicts first shoreline accumulation from floating surface hydrocarbon will occur within 24 hours (15 m^3 at Dampier Archipelago and Legendre Island) Protection strategies can be used for targeted protection of sensitive resources. Access to sensitive areas may cause more negative impact than benefit.	**Yes**	RPAs predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event. If RPAs are deemed to be at risk, based on real-time modelling during a spill event, shoreline protection and deflection techniques will be employed to minimise hydrocarbon accumulation providing net environmental benefit.
Shoreline clean-up	Shoreline clean-up is an effective means of hydrocarbon removal from contaminated shorelines where coverage is at an optimum level of 250 g/m^2.	If real-time Operational Monitoring activities (OM01, OM02 and OM03) indicate hydrocarbons will contact shorelines, pre-emptive assessments of sensitive receptors at risk (OM04), shoreline assessments (OM05) and existing TRPs will be utilised to guide shoreline protection and deflection operations, in agreement with WA DoT (for Level 2/3 spills). For MEE-02b, deterministic modelling predicts first shoreline accumulation from floating surface hydrocarbon will occur within 24 hours (15 m^3 at Dampier Archipelago and Legendre Island) Can reduce or prevent impact on sensitive receptors in most cases. Must ensure, through shoreline assessment, that sensitive sites will benefit from clean-up activities as the response itself may cause more negative impact than benefit through disturbance of habitats and species.	**Yes**	Response Protection Areas predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event. If RPAs are at risk, based on real-time modelling during a spill event, shoreline clean-up techniques will be deployed to expedite clean-up of the impacted sites. Removal of hydrocarbons will help shorten the recovery window unless shoreline type is of a sensitive nature. This technique can help prevent remobilisation of hydrocarbon and impact on shorelines.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Oiled wildlife response	Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination.	In the event that wildlife are at risk of contamination, oiled wildlife response will be undertaken in accordance with the Oiled Wildlife Response Operational Plan as and where required. In addition, any rehabilitation could only be undertaken by trained specialists. Due to the likely volatile atmospheric conditions surrounding a Pluto Condensate spill, response options may be limited to hazing to ensure the safety of response personnel.	**Yes**	This technique may prevent impact to and/or treat oiled wildlife providing net environmental benefit.

Table 4-3: Response technique evaluation – vessel collision

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
Hydrocarbon: Marine Gas Oil (MGO) (CS-05)				
Operational Monitoring	Will be effective in tracking the location of the spill, predicting potential impacts and triggering further monitoring and response techniques as required. Monitoring techniques include: • OM01 Predictive modelling of hydrocarbons – used throughout spill. 'Ground-truthed' using the outputs of all other monitoring techniques. • OM02 Surveillance and reconnaissance to detect hydrocarbons and resources at risk – from outset of spill. • OM03 Monitoring of hydrocarbon presence, properties, behaviour and weathering in water – from outset of spill. • OM04 Pre-emptive assessment of sensitive receptors at risk – triggered once OM01, OM02 and OM03 inform likely RPAs at risk. OM05 Shoreline assessment – once OM02, OM03 and OM04 inform if any RPAs have been impacted.	Monitoring of a marine diesel spill is a feasible response technique and outputs will be used to guide decision making on the use of other monitoring/response techniques and providing information to regulatory agencies including AMSA and WA DoT. Practicable techniques that could be used for this scenario include predictive modelling (OM01), surveillance and reconnaissance OM02) and monitoring of hydrocarbon presence in water (OM03). Modelling does not predict impact of any shoreline receptors at threshold, however, pre-emptive assessment of sensitive receptors at risk (OM04) and monitoring of contaminated resources (OM05) would be utilised if any sensitive shoreline receptors are deemed to be at risk of impact.	**Yes**	Monitoring the spill will be necessary to: • validate trajectory and weathering models • determine the behaviour of the oil in water • determine the location and state of the slick • provide forecasts of spill trajectory • determine appropriate response techniques • determine effectiveness of response techniques • confirm impact pathways to receptors • provide regulatory agencies with required information.
Source control via vessel SOPEP	Controlling the spill of diesel at source would be the most effective way to limit the quantity of hydrocarbon entering the marine environment.	A spill of diesel from a vessel collision will be instantaneous and source control will be limited to what the vessel or facility can safely achieve whilst responding to the incident.	**Yes**	Ability to stop the spill at source will be dependent upon the specific spill circumstances and whether or not it is safe for response personnel to access/isolate the source of the spill.
Surface dispersant application	Application of surface dispersant would likely reduce the volumes of hydrocarbons contacting sensitive surface receptors. Dispersant can also enhance biodegradation and may reduce VOCs in some circumstances therefore reducing potential health and safety risk to responders. Dispersant can increase dispersed/entrained hydrocarbons which can potentially have higher toxicity to biota in shallow water than naturally dispersed hydrocarbons. Subsurface oil plume likely to increase in size resulting in greater spatial extent of entrained oil. Entrained oil could potentially impact on sensitive shallow-water receptors e.g. corals, which otherwise may have been unaffected.	This technique is not suitable for MGO spills as this hydrocarbon is prone to rapid spreading and evaporation and 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 resulting in the unnecessary addition of chemicals to the marine environment. Further, modelling for CS-05 does not predict that floating oil will reach the minimum feasible threshold for surface dispersant application (>50 g/m^2) The volatile nature of MGO is also likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon thus this response technique is deemed inappropriate.	**No**	The application of dispersant to marine diesel is not appropriate as the diesel will rapidly evaporate and would thus unnecessarily introduce additional chemical substances to the marine environment. The additional entrainment would also increase exposure of subsea species and habitats to hydrocarbons.
Mechanical dispersion	Mechanical dispersion involves the use of a vessel's prop wash and/or fire hose to target surface hydrocarbons to achieve dispersion into the water column. However, this technique is of limited benefit in an open ocean environment where wind and wave action are likely to deliver similar advantages.	Although the technique is feasible, highly volatile hydrocarbons are likely to weather, spread and evaporate quickly. The volatile nature of the oil likely to lead to unsafe conditions in the vicinity of fresh hydrocarbon. Additionally, any vessel used for mechanical dispersion activities would be contaminated by the hydrocarbon and could potentially cause secondary contamination of unimpacted areas when exiting the spill area.	**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.

Response Technique	Effectiveness	Feasibility	Decision	Rationale for the decision
		The decontamination of a vessel used for mechanical dispersion activities would result in additional quantities of oily waste requiring appropriate handling and treatment.		
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 and its used would unnecessarily cause an increase the release of atmospheric pollutants.	**No**	Diesel characteristics are not appropriate for the use of in-situ burning and would unnecessarily cause an increase the release of atmospheric pollutants.
Containment and recovery	Containment and recovery has an effective recovery rate of 5-10% when a hydrocarbon encounter rate of 25-50% is achieved at BAOAC 4 and 5 with a 50-100% coverage of 100 g/m^2 to 200 g/m^2.	Modelling of an MGO spill predicts that floating oil will be prone to rapid spreading and evaporation and will not reach the required threshold (>50 g/m^2) for containment and recovery to be feasible within any RPA. The volatile nature of MGO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon thus this response technique is deemed inappropriate.	**No**	Containment and recovery would be an inappropriate response technique for a spill of MGO. Corralling a volatile hydrocarbon such as MGO is deemed unsafe for response personnel thus this response strategy is not considered feasible. In addition to the safety issues, most of the spilled diesel would have been subject to rapid evaporation prior to the commencement of containment and recovery operations.
Shoreline protection and deflection	Shoreline protection and deflection can be effective at preventing contamination of at-risk areas.	Stochastic modelling predicts that no shoreline receptors will be contacted by hydrocarbons at any threshold. An MGO spill would be prone to rapid spreading and evaporation. Furthermore, the volatile nature of MGO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon. Operational monitoring will, however, be deployed from the outset of a spill to track the spill location and fate in real-time.	**No**	In addition to safety issues and the rapid spreading and evaporation of the diesel, the modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at any of the assessed thresholds.
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/m2.	Stochastic modelling predicts that no shoreline receptors will be contacted by hydrocarbons at any threshold. An MGO spill would be prone to rapid spreading and evaporation. Furthermore, the volatile nature of MGO is also likely to lead to unsafe conditions in the vicinity of the hydrocarbon. Operational monitoring will, however, be deployed from the outset of a spill to track the spill location and fate in real-time.	**No**	In addition to safety issues, the modelling undertaken predicts that no shoreline receptors would be contacted by floating oil concentrations at a recoverable threshold and a spill of marine diesel is unlikely to accumulate at concentrations appropriate for shoreline clean-up techniques.
Oiled wildlife response	Oiled wildlife response is an effective response technique for reducing the overall impact of a spill on wildlife. This is mostly achieved through hazing to prevent additional wildlife from being contaminated and through rehabilitation of those already subject to contamination.	Due to the likely volatile atmospheric conditions surrounding a diesel spill, response options may be limited to hazing to ensure the safety of response personnel. The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. Monitor and evaluate will, however, be deployed from the outset of a spill to track the spill location and fate in real-time. Thus, in the event that wildlife are at risk of contamination, oiled wildlife response will be undertaken in accordance with the Oiled Wildlife Response Operational Plan as and where required. In addition, any rehabilitation could only be undertaken by trained specialists.	**Yes**	The modelling undertaken predicts that no sensitive areas will be impacted thus it is unlikely that this technique would be required. However, in the event that wildlife are at risk of contamination, oiled wildlife response will be undertaken as and where required.

5 HYDROCARBON SPILL ALARP PROCESS

Woodside's hydrocarbon spill ALARP process is aligned with guidance provided by NOPSEMA in *ALARP Guidance Note N-04300-GN0166* (2022) and *Oil Spill Risk Management Guidance Note N-04750-GN1488* (2021) and is set out in the 'Woodside Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) Guidelines'.

From the identified response planning need and pre-operational NEBA/SIMA, Woodside conducts a structured, semi-quantitative hydrocarbon spill process which has the following steps:

1. It 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. It 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. It 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 unreasonable control measure.
5. cumulative effects have been analysed when considered in combination across the whole activity.

The response technique selection is based on the risk assessment conducted in the EP. The risk assessment identifies the type of oil, volume of release, duration of release, predicted fate, weathering and the EMBA (along with other requirements such as time to impact and predicted volumes ashore). Modelling is then used to inform the NEBA and the prioritisation of suitable response options. The scale of the response techniques selected in the pre-operational NEBA is informed through the assessment of results from deterministic modelling.

For the 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 complexity of financial, safety, design/storage/installation, capital/lease, and/or operations/maintenance required to adopt a control measure.

- Environmental impact is the comparison against standard environmental values and sensitivities impacts using positive or negative criteria from the NEBA Impact Ranking Classification Guidance in Annex A.

5.1 Operational Monitoring

Operational Monitoring includes the gathering and evaluation of data to inform the oil spill response planning and operations. It includes fate and trajectory modelling, spill tracking, weather updates and field observations. This response option is deployed in some capacity for every event.

The table below provides the operations monitoring plans that support the successful execution of this response technique.

Table 5-1: Description of supporting operational monitoring plans

ID	Title
OM01	Predictive modelling of hydrocarbons to assess resources at risk
OM02	Surveillance and reconnaissance to detect hydrocarbons and resources at risk
OM03	Monitoring of hydrocarbon presence, properties, behaviour and weathering in water
OM04	Pre-emptive assessment of sensitive receptors at risk
OM05	Shoreline assessment

Woodside maintains an *Operational Monitoring Operational Plan*. If shoreline contact is predicted, RPAs will be identified and assessed before contact. If shorelines are contacted, a shoreline assessment survey will be completed to guide effective shoreline clean-up operations. This plan includes the process for the IMT to mobilise resources depending on the nature and scale of the spill.

The proximity of Dampier, Onslow and Exmouth to the spill event locations means that multiple logistical options are available to monitor the spill in relatively short timeframes. The primary mobilisation base for initial monitoring activities would be Dampier. However, in the unlikely event of an extended spill with potential to impact receptors further afield, monitoring activities may also be mobilised from Exmouth, Onslow, Karratha, and Port Hedland.

5.1.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Floating surface oil in sufficient concentrations for effective operational monitoring (>10 g/m^2) is expected to be present after 1 hour (CS-05) or 43 hours (CS-01) at Montebello Marine Park. .
- The shortest timeframe that shoreline contact at response threshold (>100 g/m^2) is predicted within 24 hours at Dampier Archipelago and Legendre Island (MEE-02b only).
- The time to contact for oil at concentrations of entrained hydrocarbons greater than 100 ppb is 1 hour within Montebello Marine Park (CS-05).
- Arrangements for support organisations who provide specialist services or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for operational and support functions. These should be reviewed and updated regularly.
- The duration of the spill may extend up to 59 and 77 days for CS-01 and MEE-01 respectively, and up to 8 hours for MEE-02b and CS-05 with response operations extending to 5 days (MEE-02b) based on the predicted time to complete shoreline clean-up operations.

5.1.2 Environmental performance based on need

Table 5-2: Environmental Performance – Operational Monitoring

Environmental Performance Outcome		To gather information from multiple sources to establish an accurate common operating picture as soon as possible and predict the fate and behaviour of the spill to validate planning assumptions and adjust response plans as appropriate to the scenario.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.10)**
1	Oil spill trajectory modelling	1.1	Initial modelling available within 6 hours using the Rapid Assessment Tool	1, 3B, 3C, 4
		1.2	Detailed modelling available within 4 hours of RPS receiving information from Woodside	
		1.3	Detailed modelling service available for the duration of the incident upon contract activation	
2	Tracking buoy	2.1	Tracking buoy located on facility/ lead vessel and ready for deployment 24/7	1, 3A, 3C, 4
		2.2	Deploy tracking buoy from facility/ lead 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 COP daily to improve the accuracy of other Operational Monitoring techniques.	1, 3B, 4
		2.5	For unmanned facility/ vessel deploy tracking buoy within 48 hours	1, 3A, 3C, 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 Operational Monitoring techniques.	1, 3B, 4
		3.6	Satellite Imagery services available and employed during response	1, 3C, 4
4	Aerial surveillance	4.1	1 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 3 days: • 3 specialists in water quality monitoring • 2 monitoring systems and ancillaries	1, 2, 3C, 3D, 4

Environmental Performance Outcome		To gather information from multiple sources to establish an accurate common operating picture as soon as possible and predict the fate and behaviour of the spill to validate planning assumptions and adjust response plans as appropriate to the scenario.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.10)**
			• 1 vessel for deploying the monitoring systems with a dedicated winch, A-frame or Hiab and ancillaries to deploy the equipment.	
		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.	
6	Pre-emptive assessment of sensitive receptors	6.1	Mobilisation within 24 hours in consultation with WA DoT (for Level 2/3 incidents), of 2 specialists from resource pool in establishing the status of sensitive receptors.	1, 2, 3B, 3C, 4
		6.2	Daily reports provided to CIMT 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	Mobilisation within 24 hours, in consultation with WA DoT (for Level 2/3 incidents), of 2 x specialist(s) 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 CIMT daily detailing the assessed areas to maximise effective utilisation of resources	1, 3B, 4
		7.3	Shoreline access routes with the least environmental impact identified will be selected by a specialist in SCAT operations	1

The control measures and capability of Woodside and its third-party service providers are shown to support Operational Monitoring activities up to and including the identified WCCS. This is demonstrated by the following:

- Woodside has a documented, structured and tested capability for Operational Monitoring 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 seek to maintain sufficient capability for the duration of the response.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.1.

5.2 Source control and well intervention

The worst-case scenario for a Pluto production well is considered to be to be loss of well containment due to a 'tree off' scenario (MEE-01). The worst case scenario during Xena-03 well drilling operations would be a loss of containment resulting in an uncontrolled flow from the well (CS-01). Both scenarios are detailed in the EP. In the event of a loss of well containment for either MEE-01 or CS-01, the primary response would be source control and well intervention.

The Woodside Source Control Emergency Response Planning Guideline has been developed as part of the Woodside assurance plans and in alignment with the guidelines in the *NOPSEMA Source Control Planning and Procedures Information Paper* (N-04750-IP1979 A787102). It includes the process for the CIMT to mobilise resources for Subsea First Response Toolkit (SFRT) support, and capping support. This plan has pre-identified vessel specifications and contracts required for SFRT debris clearance work.

Woodside is a signatory to the Australian Energy Producers' (AEP) MoU between Australian offshore operators to provide mutual aid to facilitate and expedite mobilising a MODU and drilling a relief well, if a loss of well containment incident was to occur. The MoU commits the signatories to share rigs, equipment, personnel, and services to assist another operator in need. Moored and dynamically positioned (DP) MODUs are suitable for the Pluto and Xena wells.

Source control operations cannot be implemented if the safety of response personnel cannot be guaranteed. Circumstances that limit the safe execution of this control measure include lower explosive limit (LEL) concentrations, volatile concentrations of hydrocarbons in the atmosphere, weather window, waves and/or sea states (>1.5m waves) and high ambient temperatures. Gas monitoring will be undertaken in line with standard protocol.

5.2.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which a response need can be based:

- Prior to any source control activities, Woodside will implement protocols seeking to ensure that the site is safe including subsea ROV surveys and surface air monitoring.
- Hydrocarbons will flow from the well until one of the following interventions can be made:
  - closure of the Tubing Retrievable Safety Valve (TRSV)
  - intervention with a capping stack.
  - a relief well is drilled and first attempt at well kill within 77 days (MEE-01) or 64 days (CS-01)
- Arrangements for support organisations who provide specialist services or resources should be tested regularly.
- Plans, procedures and support documents need to be in place for operational and support functions. These should be reviewed and updated regularly.
- The duration of the spill may extend up to 77 days (MEE-01) or 64 days (CS-01) with response operations extending until a capping stack has been installed or successful relief well is completed. Modelling does not predict shoreline contact for either MEE-01 or CS-01.

In addition, a number of assumptions are required to estimate the response need for source control. These assumptions have been described in the table below.

Table 5-3: Response Planning Assumptions – Source Control

Response planning assumptions	
Safety considerations	Source control operations cannot be implemented if the safety of response personnel cannot be guaranteed. This requires an initial and ongoing risk assessment of health and safety hazards and risks at the site, in accordance with the Woodside Management System (WMS). Personnel safety issues may include: • hydrocarbon gas and/or liquid exposure • high winds, waves and/or sea states • high ambient temperatures.
Feasibility considerations	Woodside's primary source control option would be ROV intervention if the BOP remains in place and is operable (CS-01). Relief well drilling for the Pluto Facility Operations and Xena wells , coupled with capping stack deployment (if conditions permit and the safety of the intervention personnel can be guaranteed), would also be attempted. The following approaches outline Woodside's hierarchy for relief well operations; • primary – review internal drilling programs and MODU availability to source appropriate rig(s) operating within Australia with an approved Safety Case • alternate – source and contract MODU through AEP MoU that is operating within Australia with an approved Safety Case • contingency – source and contract a MODU outside Australia with an approved Australian Safety Case.

5.2.2 Environmental performance based on need

Table 5-4: Environmental Performance – Source Control

Environmental Performance Outcome		To stop the flow of hydrocarbons into the marine environment		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.10)**
8	Subsea First Response Toolkit (SFRT)	8.1	Oceaneering support staff available all year round, via contract, to assist with the mobilisation, deployment, and operation of the SFRT equipment.	1, 3B, 3C
		8.2	Intervention vessel with minimum requirement of a working class ROV and operator.	1, 3C
		8.3	Mobilised to site for deployment within 11 days.	1, 3B, 3C
		8.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
9	Well intervention	9.1	Frame agreements with ROV providers in place to be mobilised upon notification. ROV equipment deployed within 7 days.	1, 3B, 3C
		9.2	Source control vessel will have the following minimum specifications: • active heave compensated crane, rated to at least 150 T in shallower water and 250 T in deeper water. • at least 90 m in length • deck has water/electricity supply • deck capacity to hold at least 110 T of capping stack.	1, 3B, 3C
		9.3	Identify source control vessel availability within 24 hours and begin contracting process. Vessel mobilised to site for deployment within 16 days for conventional capping.	1, 3B, 3C
		9.4	ROV available on MODU ready for deployment within 48 hours to attempt initial BOP well intervention (CS-01 only).	1, 3B, 3C
		9.5	Hot Stab and/or well intervention attempt made using ROV and SFRT within 11 days.	1, 3B, 3C
		9.6	Capping stack on suitable vessel mobilised to site within 16 days. Deployment and well intervention attempt will be made once plume size is acceptable and safety and metocean conditions are suitable.	1, 3C
		9.7	Wild Well Control Inc (WWCI) equipment and staff available all year round to assist with the mobilisation, deployment, and operation of the capping stack and well intervention equipment.	1, 3B, 3C
		9.8	MODU mobilised to site for relief well drilling within 21 days.	1, 3C
		9.9	First well kill attempt completed within 64 days (CS-01) and 77 days (MEE-01).	1, 3B, 3C
		9.10	Open communication line(s) to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
		9.11	**CS-01:** Relief well peer review undertaken during well design which includes screening and identification of suitable MODU(s) with in-force Australian Safety Cases for relief well drilling	1, 3C
		9.12	Monthly monitoring of the availability of MODUs through existing market intelligence including current Safety Case history.	3C

Environmental Performance Outcome		To stop the flow of hydrocarbons into the marine environment		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.10)**
		9.13	**CS-01:** Prior to entering the reservoir, reconfirm that pre-identified/screened MODU(s) remain available for relief well drilling.	1, 3C
10	Support vessels	10.1	Access to 24/7 tracking software to monitor availability of suitable vessels to meet specifications for source control.	3C
		10.2	Frame agreements for installation support vessels (ISVs) require vessels to maintain in-force Safety Case approvals covering ROV operations and provide support in the event of an emergency.	1, 3B, 3C
		10.3	MODU and vessel contracts include clause outlining requirement for support in the event of an emergency	1, 3C
11	Safety Case	11.1	Woodside will prioritise MODU or vessel(s) for intervention work(s) that have an existing Safety Case	1, 3C
		11.2	Woodside Planning, Logistics, and Safety Officers (on roster/Call 24/7) to assist in expediting the Safety Case assessment process as far as practicable.	1, 3C
		11.3	Woodside will maintain minimum safe operating standards that can be provided to MODU and vessel operators for Safety Case guidance..	1, 3C

The resulting source control capability has been assessed against the WCCS. The range of techniques provide a feasible and viable approach to well intervention and, if necessary, relief well drilling operations to stop the well flowing.

The health and safety, financial, capital and operations/maintenance costs of implementing the alternative, additional or improved control measures identified and not carried forward are considered disproportionate to the insignificant environmental benefit gained and/or not reasonably practicable for this PAP.

Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.2.

5.3 Source Control via Vessel SOPEP

Vessel source control will be conducted, where feasible and in accordance with MARPOL 73/78 Annex I, by the Vessel Master under the Shipboard Oil Pollution Emergency Plan (SOPEP) triggered by any loss of containment from the PAP vessels.

The SOPEP provides guidance to the Master and Officers on board the vessel with respect to the extra steps to be taken when an unexpected pollution incident has occurred or is likely to occur. The SOPEP contains all information and operational instructions required by IMO Resolution MEPC.54 (32) adopted on 6 March 1992, as amended by resolution MEPC.86 (44) adopted on 13 March 2000.

Its purpose is to set in motion the necessary actions to stop or minimise oil discharge and mitigate its effects and outlines responsibilities, pollution reporting requirements, procedures and resources needed in the event of a hydrocarbon spill from vessel activities.

In the event of the WCCS vessel collision event, the vessel master may engage precautionary marine manoeuvres to avoid collision or commence pumping operations to transfer MGO and thus minimise the release.

5.3.1 Environmental performance based on need

Woodside has established control measures, environmental performance outcomes, performance standards and measurement criteria to be used for vessel-source oil spill response during the PAP which are detailed in Section 6.7 of the EP. The vessel master's roles and responsibilities are described in EP Section 7.5.

Performance standards for each contracted PAP vessel are detailed in the vessel's specific SOPEP.

These standards ensure that sufficient resources are available and are adequately tested to ensure implementation of the SOPEP in the event of a hydrocarbon spill.

5.4 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.

5.4.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which the response need can be based:

- The shortest timeframe that shoreline contact at response threshold (>100 g/m^2) is predicted within 24 hours at Dampier Archipelago and Legendre Island (MEE-02b only).
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised prior to shoreline contact at 100 g/m^2, which occurs within 24 hours at Dampier Archipelago and Legendre Island (MEE-02b only).
- The duration of the spill may extend up to 59 and 77 days for CS-01 and MEE-01 respectively, and up to 8 hours for MEE-02b and CS-05 with response operations extending to 5 days (MEE-02b) based on the predicted 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.
- TRPs for 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 5-5: 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 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 trained supervisors • 8-10 personnel/ labour hire Specific details of each operation would be tailored to the TRP implemented (where available).

5.4.2 Environmental performance based on need

Table 5-6: Environmental Performance – Shoreline protection and deflection

Environmental Performance Outcome		To stop hydrocarbons encountering particularly sensitive areas		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.10)**
12	Response teams	12.1	In liaison with WA DoT (for Level 2/3 incidents), relevant Tactical Response Plans (TRPs) will be identified in the First Strike plan for activation.	1, 3A, 3C, 4
		12.2	In liaison with WA DoT (for Level 2/3 incidents), mobilise teams to RPAs within 24 hours. 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
		12.3	In liaison with WA DoT (for Level 2/3 incidents), 1 operation mobilised within 24 hours to each identified RPA.	1, 3A, 3B, 4
		12.4	12 trained personnel available within 24 hours sourced through resource pool.	1, 2, 3A, 3B, 3C, 4
		12.5	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s)	1, 3A, 3B
		12.6	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
13	Response equipment	13.1	Equipment mobilised from closest stockpile within 24 hours.	1, 3A, 3C, 4
		13.2	Supplementary equipment mobilised from AMOSC, AMSA and State stockpiles within 48 hours.	1, 3C, 3D, 4
		13.3	Supplementary equipment mobilised from OSRL within 48 hours.	
		13.4	Woodside maintains integrated fleet of vessels. Additional vessels can be sourced through existing contracts/frame agreements	1, 3A, 3C, 4
14	Management of environmental impact of the response risks	14.1	If vessels are required for access, anchoring locations will be selected to minimise disturbance to benthic 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
		14.2	Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines	

The resulting 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, the capability available meets the need identified within 72 hours. It indicates that, the shoreline protection and deflection capability has the following expected performance:

- Deterministic modelling scenarios indicate that first shoreline impact within 24 hours at Dampier Archipelago and Legendre Island for the Pluto Facility Operations export pipeline loss of containment scenario near the State Water boundary (MEE-02b).
- Existing capability allows for mobilisation and deployment of 1-2 protection and deflection operations within 24 hours (if required).
- 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 identified RPAs excepting international locations.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.4.

5.5 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
- 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).

5.5.1 Response need based on predicted consequence parameters

The following statements identify the key parameters upon which the response need can be based:

- The shortest timeframe that shoreline contact at response threshold (>100 g/m^2) is predicted within 24 hours at Dampier Archipelago and Legendre Island (MEE-02b only).
- The duration of the spill may extend up to 59 and 77 days for CS-01 and MEE-01 respectively, and up to 8 hours for MEE-02b and CS-05 with response operations extending to 5 days (MEE-02b) based on the predicted time to complete shoreline clean-up operations.
- Pre-emptive assessment and shoreline assessments (OM04 and OM05) will be mobilised to RPAs with predicted 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.
- TRPs for 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, assumptions are required to estimate the response need for shoreline clean-up. These are described in the table below.

Table 5-7: 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 trained supervisor • 8–10 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) – approximately 0.25–1 m^3 oil recovered per person per 10 hour 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.

Table 5-8: Shoreline Clean-up techniques and recommendations

Technique	Description	Shoreline type		Application
		Recommended	Not recommended	
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		Application
		Recommended	Not recommended	
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 cleaning 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		Application
		Recommended	Not recommended	
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.

5.5.2 Environmental performance based on need

Table 5-9: 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 5.10)**
15	Shoreline responders	15.1	In liaison with WA DoT (for Level 2/3 incidents), deployment of shoreline clean-up teams to contaminated RPAs 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
		15.2	Relevant Tactical Response Plans (TRPs) will be identified in the first strike plan for activation within 24 hours of a release.	1, 3A, 3C, 4
		15.3	Clean-up operations for shorelines in line with results and recommendations from SCAT outputs	1, 3A, 3B
		15.4	All shoreline clean-up sites will be zoned and marked before clean-up operations commence to prevent secondary contamination and minimise the mixing of clean and oiled sediment and shoreline substrates.	
		15.5	In liaison with WA DoT (for Level 2/3 incidents), mobilise and deploy 1-2 shoreline clean-up operations within 24 hours. .	1, 2, 3A, 3C, 4
		15.6	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
		15.7	Open communication line to be maintained between CIMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
16	Shoreline clean up equipment	16.1	Contract in place with 3rd party providers to access equipment.	1, 3A, 3C, 4
		16.2	Equipment mobilised from closest stockpile within 24 hours.	
		16.3	Supplementary equipment mobilised from AMOSC, AMSA and State stockpiles within 48 hours.	1, 3C, 3D, 4
		16.4	Supplementary equipment mobilised from OSRL within 48 hours.	
17	Management of environmental impact of the response risks	17.1	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
		17.2	Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines	
		17.3	Vehicular access will be restricted on dunes, turtle nesting beaches an in mangroves	
		17.4	Removal of vegetation will be limited to moderately or heavily oiled vegetation.	
		17.5	Shoreline access routes with the least environmental impact identified will be selected by a specialist in SCAT operations.	
		17.6	Oversight by trained personnel who are aware of the risks.	
		17.7	Trained unit leaders will brief personnel prior to operations of the environmental risks of presence of personnel on the shoreline.	

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 existing capability can cover all required shoreline clean-up operations for the PAP within 72 hours.

Existing capability allows for mobilisation and deployment of 1-2 shoreline clean-up operations within 24 hours (if required).

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):

- Woodside has the capacity to mobilise and deploy up to 15–20 shoreline clean-up teams within 7 days at up to 6-10 RPAs using existing labour hire contracts with Woodside, AMOSC, Core Group, AMSA and OSRL team leads.
- Assessment of response capability indicates that for a worst-case scenario the actual teams required would meet the available capability within 48 hours, with the response completed by day 5.
- 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 excepting international locations.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.5

5.6 Oiled wildlife response (including hazing)

Oiled wildlife response (OWR) includes wildlife surveillance/ reconnaissance, wildlife hazing, pre-emptive capture, and the capture, cleaning, treatment, and rehabilitation of animals that have been oiled. In addition, it includes the collection, post-mortem examination, and disposal of deceased animals that have succumbed to the effects of oiling.

For a petroleum activity spill in Commonwealth waters, Woodside will act as Control Agency and will be responsible for the wildlife response. In such circumstances, Woodside would implement a response in accordance with the *Oiled Wildlife Operational Plan*, the WA Oiled Wildlife Response Plan (WAOWRP) (DBCA, 2022a) and the WA OWR Manual (DBCA, 2022b). The *Oiled Wildlife Operational Plan* includes the process for the IMT to mobilise resources depending on the nature and scale of the spill. Oiled wildlife operations would be implemented with advice and assistance from the Oiled Wildlife Advisor from the Department of Biodiversity, Conservation and Attractions (DBCA).

The key plan for OWR in WA is the WAOWRP (DBCA, 2022a). The WAOWRP establishes the framework for preparing and responding to potential or actual wildlife impacts during a spill and sets out the management arrangements for implementing an OWR in conjunction with the DoT *State Hazard Plan – Maritime Environmental Emergencies* (SHP-MEE). It is the responsibility of DBCA to administer the WAOWRP under the direction of the DoT. The WA OWR Manual (DBCA, 2022b) supports, and should be used in conjunction with, the WAOWRP. The purpose of the WA OWR Manual is to standardise the operating procedures, protocols and processes for an OWR during a spill event in WA waters, and to create alignment between the wildlife response processes and the overall incident response (DBCA, 2022b).

If a spill occurs in WA State waters or enters State waters, DBCA is the Jurisdictional Authority for oiled wildlife response for level 2/3 spills and will also lead the oiled wildlife response under the control of the DoT. DBCA is the State Government agency responsible for administering the *Biodiversity Conservation Act 2016 (WA) (BC Act)*, which has provisions for authorising activities that affect wildlife.

For level 1 spills in State waters, Woodside will be the Control Agency, including for wildlife response. It is, however, also an expectation that for level 2/3 petroleum activity spills, Woodside will conduct the initial first-strike response actions for wildlife response and continue to manage those operations until DBCA is activated as the lead agency for wildlife response and formal handover occurs. Following formal handover, Woodside will function as a support organisation for the OWR and will be expected to continue to provide planning and resources as required.

Woodside retains specialist personnel to support and manage oiled wildlife operations, including trained and competent responders for deployment in Exmouth and Dampier. Additional personnel would be sourced through Woodside's arrangements to support an oiled wildlife response as required.

5.6.1 Response need based on predicted consequence parameters

Wildlife response protection areas and assessment of wildlife impact

French-McCay et al. (2002), based on a review of existing literature at the time, determined lethal thresholds for floating and shoreline oil for the external coating of wildlife to be 10 g/m^2 for floating, and 100 g/m^2 for shoreline accumulation. It should however be noted that toxicity thresholds for wildlife are likely to be highly variable due to differences in species sensitivity, type of hydrocarbon, type of exposure (ingestion or external oiling), life-stage, and on-water versus land habitat.

For planning purposes, determination of wildlife priority protection areas is based on stochastic modelling of the worst-case spill scenarios at 10 g/m^2 for floating, and 100 g/m^2 for shoreline accumulation (acknowledging that impacts to wildlife may occur at lower concentrations), the known presence of wildlife, and in consideration of the following:

- presence of high densities of wildlife, threatened species, and/or endemic species with high site fidelity
- greatest probability of shoreline accumulation
- shortest timeframe to contact.

At the time of a spill, identification and allocation of wildlife response protection areas should also take into consideration any key biological activities. Additional detail regarding species and their key

biological activities within the vicinity of the PAP are described in Section 4.6 of the Pluto Facility Operations EP.

For WA, although somewhat outdated, the Pilbara and Kimberley Regional Oiled Wildlife Plans (DBCA [formerly Department of Parks and Wildlife], 2014) provide useful information relating to wildlife priority response areas in their respective regions.

Table 5-10: Key at-risk species potentially in Priority Protection Areas and open ocean

Species	Dampier Archipelago	Keast Island	Legendre Island	Cape Bruguieres	Cohen Island	Montebello MP
Marine turtles	✓	✓	✓	✓	✓	✓
Whale sharks		✓	✓	✓	✓	✓
Seabirds and/or migratory shorebirds	✓	✓	✓	✓	✓	✓
Cetaceans – migratory whales	✓	✓	✓	✓	✓	✓
Cetaceans – dolphins and porpoises	✓	✓	✓	✓	✓	✓
Dugongs		✓	✓	✓	✓	
Sharks and rays	✓	✓	✓	✓	✓	✓

The following statements identify the key parameters upon which a wildlife response need can be based:

- The minimum time to floating contact receptors at >10 g/m^2 was 1 hour at Montebello Marine Park (CS-05).
- The minimum time to shoreline contact at response thresholds (>100 g/m^2) is 21 hours to the Dampier Archipelago and Legendre Island.
- At sea there are likely to be low numbers of at risk or impacted wildlife, and limited opportunities to rescue wildlife, given the distribution and behaviour of animals in the open marine environment. At sea, continued wildlife reconnaissance, carcass recovery, sampling of carcasses that cannot be retrieved and scientific monitoring are more likely to be the focus of response efforts.
- As the surface oil approaches shorelines and as oil accumulates on the shoreline, the potential for oiled wildlife impacts is likely to increase as well as opportunities to rescue wildlife.
- It is estimated that the wildlife impact would be medium, as defined in the WAOWRP (DBCA, 2022a) (**Table 5-11)**.

Table 5-11: WAOWRP Guide for rating wildlife impact of an oil spill (DBCA, 2022)

Wildlife Impact Rating	Low	Medium	High
What is the likely duration of the wildlife response?	<3 days	3-10 days	>10 days
What is the likely total intake of animals?	<10	11-25	>25
What is the likely daily intake of animals?	0-2	2-5	>5
Are threatened species, or species protected by treaty, likely to be impacted, either directly or by pollution of habitat or breeding areas?	No	Yes – possible	Yes – likely
Is there likely to be a requirement for building primary care facility for treatment, cleaning and rehabilitation?	No	Yes – possible	Yes – likely

Tactics

Where there is imminent or actual impact to wildlife, Woodside will activate the Wildlife Division and follow the oiled wildlife incident management framework and implementation plan outlined in the Woodside *Oiled Wildlife Operational Plan*.

In Commonwealth waters, Woodside will be responsible for the planning and implementation of the OWR in its entirety. Noting that at sea, and in comparison to the shoreline, there are likely to be less wildlife impacted by an oil spill and limited opportunities to rescue wildlife, given the distribution and behaviour of animals in the open marine environment. At sea, continued wildlife reconnaissance, carcass recovery, sampling of carcasses that cannot be retrieved and integration with scientific monitoring are more likely to be the focus of the OWR.

In State waters, Woodside will conduct the initial first-strike response actions for wildlife and continue to manage those operations until DBCA is activated as the lead agency for wildlife response and formal handover occurs. Following formal handover, Woodside will function as a support organisation for the OWR and will be expected to continue to provide planning and resources as required.

If a protracted response requiring preventative actions and/or wildlife rescue is likely, and formal handover to the Control Agency (in State waters) has not yet occurred, the Wildlife Division will be responsible for the development of the Wildlife Division portion of the IAP. Preventative actions, such as hazing, capture, intake and treatment, require a higher degree of planning, approval (licenses) and skills. These activities will be planned for and carried out under the IAP as outlined in the *Oiled Wildlife Operational Plan* and in accordance with the WAOWRP (DBCA, 2022a) and WA OWR Manual (DBAC, 20022b).

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.

5.6.2 Environmental performance based on need

Table 5-12: Environmental Performance – Oiled Wildlife Response

Environmental Performance Outcome		OWR is conducted in accordance with the Western Australian Oiled Wildlife Response Plan (WAOWRP, 2022) to meet legislative requirements to house, release or euthanise wildlife under the *Biodiversity Conservation Act 2016 (WA)*.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.10)**
18	Wildlife response arrangements	18.1	Oiled Wildlife Operational Plan in place and utilised during a response to plan, coordinate, implement and terminate operations	1, 3A, 4
		18.2	Initiate a wildlife first strike response within 24 hours of confirmed or imminent wildlife contact as directed by relevant Operational Monitoring techniques (OM01-05) and in liaison with DBCA	1
19	Wildlife response equipment	19.1	Maintain contract with AMOSC for immediate access to oiled wildlife response equipment.	1, 3C, 3D, 4
		19.2	Maintain contract with OSRL to access additional oiled wildlife response equipment.	1, 3C, 3D, 4
20	Wildlife responders	20.1	Two Oiled Wildlife Team Members to supervise the oiled wildlife operations who have completed an Oiled Wildlife Response Management course.	1, 2, 3B
		20.2	Maintain contract with AMOSC for immediate access to trained OWR specialists	1, 3B, 3C
		20.3	Maintain contract with OSRL to access additional trained oiled wildlife response specialists	1, 3B, 3C
		20.4	Open communication line to be maintained between IMT and infield operations to ensure awareness of progress against plan(s).	1, 3A, 3B
21	Management of environmental impacts of response risks	21.1	Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA, and in accordance with the processes and methodologies described in the WA OWRP and the relevant regional plan.	1

The resulting wildlife response capability has been assessed against the WCCS. The range of techniques provide an ongoing approach to response at identified RPAs.

Under optimal conditions, during the subsea or surface release, the capability available meets the need identified. It indicates that, the wildlife response capability has the following expected performance to:

- undertake OWR first strike response including mobilisation of operational monitoring (OM01-05) to identify wildlife and RPAs contacted or at imminent risk of contact by hydrocarbons
- confirm availability and mobilisation of trained OWR personnel to supervise OWR activities
- access to wildlife resources (personnel and equipment) to meet the needs where there are medium or high levels of wildlife impact.

5.7 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 shoreline clean-up and oiled wildlife operations
- solids/semi-solids (oily solids, garbage, contaminated materials) and debris (e.g. seaweed, sand, woods, and plastics) collected during shoreline clean-up and oiled wildlife operations.

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 maintain continuous response operations.

All waste management activities will follow the Environment Protection (Controlled Waste) Regulations 2004 (WA) and the waste will be managed to minimise final disposal volumes. Waste treatment techniques will consider contaminated solids treatment to allow disposal to landfill and solids with high concentrations of hydrocarbon will be treated and recycled where possible or used in clean fill if suitable.

The waste products would be transported from response locations to the nearest suitable staging area/waste transfer station for treatment, disposal or recycling. Waste will be transferred with appropriately licensed vehicles. Containers will be available for temporary waste storage and will be:

- labelled with the waste type
- provided with appropriate lids to prevent waste being blown overboard
- bunded if storing liquid wastes.

Processes will be in place for transfers of bulk liquid wastes and include:

- inspection of transfer hose undertaken prior to transfer
- watchman equipped with radio visually monitors loading hose during transfer
- tank gauges monitored throughout operation to prevent overflow.

The *Oil Spill Preparedness Waste Management Support Plan* details the procedures, capability and capacity in place between Woodside and its primary waste services contractor to manage waste volumes generated from response activities.

5.7.1 Response need based on predicted consequence parameters

Table 5-13: Response Planning Assumptions – Waste Management

Response planning assumptions: Waste management	
Waste loading per m^3 oil recovered (multiplier)	Shoreline clean-up (manual) – approximately 5-10x multiplier for oily solid and liquid wastes generated by manual clean-up.
	Oiled wildlife response – approximately 1 m^3 of oily solid and liquid waste generated for each wildlife unit cleaned

5.7.2 Environmental performance based on need

Table 5-14: 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 5.10)**
22	Waste Management	22.1	Contract with waste management services for transport, removal, treatment and disposal of waste	1, 3A, 3B, 3C, 4
		22.2	Access to at least 124 m^3 of solid and liquid waste storage available within 24 hours upon activation of 3rd party contract.	
		22.3	Access to up to 675 m^3 of solid and liquid waste storage available by end of day 4.	
		22.4	Recovered hydrocarbons and wastes will be transferred to licensed treatment facility for reprocessing or disposal.	
		22.5	Waste management provider support staff available year-round to assist in the event of an incident with waste management as detailed in contract.	
		22.6.	Open communication line to be maintained between IMT and waste management services to ensure the reliable flow of accurate information between parties.	1, 3A, 3B
		22.7	Waste management to be conducted in accordance with Australian laws and regulations	1, 3A, 3B, 3C, 4
		22.8	Waste management services available and employed during response	
23	Management of environmental impacts of response risks	23.1	Teams will segregate liquid and solid wastes at the earliest opportunity.	1, 3A, 3B, 3C, 4

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.

Given the largest shoreline volumes ashore are predicted within 24 hours (MEE-02b) at a maximum volume of 15 m^3, and up to 341 m^3 of waste is expected across all shoreline clean-up operations, the capability available exceeds the need identified.

It indicates that the waste management capability has the following expected performance:

- Shoreline and nearshore operations may generate 74 to 341 m^3 over 5 days of clean-up operations.
- Woodside has assessed the existing capability available and considered potential alternative, additional and improved control measures. Where control measures have been selected and implemented, they are included in Section 6.7.
- Woodside's waste contractor has access to approximately 120,000 m^3 to treat overall waste volumes. The waste management requirements are within Woodside's and its service providers existing capacity.

5.8 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 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 PAP (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 2-6, 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 PAP worst-case credible spill scenarios CS-01, MEE-01, MEE-02a, MEE02b and CS-05 (**Table 2-1**) define the EMBA and are the basis of the SMP approach presented in this section.

It should be noted that the resulting SMP receptor locations differ from the RPAs presented and 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**) for 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
- 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 NOPSEMA Bulletin #1 Oil Spill Modelling (2019), as shown in **Figure 5-1**.

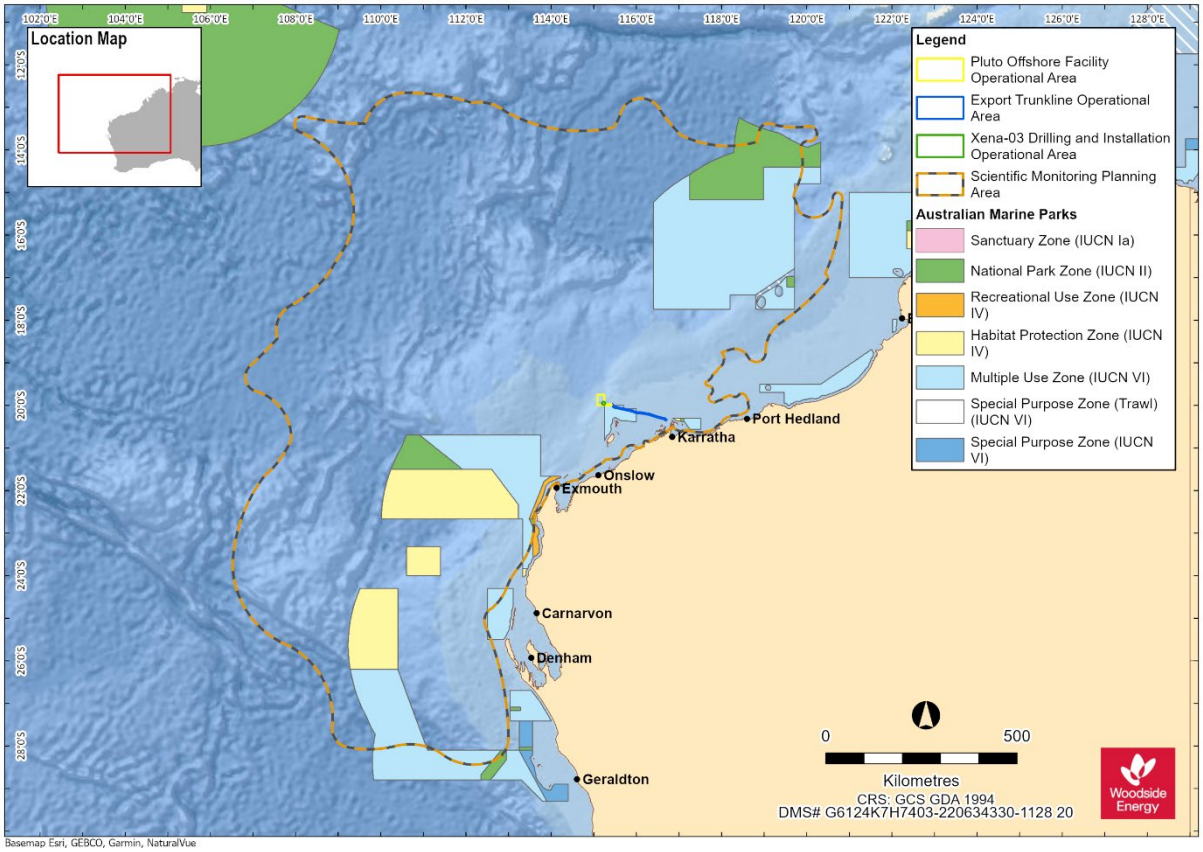

Figure 5-1: The planning area for scientific monitoring based on the area potentially contacted by the low (below ecological impact) entrained hydrocarbon threshold of 10 ppb in the event of the worst-case credible spill scenarios.

Please note that Figure 5-1 represents the overall combined extent of the oil spill model outputs based, on a total of 100 replicate simulations over an annual period each for CS-01, MEE-01, MEE-02a and MEE-02b, and 200 replicate simulations over an annual period for CS-05 and therefore represents the largest spatial boundaries of 100-200 oil spill combinations, not the spatial extent of a single spill.

5.8.1 Scientific Monitoring Deployment Considerations

Scientific monitoring deployment considerations	
Existing baseline studies for sensitive receptor locations predicted to be affected by a spill	PBAs of the following two categories: • PBAs within the predicted <10-day hydrocarbon contact time prediction: The approach is to conduct a desktop review of available and appropriate baseline data for key receptors for locations (if any) that are potentially impacted within 10 days of a spill and look to conduct baseline data collection to address data gaps and demonstrate spill response preparedness. Planning for baseline data acquisition is typically commenced pre-PAP and execution of studies undertaken with consideration of weather, receptor type, seasonality and temporal assessment requirements. • PBAs >10 days to predicted hydrocarbon contact in the event of an unplanned hydrocarbon release from the PAP. SMP activation (as per the Pluto Facility Operations First Strike Plan) directs the SMP team to follow the steps outlined in the SMP Operational Plan. The steps include: checking the availability and type of existing baseline data, with particular reference to any PBAs identified as >10 days to hydrocarbon contact. Such information is used to identify response phase PBAs and plan for the activation of SMPs for pre-emptive (i.e. pre-hydrocarbon contact) baseline assessment.
Pre-emptive Baseline in the event of a spill	Activation of SMPs in order to collect baseline data at sensitive receptor locations with predicted hydrocarbon contact time >10 days (as documented in ANNEX C).
Survey platform suitability and availability	In the event of the SMP activation, suitable survey platforms are available and can support the range of equipment and data collection methodologies to be implemented in nearshore and offshore marine environments.
Trained personnel to implement SMPs suitable and available.	Access to trained personnel and the sampling equipment contracted for scientific monitoring via a dedicated scientific monitoring program standby contract.
Metocean conditions	The following metocean conditions have been identified to implement 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 metocean conditions on a day to day basis by SMP operations.

5.8.2 Response planning assumptions

Response Planning Assumptions	
PBAs	PBAs identified through the application of defined hydrocarbon impact thresholds during the Quantitative Spill Risk Assessment process and a consideration of the minimum time to contact at receptor locations fall into two categories: • 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. Response phase PBAs are prioritised for SMP activities due to vulnerability (i.e. time to contact and environmental sensitivity) to potential impacts from hydrocarbon contact and an identified need to acquire baseline data. 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 Pluto Operations Facility. Pre-emptive Baseline Areas for the Pluto Operations facility are identified and listed in ANNEX D, Table D-1. The PBAs together with the situational awareness (from the operational monitoring) are the basis for the response phase SMP planning and implementation.
Pre-spill	A review of existing baseline data for receptor locations (refer to Annex D) with potential to be contacted by surface, dissolved or entrained hydrocarbons at environmental thresholds within ≤10 days, relating to the credible hydrocarbon release for Pluto Facility Operations has identified the following: • Rankin Bank[5] • Dampier Archipelago • Barrow, Lowendal and Montebello Island groups • Barrow Island MMA and Montebello State Marine Park Australian Marine Parks (AMPs) potentially affected include: • Dampier AMP • Montebello AMP Note: The AMPs are located in offshore, open waters where hydrocarbon exposure is possible on surface waters and in the upper water column (entrained hydrocarbons) only.
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 CIMT) as the spill event unfolds and as the situational awareness provided by the OMPs permits delineation of the spill affected area (for example, updates to the spill trajectory tracking). The full list is presented in Annex D, based on the PAP credible spill scenario(s) (Table 2-1). To address the initial focus in a response phase SMP planning situation, receptor locations predicted to be contacted >10 days have been identified as follows: • Ningaloo Coast and the Muiron Islands (State Marine Park, MMA and WHA) • Pilbara Islands – Middle and Southern Island Groups • Glomar Shoal • Gascoyne AMP • Ningaloo AMP • Argo-Rowley Terrace 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 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 that are potentially impacted after 10 days following a spill event or commencement of the spill and where adequate and appropriate baseline data are not available, there will be a response phase effort to collect baseline data for the following purposes: i. 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 Pluto Facility Operations facility, priority would be

[5] Only entrained hydrocarbon contact is predicted at ≤ 10 days. This is based upon predicted upper water column entrained hydrocarbons which may extend to approximately 20 m depth and contact the submerged shoal benthic communities.

	focused on Ningaloo Coast and the Muiron Islands (State Marine Park, MMA and WHA), Pilbara Islands – Middle and Southern Island Groups and Glomar Shoal. ii. Collect baseline data for receptors predicted to be outside the spill affected area so reference datasets for comparative analysis with impacted receptor types can be assessed post-spill.
Baseline data	A summary of the spill affected area and receptor locations as defined by the EMBA for the PAP credible spill scenario(s) is presented Section 2. The key receptors at risk by location and corresponding SMPs based on the EMBA for the PAP are presented in ANNEX D, as per credible spill event scenario(s). This matrix maps the receptors at risk with their location and the applicable SMPs that may be triggered in the event of a Level 2 or 3 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 Corporate Environment Environmental Baseline Database (managed by the Woodside Biodiversity and 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: Oil Spill Scientific

5.8.3 Summary – scientific monitoring

The resulting scientific monitoring capability has been assessed against the PAP credible spill scenario(s). The range of techniques provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts. All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be moderate and the overall delivery effectiveness determined to be medium. The SMP's main objectives can be met, with no additional, alternative or improved control measures providing further benefit.

5.8.4 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 the SMP standby 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.

Scope of SMP Operations in the event of a hydrocarbon spill

Receptor locations of interest for the SMP during the response phase are:

- Rankin Bank and Glomar Shoal
- Dampier Archipelago
- Barrow, Lowendal and Montebello Island groups
- Barrow Island MMA and Montebello State Marine Park

Documented baseline studies are available for certain receptor locations including Rankin Bank and Glomar Shoal (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 data at sensitive receptor locations i.e., the sections of the WA Coast not immediately contacted by hydrocarbons. As the exact locations where hydrocarbon contact occurs may be unpredictable, SM01 would be mobilised as a priority to detect hydrocarbons and track the leading edge of the spill to verify where hydrocarbon contact occurs which will assist in prioritising deployment of SMP resources to obtain pre-emptive baseline data.

The ALARP assessment for the SMP (Section 6.8) considers alternate, additional, and/or improved control measures on each selected response technique.

[1] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

5.8.5 Environmental performance based on need

Table 5-15: 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**
24	• Woodside has an established and dedicated SMP team comprising the Biodiversity and Science Team and additional Environment Advisers within the HSEQ Business Group.	24.1	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
25	• Woodside has a SMP standby contractor to provide scientific personnel to resource a base capability of one team per SMP (SM01-SM10, see Table C-2, ANNEX C) as detailed in Woodside's SMP Implementation Plan, to implement the oil spill scientific monitoring programs. The availability of relevant personnel is reported to Woodside monthly via a simple report on the base-loading availability of people for each of the SMPs comprising field work for data collection (SMP resourcing report register. • In the event of a spill and the SMP is activated, the base-loading availability of scientific personnel will be provided by SMP standby contractor for the individual SMPs and where gaps in resources are identified, SMP standby contractor/Woodside will seek additional personnel (if needed) from other sources including Woodside's Environmental Services Panel.	25.1	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, as detailed within the SMP Implementation Plan. • SMP 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 (HSP) Internal Control Environment (ICE) tracks the quarterly review of the Oil Spill Contracts Master. • 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
26	• Roles and responsibilities for SMP implementation are captured in Table C-1 (Annex C) and the SMP team (as per the organisational structure of the CIMT) is outlined in the Oil Spill Scientific Monitoring Program Operational Plan. Woodside has a defined Crisis and Incident Management structure including Source Control, Operations, Planning and Logistics Sections to manage a loss of well control response. • SMP Team structure, interface with SMP standby contractor (standby SMP contractor) and linkage to the CIMT 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 ICS framework. • Woodside utilises online incident management software to coordinate and track key incident management Sections. 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 Oil Pollution First Strike Plan. • Step by step process for activation of individual SMPs provided in the SMP Operational Plan. • All decisions made regarding SMP logged in the online incident management software (SMP team members trained in its use). • SMP component input to the CIMT Incident Action Plan (IAP) as per the identified CIMT timed sessions and the SMP IAP logged on the online incident management software. • Woodside Biodiversity and Science Team provide awareness training on the activation and stand-up of the SMP for the Environment Advisers in Woodside who are listed on the SMP team on an annual basis. • Woodside Biodiversity and Science Team provide awareness training on the activation and stand-up of the Scientific Monitoring Programme (SMP) for the SMP standby contractor. • Woodside Biodiversity and Science Team co-ordinates an annual SMP arrangement testing exercise which the SMP standby contractor.	26.1	• Woodside have established an SMP organisational structure and processes to stand up and deliver the SMP.	• Oil Spill Scientific Monitoring Program Operational Plan • SMP Implementation Plan • SMP annual arrangement testing and reporting

27	• 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 may 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 with SMP standby contractor for SMP resources and if additional surge capacity is required this would be available through the other Woodside Environmental Services Panel Contractors and specialist contractors. SMP standby contractor can also address equipment redundancy through either individual or multiple suppliers. MoUs are in place with one marine sampling equipment companies 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 'acquire, where practicable, the environmental baseline data prior to hydrocarbon contact required to support the post-response SMP.	27.1	Woodside maintains standby SMP capability to mobilise equipment required to conduct scientific monitoring programs SM01 – SM10 (except desktop based SM08): • Equipment is sourced through the existing standby contract with SMP standby contractor, as detailed within the SMP Implementation Plan.	• HSP Internal Control Environment tracks the quarterly review of the Oil Spill Contracts Master. • SMP standby monthly resource reports of equipment availability provided by SMP contractor (SMP resourcing report register). • SMP annual arrangement testing and reporting
28	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 of annual reviews of the Woodside Baseline Environmental Studies Database, and specific activity baseline gap analyses. • accessing external databases such as IMSA (refer to ANNEX C: Oil Spill Scientific Monitoring Program).	28.1	• Annual reviews of environmental baseline data • PAP specific Pre-emptive Baseline Area baseline gap analysis	• Annual review/update of Woodside Baseline Environmental Studies Database • Desktop review to assess the environmental baseline study gaps completed prior to EP submission • Accessing baseline knowledge via the SMP annual arrangement testing

Environmental Performance Outcome		SMP plan to acquire response phase monitoring targeting pre-emptive baseline data achieved		
Control measure		**Performance Standard**		**Measurement Criteria**
29	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.	29.1	**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 CIMT) contribute SMP component of the CIMT Planning Section in development of the IAP.	• Response SMP plan • Woodside's online Incident Management System Records • SMP component of the IAP.
		29.2	**Post Spill contact** For the receptors contacted by the spill where baseline data are available, SMPs to assess and monitor receptor condition will be implemented post spill (i.e. after the response phase):	• SMP planning document • SMP Decision Log • IAPs

Environmental Performance Outcome		Implementation of the SMP (response and post-response phases)		
Control measure		**Performance Standard**		**Measurement Criteria**
30	• 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 as listed in Section 5.8. • 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 which details 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 via the SMP resourcing report. All SMP documents and their status are tracked via SMP document register.	30.1	**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
		30.2	**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
		30.3	**Termination of SMP plans** The Scientific Monitoring Program will be terminated in accordance with termination triggers for the SMP's detailed in Table C-2 of Annex C, and the Termination Criteria Decision-tree for Oil Spill Environmental Monitoring (Figure C-3 of Annex C):	Evidence of Termination Criteria triggered: • Documentation and approval by relevant persons/ organisations to end SMPs for specific receptor types.

5.9 Incident Management System

The Incident Management System (IMS) is both a control measure and a measurement criterion. As a control measure the function of the IMS 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 for 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.

5.9.1 Incident action planning

The CIMT will be required to collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an IAP and assist the IMT with the execution of that plan. The site-based Incident Commander (IC) may request the CIMT to complete notifications internally within Woodside, to relevant persons/ organisations and government agencies as required. Depending on the type and scale of the incident the CIMT IC will be responsible for ensuring the development of the IAP. Incident Action Planning is an ongoing process that involves continual review to confirm the appropriateness of techniques to control the incident for the situation at the time.

5.9.2 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.

5.9.3 Consultation process

Woodside will consult relevant persons/ organisations during the spill response in accordance with internal standards. This process requires that Woodside will:

- Undertake all required notifications (including government notifications) for relevant persons/ organisations in the region (identified in the First Strike Plan). This includes notification to mariners to communicate navigational hazards introduced through response equipment and personnel.
- In the event of a response, identify and engage with relevant persons/ organisations and continually assess and review.

5.9.4 Environmental performance based on need

Table 5-16: Environmental Performance – Incident Management System

Environmental Performance Outcome		To support the effectiveness of all other control measures and monitor/record the performance levels achieved.		
Control measure		**Performance Standard**		**Measurement Criteria (Section 5.10)**
31	Operational SIMA	31.1	Confirm that the response techniques adopted at the time of acceptance remain appropriate to reduce the consequences of the spill within 24 hours.	1, 3A
		31.2	Record the evidence and justification for any deviation from the planned response activities.	
		31.3	Record the information and data from operational and scientific monitoring activities used to inform the SIMA.	
32	Stakeholder engagement	32.1	Prompt and record all notifications (including government notifications) for relevant persons/ organisations in the region	
		32.2	In the event of a response, identification of relevant persons/ organisations will be re-assessed throughout the response period.	
		32.3	Undertake communications in accordance with: • External Communication and Continuous Disclosure Procedure • External Stakeholder Engagement Procedure	
33	Personnel required to support any response	33.1	Action planning is an ongoing process that involves continual review to confirm the appropriateness of techniques to control the incident for the situation at the time.	1, 3B
		33.2	A duty roster of trained and competent people will be maintained to confirm that minimum manning requirements are met all year round.	3C
		33.3	Immediately activate the IMT with personnel filling one or more of the following roles: • CIMT Incident Commander • CIMT Deputy Incident Commander • Operations Section Chief • Planning Section Chief • Logistics Section Chief • Documentation Unit Leader • Safety Officer • Environment Unit Leader • Human Resources Officer • Public Information Officer • Situation Unit Leader • Finance Section Chief • Source Control Section Chief	1, 2, 3B, 3C, 4
		33.4	Collect and interpret information from the scene of the incident to determine support requirements to the site-based IMT, develop an IAP and assist with the execution of that plan.	
		33.5	Security and Emergency Management advisors will be integrated into CIMT to monitor performance of all functional roles.	
		33.6	Continually communicate the status of the spill and support Woodside to determine the most appropriate response by delivering on the responsibilities of their role.	
		33.7	Follow the OPEA, Operational Plans, FSPs, support plans and the IAPs developed.	1, 2, 3A, 4
		33.8	Contribute to Woodside's response in accordance with the aims and objectives set by the Incident Commander.	1, 2, 3B, 3C, 4

5.10 Measurement criteria for all response techniques

Woodside measures compliance with environmental performance outcomes and standards through four primary mechanisms. The performance tables in the previous sections 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 communicates 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, and development and execution of the IAP.

2. The Security and Emergency Management Competency Dashboard

The Security and Emergency Management 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
- Australian Marine Oil Spill Centre (AMOSC) Core Group
- AMOSC
- Oil Spill Response Limited (OSRL)
- Marine Spill Response Corporation (MSRC)
- AMSA
- Woodside contracted workforce.

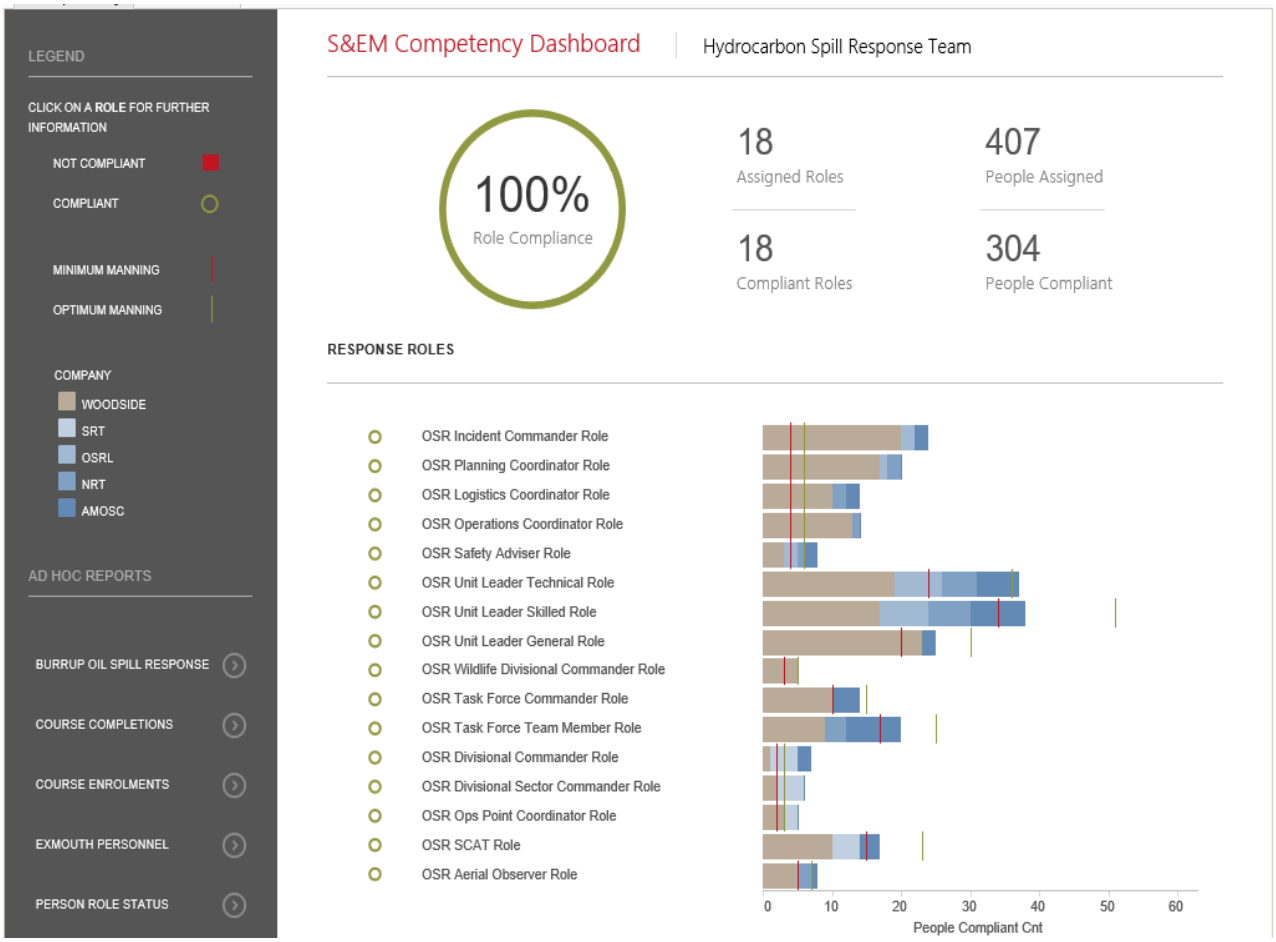

Figure 5-2: Example screenshot of the HSP competency dashboard

The Dashboard is one of Woodside's key means of monitoring its readiness to respond. It also demonstrates Woodside's ability meet the requirements of the environmental performance standards that relate to certain response roles.

Figure 5-3 shows deeper dive into the Operations Point Coordinator role and the training modules required to show competence.

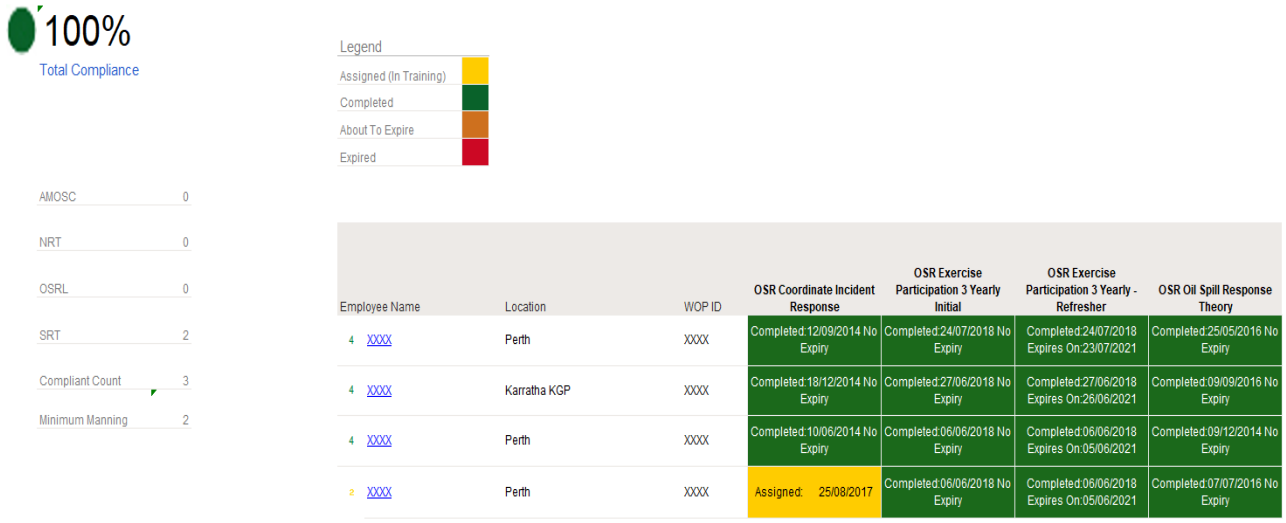

Figure 5-3: Example screenshot for the Operations Point Coordinator role

3. The Hydrocarbon Spill Preparedness ICE Assurance Process

The Hydrocarbon Spill Response Team has developed a Hydrocarbon Spill Preparedness 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** – confirms all plans (including: Oil Pollution Emergency Arrangements, first strike plans, operational plans, support plans and tactical response plans) are current and in line with regulatory and internal requirements.

b) **Competency** – confirms the competency dashboard is up to date and minimum numbers of required personnel are maintained across CIMT, 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 meet compliance requirements.

c) **Capability** – tracks and monitors the capability that could be required in a hydrocarbon incident, including integrated fleet[6] vessel schedule, dispersant availability, rig/vessels monitoring, equipment stockpiles, tracking buoy locations and the CIMT duty roster.

d) **Compliance and Assurance** – confirms 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 for ongoing compliance monitoring. The level of compliance can be reviewed in real time and is reported monthly through the S&EM Business Group.

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.

This procedure details the:

- requirement for an Oil Pollution Emergency Plan (OPEP) to be developed, maintained, reviewed, and approved by appropriate regulators (where applicable) including:
  - defining how spill scenarios are developed on an activity specific basis
  - developing and maintaining all hydrocarbon spill related plans
  - ensuring the ongoing maintenance of training and competency for personnel
  - developing the testing of spill response arrangements
  - maintaining access to identified equipment and personnel.
- planning for hydrocarbon spill response preparedness
- accountabilities for hydrocarbon spill response preparedness
- spill training requirements
- requirements for spill exercising / testing of spill response arrangements
- spill equipment and services requirements.

The procedure also details the roles and responsibilities of the dedicated Woodside Hydrocarbon Spill Preparedness team. This team is responsible for:

[6] The Integrated fleet consists of vessels from multiple operators that have been contracted to Woodside to undertake a number of duties including hydrocarbon spill response

- assuring that Woodside hydrocarbon spill responders meet competency requirements.
- establishing the competency requirements, annual training schedule and a training register of trained personnel.
- establishing and maintaining the total numbers of trained personnel required to provide an effective response to any hydrocarbon spill incident.
- ensuring equipment and services contracts are maintained
- establishing OPEPs
- establishing OPEAs
- priority response receptor determination
- ALARP determination
- ensuring compliance and assurance is undertaken in accordance with external and internal requirements.

6 ALARP EVALUATION

This Section should be read in conjunction with Section 5 which is the capability planned for this activity.

6.1 Operational Monitoring – ALARP Assessment

Alternative, additional and improved control measure options have been identified and assessed against the base capability described in Section 5. Those that have been selected for implementation are 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.

6.1.1 Operational Monitoring – Control Measure Options Analysis

6.1.1.1 Alternative Control Measures

Alternative Control Measures considered *Alternative control measures, 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 is approximately 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 operational monitoring data used to inform all other response techniques. No improvement required.	Woodside considers 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 approximately 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 and additional needs are met from Woodside-owned stocks in King Bay Support Facility (KBSF) 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.	Current capability meets need. Woodside has access to a pool of trained, competent observers at strategic locations to allow timely and sustainable response. Additional observers are available through current contracts with AMOSC and OSRL.	Aviation standards and guidelines confirm 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 maintain training and competency.	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

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 turnaround time from modelling contractor.	Improved control measure does not provide an environmental benefit compared to the disproportionate cost in having an additional contract in place.	External contractor on CIMT roster to be called as soon as required. However initial information needs to be gathered by CIMT team to request an accurate model. External contractor has person on call to respond from their own location.	Modelling service with a faster activation time would be achieved via membership of an alternative modelling service at an annual cost of A$50,000 for 24hr access plus an initial A$5,000 per modelling run.	This option is not adopted as the minimal environmental benefit gained is disproportionate to the cost and complexity of its implementation.	**No**
Nighttime 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 Safety 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 KBSF.	Operations are not feasible on day one as the hydrocarbon will take time to surface, and volatility has potential to cause health concerns within the first 24 hours of the response.	The cost and organisational complexity of employing two dedicated response vessels (approximately A$15m per year per vessel) is considered disproportionate to the potential environmental benefit to be realised by adopting this delivery options. Cost for purchase of equipment is approximately 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 approximately A$1 m per annum, which is disproportionate to the incremental benefit this would provide, assets are already available on day one. two integrated fleet vessels are available from day one, however these could be tasked with other operations.	This option is not adopted as the area could not be accessed earlier due to safety considerations. Additionally, the cost and complexity of implementation outweighs the benefits.	**No**

6.1.2 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP:

- alternative
  - none selected
- additional
  - none selected
- improved
  - none selected

6.2 Source Control – ALARP Assessment

Woodside has based its response planning on the worst-case scenarios for Xena-03 drilling activities (CS-01) and Pluto Facility Operations (MEE-01) as described in **Table 2-1**. This includes the following selection of primary source control and well intervention techniques which would be conducted concurrently:

- direct remotely operated vehicle (ROV) intervention on BOP (CS-01) or Xmas tree (MEE-01)
- debris clearance and/or removal
- capping stack
- relief well drilling.

6.2.1 ROV Intervention

Following confirmation of an emergency event, Woodside would mobilise inspection class ROVs to assess the status of the wellhead and Xmas tree. For CS-01, the ROV available on the MODU can be deployed for this purpose within 48 hours. Work class ROVs for well intervention are available through the existing frame agreements.

As Woodside holds frame agreements for vessels along with contracts for ROV providers and pilots, inspection activities using ROVs are expected to commence within seven days of an emergency event.

A hydraulic accumulator contained as part of the SFRT can be mobilised and deployed with well intervention attempted within 11 days.

Table 6-1: ROV timings

	Estimate ROV inspection duration for Xena-03 tie-back activities (days) – CS-01	Estimate ROV inspection duration for Pluto Facility Operations (days) – MEE-01
Source and mobilise vessel with work class ROV	2 days	2 days
Liaise with Regulator regarding risks and impacts*	4 days	4 days
Undertake ROV Inspection	1 day	1 day
TOTAL	**7 days***	**7 days***

** Based on timings from the Report into the Montara Commission of Enquiry, submission and discussion of revised documentation for limited activities inside the Petroleum Safety Zone (water deluge operations) to manage personnel risks and impacts was up to 20 days.*

6.2.1.1 Safety Case considerations

Woodside has assessed against the NOPSEMA Safety Case guidance (NOPSEMA N-09000-GN1661), confirming that vessels conducting subsea intervention operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements to be in place. In the event of an emergency, Woodside has access to suitable installation support vessels (ISVs) for well intervention through existing frame agreements. The frame agreements for ISV vessels require the vessels to maintain in-force Safety Case approval covering a range of subsea activities. This would cover the requirement for intervention operations such as subsea manifold installation, maintenance and repair, commissioning, cargo transfer (including bulk liquids) and ROV operations. With frame agreements in place, the credible Safety Case scenario from those presented in **Figure 6-4** and **Figure 6-5** for implementing this response would be “no Safety Case revision required”. Timeframes for well intervention are detailed in Figure 6-2 and **Figure 6-3** would be implemented concurrently to the actions required by the “no Safety Case” revision scenario detailed in **Figure 6-4** and **Figure 6-5**, therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

6.2.2 Debris clearance and/or removal

The Woodside Source Control Response Procedure details the mobilisation and resource requirements for implementing this strategy. Debris clearance may be required as a prerequisite to deployment of the capping stack. The AMOSC SFRT would be mobilised from Fremantle. The mobilisation of the SFRT would take place in parallel with mobilisation of the capping stack to allow initial ROV surveys and debris clearance have commenced before the arrival of the capping stack. The SFRT comprises ROV-deployed cutters and tools that are used to remove damaged or redundant items from the wellhead and allow improved access to the well. The SFRT can be mobilised and deployed with well intervention attempted within 11 days.

6.2.2.1 Safety Case considerations

Woodside has assessed against the NOPSEMA Safety Case guidance (NOPSEMA N-09000-GN1661) and can confirm that vessels conducting debris clearance and removal operations are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements in place. In the event of an emergency, Woodside has access to suitable ISVs for these operations through existing frame agreements. The frame agreements for ISVs require the vessels to maintain in-force Safety Case approval covering a range of subsea activities. This would cover the requirement for debris clearance and removal operations such as subsea manifold installation, commissioning, cargo transfer (including bulk liquids) and ROV operations. With frame agreements in place, the credible Safety Case Scenario, from those presented in **Figure 6-4** and **Figure 6-5** for implementing this response would be “no Safety Case revision required”. Timeframes for debris clearance and removal equipment deployment are detailed in Figure 6-2 and **Figure 6-3** would be implemented concurrently to the actions required by the “No Safety Case” revision scenario detailed in **Figure 6-4** and **Figure 6-5**, therefore, the Safety Case scenario will have no impact on the delivery of the strategy.

6.2.3 Capping stack

The Woodside Source Control Emergency Response Planning Guideline details the mobilisation and resource requirements for implementing capping stack deployment. A capping stack is designed to be installed on a subsea well and provides a temporary means of sealing the well, until a permanent well kill can be performed through either a relief well or well re-entry.

In the event of a loss of well containment, the use of a subsea deployment method such as a heavy lift vessel, which is more commonly used in industry, is a more reliable and, in turn, an ALARP approach. If environmental conditions permit (wind speed, wave height, current and plume radius), deployment of a capping stack with a heavy lift vessel with a 150 T crane capacity in shallower waters or 250 T crane in deeper waters could be feasible.

Woodside assumes that sourcing conventional capping stack deployment vessels would be per the Woodside Source Control Emergency Response Planning Guideline. This plan has pre-identified vessel specifications for the capping stack deployment. Woodside maintains several frame agreements with various vessel service providers and maintains the ability to call off services with a capping stack and debris clearance agreement.

A capping stack can be mobilised to site within 16 days. Woodside will monitor the conditions around the wellsite and deployment for a well intervention attempt will be undertaken once plume size is acceptable and safety and metocean conditions are suitable.

6.2.3.1 Safety Case considerations

Woodside has assessed against the NOPSEMA Safety Case guidance (NOPSEMA N-09000-GN1661) and can confirm that vessels conducting deployment of the capping stack are not classified as an “associated offshore place” but as a facility and therefore require the appropriate Safety Case arrangements in place.

The 16-day timeframe to mobilise the vessel is based on the following assumptions:

- An existing frame agreement vessel, located outside the region with approved Australian Safety Case
- A Safety Case revision and scope of validation is required

- The vessel meets the technical requirements for deploying capping stack as per the Source Control Emergency Response Planning Guideline
- The vessel has an active heave compensated crane, rated to at least 150 T for shallow waters or 250 T in deeper waters and at least 90 m in length and a deck capacity to hold at least 110 T of capping stack.

Timeframes for capping stack deployment detailed in Figure 6-2 and **Figure 6-3** would be implemented concurrently with the actions required for the Safety Case revision development scenarios detailed in **Figure 6-4**, **Figure 6-5** and **Table 6-3**. Woodside will execute the capping stack response within the timeframes detailed in Figure 6-2 and **Figure 6-3** , dependent upon presence of required safety and metocean conditions. Woodside has considered a broad range of alternate, additional, and improved options as outlined later in Section 6.2.5.

6.2.4 Relief Well drilling

The options analysis detailed in this section considers options to source, contract and mobilise a MODU and obtain necessary regulatory approvals to meet timelines for relief well drilling. The screening for relief well drilling MODUs is based on the following three approaches and is illustrated in Figure 6-1:

- Primary – review internal Woodside drilling programs and MODU availability to source an appropriate MODU operating within Australia with an approved Safety Case.
- Alternate – source and contract a MODU through AEP MOU that is operating within Australia with an approved Safety Case.
- Contingency – source and contract a MODU outside Australia with an approved Australian Safety Case.

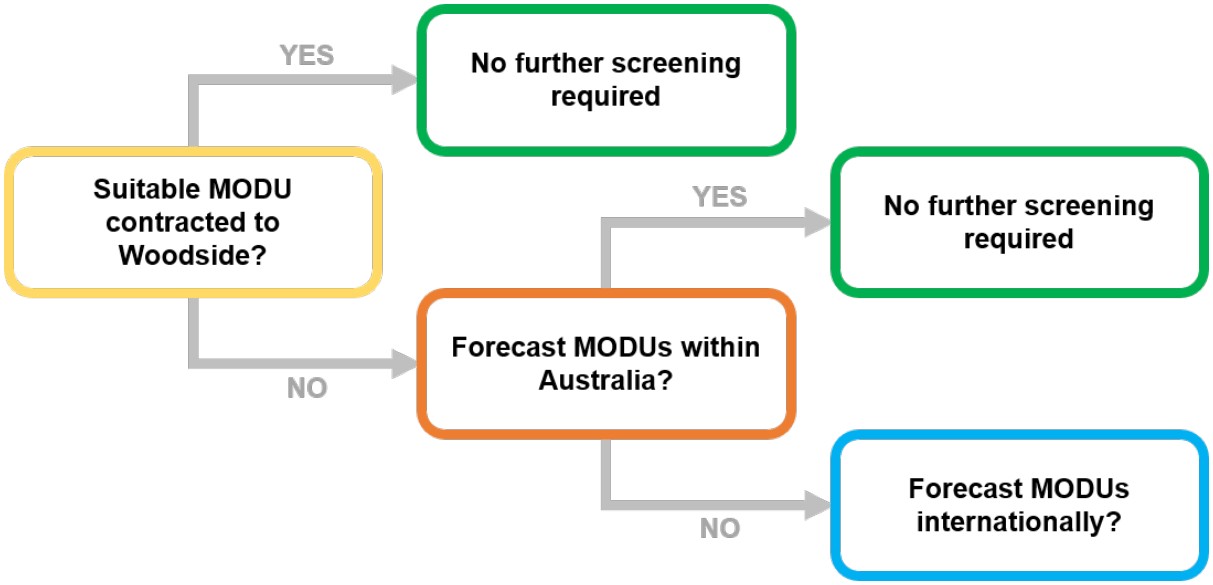

Figure 6-1: Pluto Facility Operations process for sourcing relief well MODU

Screening of a relief well MODU from international waters is undertaken only if required, i.e. there is low confidence in local (Australian) availability. The capability, location and Australian Safety Case status is assessed for each Woodside contracted MODU. In the event the Woodside contracted MODUs are unsuitable, screening is extended to all MODUs operating in Australian Waters.

Based on the detail provided, the primary and alternate approaches are expected to be achieved within the 21-day period.

The internal and external availability of MODUs, plus MODU activities of registered operators and MODUs with approved Safety Cases, are tracked by Woodside to allow the best available options to be sourced and utilised in the event of the worst-case scenario.

If the above forecast indicates a gap in availability of a suitable MODU for relief well drilling within Australia, screening would be extended to MODUs with a valid Safety Case outside Australia. If an international MODU with an Australian Safety Case is not identified, an internal review will be

undertaken, NOPSEMA notified and the issue tabled at the AEP DISC. A review of the significance of the change in risk will be undertaken in accordance with Woodside's environment management of change requirements and relevant regulatory triggers. The aforementioned lookahead process would allow two years' warning of any potential gap.

The detail of these arrangements demonstrates that the risks have been reduced to ALARP and an acceptable level through the control measures and performance standards outlined in Section 5.2.

6.2.4.1 Relief Well drilling timings

The duration of a blowout (from initiation to a successful kill) is assessed as 64 days for the Xena-03 drilling operations (CS-01) and 77 days for the Pluto Facility Operations (MEE-01). Relief wells for other wells within the field are expected to be similar duration.

Details on the steps and time required to drill a relief well is shown in **Table 6-2**. DP and moored MODUs are suitable for the Pluto Facility Operations PAP. A moored MODU has been used as the basis for the time estimate below.

To validate the effectiveness of the relief MODU supply arrangements through the AEP MoU, an exercise to test the 21-day mobilisation period forms part of Woodside's three-yearly Hydrocarbon Spill Arrangements Testing Schedule. Testing of these arrangements are facilitated by an external party and includes suspension of the assisting operator's activities, contracting the MODU, vessel Safety Case revision and transit to location.

Table 6-2: Relief well drilling timings

Estimated Relief Well Duration	Moored days: Xena-03 drilling (CS-01)	Moored days: Pluto Operations (MEE-01)	
Rig Mobilisation			
Secure and suspend well. Complete Relief well design. Secure relief well materials.	8.0	8.0	21 days
Transit to location based on mobilisation from within the region	2.0	2.0	
Backload and loadout bulks and equipment, complete internal assurance of relief well design.	2.0	2.0	
Contingency for unforeseen event	9.0	9.0	
Mooring activities and relief well construction operations	**29.0**	**42.0**	
Intersection & well kill comprising the following stages:			
Drill out shoe, conduct formation integrity test and drill towards intersection point	1.5	1.5	14 days
Execute well-specific ranging plan to accurately intersect wellbore in minimum timeframe	9.5	9.5	
Pump kill weight drilling fluid per the relief well plan. Confirm well is static with no further flow	0.5	0.5	
Contingency for unforeseen technical issues	2.5	2.5	
Total Discharge Duration	**64 days**	**77 days**	

Woodside has considered a broad range of alternate, additional, and improved options as outlined in Section 6.2.5.

Intersect and kill duration is estimated at 14 days. This is a moderately conservative estimate. During the intersect process, the relief well will be incrementally drilled and logged to accurately approach and locate the existing well bore. This will result in the highest probability of intersecting the well on the first attempt and thus will reduce the overall time to kill the well.

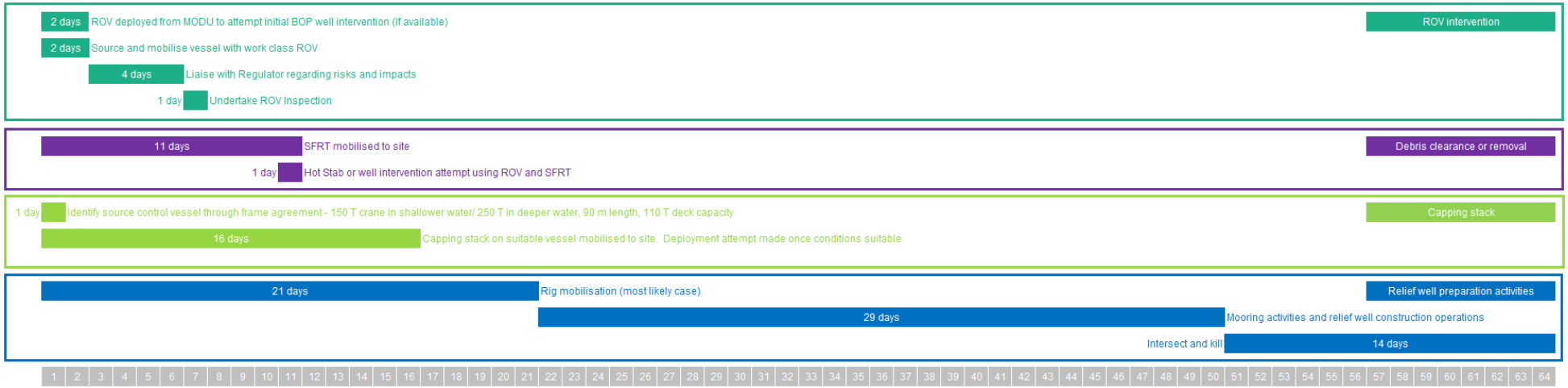

Figure 6-2: Source control and well intervention response strategy deployment timeframes for Xena-03 drilling – CS-01

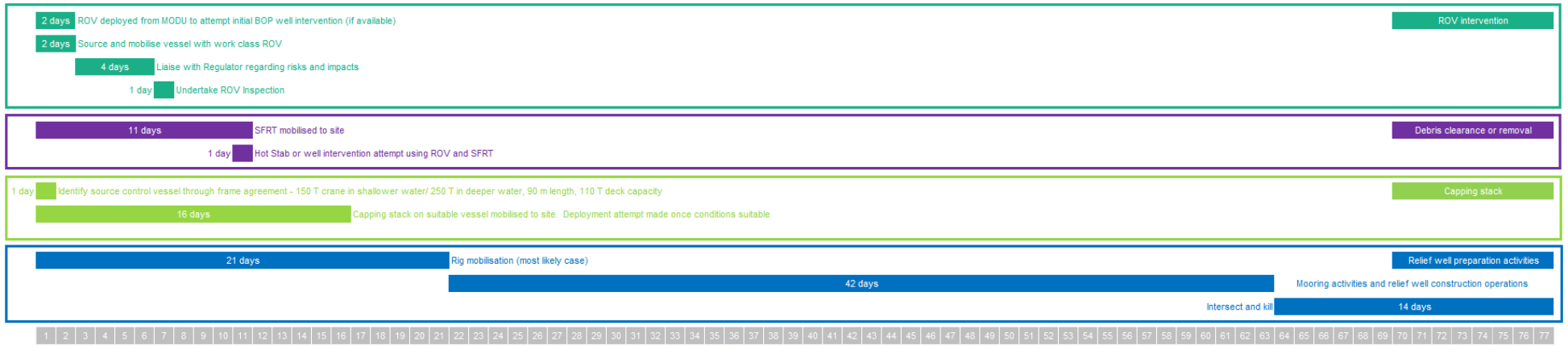

Figure 6-3: Source control and well intervention response strategy deployment timeframes for Pluto Facility Operations – MEE-01

6.2.4.2 Safety Case considerations

Woodside recognises that it will not be the Operator or holder of the Safety Case for the MODU and/or vessels involved in relief well activities. If a revision to the Operator's Safety Case is required for relief well drilling, Woodside has identified measures to enable timely response and optimise preparedness as far as practicable that can be undertaken to expedite a straightforward Safety Case revision for a MODU/ vessel to commence drilling a relief well. Performance standards associated with these measures have been included in Section 5.2.

These include;

- access to Safety and Risk discipline personnel with specialist knowledge.
- monitoring internal and external MODUs and vessel availability in the region and extended area through contracted arrangements, with a two-year lookahead.
- prioritisation of MODUs/vessels with current or historical contracting arrangements with Woodside maintaining records of previous contracting arrangements and companies and all current contracts for vessels and MODUs that are required to support Woodside in the event of an emergency.
- leverage mutual aid arrangements such as the AEP MOU for vessel and MODU support.
- Woodside Planning and Logistics, and Safety Officers (on-roster/ call 24/7) who can articulate need for, and deliver Woodside support, in key delivery tasks including those sitting with potential outside operators
- ongoing strategic industry engagement and collaboration with NOPSEMA to work toward time reductions in regulatory approvals for emergency events.

Woodside has identified three Safety Case revision development and submission scenarios for a MODU and plotted these alongside the relief well preparation activities in **Figure 6-4** and **Figure 6-5**. The assumptions for each of the cases are detailed in subsequent **Table 6-3**.

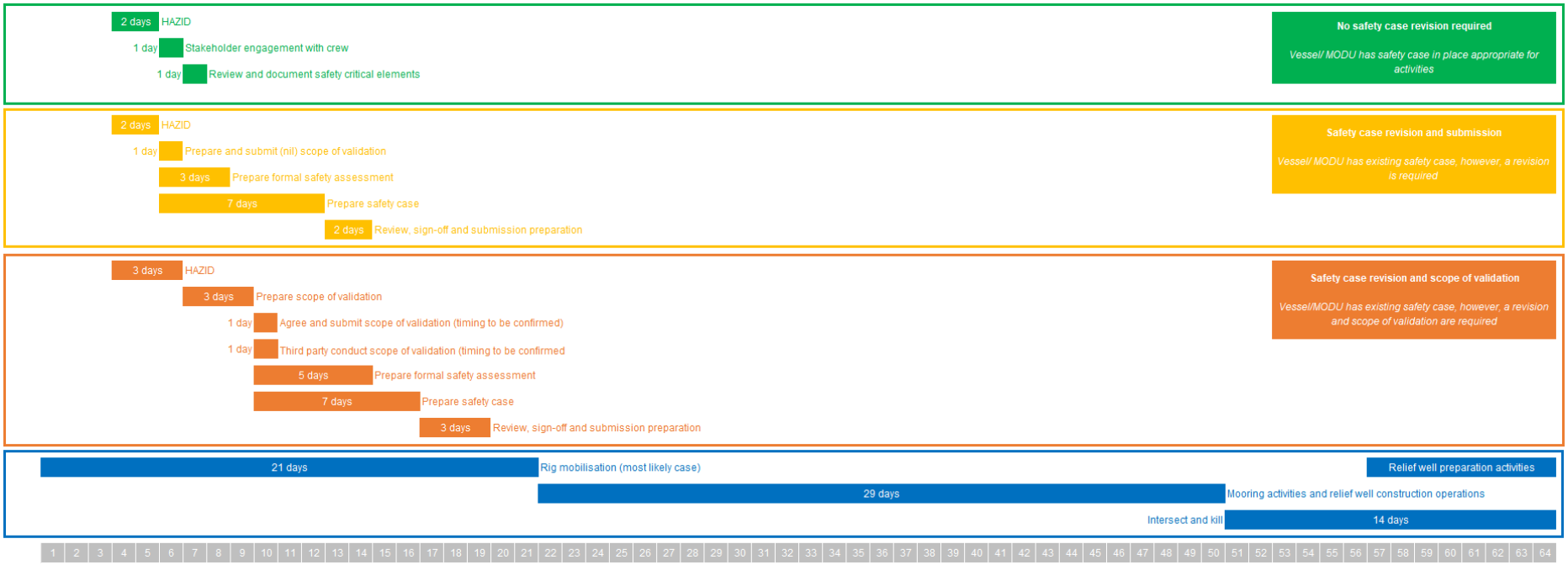

Figure 6-4: Timeline showing Safety Case revision timings alongside other relief well preparation activity timings for Xena-03 drilling – CS-01

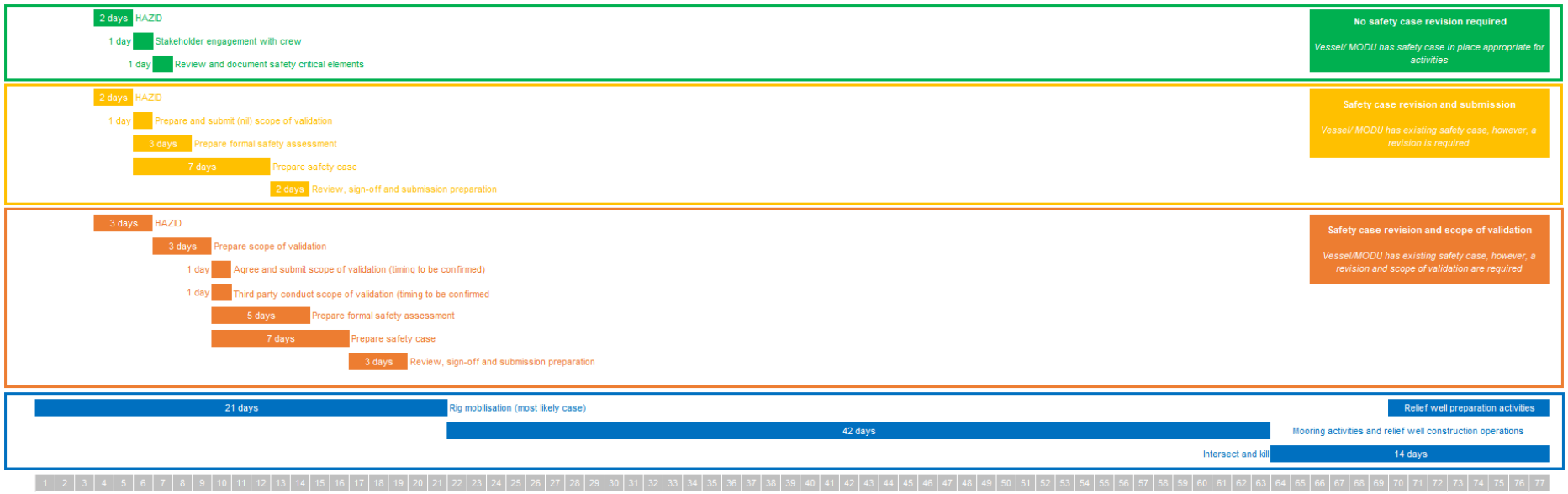

Figure 6-5: Timeline showing Safety Case revision timings alongside other relief well preparation activity timings for PLA02 (Pluto Facility Operations well)

Table 6-3: Safety case revision conditions and assumptions

Case	No Safety Case revision required	Safety Case revision and submission	Safety Case revision and scope of validation
Description	Vessel/MODU has a Safety Case in place appropriate for activities.	Vessel/MODU has an existing Safety Case, however, a revision is required.	Vessel/MODU has an existing Safety Case, however, a revision is required plus scope of validation.
Conditions/ assumptions	Assumes that existing vessel/ MODU Safety Case covers working under the same conditions or the loss of containment is not severe enough to result in any risk on the sea surface.	Safety case timing assumes vessel/ MODU selected and crew are available for workshops and Safety Case studies.	Safety case timing assumes vessel/ MODU selected and crew are available for workshops and Safety Case studies.
		Assumes nil scope of validation. This assumes that the vessel for source control allows for working in a hydrocarbon environment and control measures are already in place in the existing Safety Case. For MODU, it assumes that the relief well equipment is already part of the MODU facility and MODU Safety Case.	Validation will be required for new facilities only. The time needed for the validator to complete the review (from the last document received) and prepare validation statement is undetermined. This is not accounted for here as the Safety Case submission is not dependent on the validation statement, however the Safety Case acceptance is.
		Assumes Safety Case preparation is undertaken 24/7.	Assumes Safety Case preparation is undertaken 24/7.

6.2.5 Source Control – Control Measure Options Analysis

The assessment described in Section 6.2.1, 6.2.2, 6.2.3 and 6.2.4 outline the primary, alternate and contingency approaches respectively that Woodside would implement for relief well drilling**.**

Woodside has outlined the options considered against the activation, mobilisation (improved options), deployment (alternate and additional options) process described in Section 2.1.1 that provides an evaluation of:

- predicted cost associated with adopting the option
- predicted change/environmental benefit
- predicted effectiveness/feasibility of the option.

Alternative, additional and improved control measure options have been identified and assessed against the base capability described in Section 5. Those that have been selected for implementation are 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. The control measure options are defined as:

- Alternative control measures are potentially more effective and/or novel control measures that are evaluated as replacements for an adopted control.
- Additional control measures are evaluated in terms of their ability to reduce an impact or risk when added to the existing suite of control measures.
- Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility.

Options where there is not a clear justification for their inclusion or exclusion may be subject to a detailed assessment.

6.2.6 Activation/Mobilisation – Control Measure Options Analysis

This section details the assessment of alternative, additional or improved control measures that were considered to meet the selected level of performance in Section 5 and reduce the risk to ALARP. The alternative, additional and improved control measures that have been assessed and selected are highlighted in green and the relevant performance of the selected control is cross referenced. Items highlighted in red have been considered and rejected on the basis that they are not feasible or the costs are disproportionate compared to the environmental benefit.

6.2.6.1 Alternative Control Measures

Alternative Control Measures considered *Alternative control measures, 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**
Standby MODU shared for all Woodside activities	A standby MODU shared across all Woodside activities is likely to provide a moderate environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to 10 days (to 11 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities.	This option is not considered feasible for all Woodside activities as there are a large range of well depths, complexities, geologies and geophysical properties across all Woodside's operations. The large geographic area of Woodside activities also means that the MODU is unlikely to be in the correct location at the right time when required.	Even with costs shared across Woodside operations, the costs (approximately A$219 m per annum, A$1,095 bn over the five years) of maintaining a shared MODU are considered disproportionate to the environmental benefit potentially achieved by reducing mobilisation times by up to 10 days.	The costs and complexity of having a MODU and maintaining this arrangement for the duration of the PAP are disproportionate to the environmental benefit gained above finding a MODU through the MOU agreement for all spill scenarios.	**No**
Standby MODU shared across AEP MOU Titleholders	A standby MODU shared across all titleholders who are signatories to the AEP MOU is likely to provide a minor environmental benefit as it may reduce the 21-day sourcing, contracting and mobilisation time by up to seven days (to 14 days). This would reduce the volume and duration of release and may reduce impacts on receptors and sensitivities.	This option is not considered feasible for many titleholders due to the remote distances in Australia as well as a substantial range of well depths, types, complexities, geologies and geophysical properties across a range of Titleholders	As the environmental benefit is only considered minor and the reduction in timing would only be for the mobilisation period (reduction from 21 days to 14 days) the costs are considered disproportionate to the minor benefit gained.	The costs and complexity of having a MODU and maintaining a shared arrangement for the duration of the PAP are disproportionate to the environmental benefit gained above finding a MODU through the MOU agreement for all spill scenarios.	**No**

6.2.6.2 Additional Control Measures

Additional Control Measures considered *Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures*					
Option considered	**Environmental consideration**	**Feasibility**	**Approximate Cost**	**Assessment conclusions**	**Implemented**
Implement and maintain minimum standards for Safety Case development	Woodside's contingency planning consideration would be to source a rig from outside Australia with an existing Safety Case. This would require development and approval of a Safety Case revision for the rig and activities prior to commencing well kill operations.	This option is considered feasible and would require Woodside to develop minimum standards for safe operations for relevant Safety Case input along with maintaining key resources to support review of Safety Cases. Woodside would not be the operator for relief well drilling and would therefore not develop or submit the Safety Case revision. Woodside's role as Titleholder would be to provide minimum standard for safe operations that MODU operators would be required to meet and/or exceed.	Woodside has outlined control measures and performance standards regarding template Safety Case documentation and maintenance of resources and capability for expedited Safety Case review.	This option has been selected based on its feasibility, low cost and the potential environmental benefits it would provide.	**Yes**

6.2.6.3 Improved Control Measures

Improved Control Measures considered *Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility*					
Option considered	**Environmental consideration**	**Feasibility**	**Approximate Cost**	**Assessment conclusions**	**Implemented**
Monitor internal drilling programs for rig availability	Woodside may be conducting other campaigns that overlap with the PAP, potentially providing availability of a relief well drilling rig within Woodside. The environmental benefit of monitoring other drilling programs internally is for Woodside to understand what other rigs may be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment.	Woodside monitors vessel and MODU availability through market intelligence services for location. Woodside will continually monitor other drilling and exploration activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations.	Associated cost of implementation is minimal to the environmental benefit gained. Woodside has outlined control measures and performance standards.	This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment.	**Yes**
Monitor external activity for rig availability	The environmental benefit achieved by monitoring drilling programs and rig movements across industry provides the potential for increased availability of suitable rigs for relief well drilling. Additional discussions with other Petroleum Titleholders may be undertaken to potentially gain faster access to a rig and reduce the time taken to kill the well and therefore volume of hydrocarbons released.	Woodside will source a relief well drilling rig in accordance with the AEP MOU on rig sharing in the unlikely event this is required. Commercial and operational provisions do not allow WEL to discuss current and potential drilling programs in detail with other Petroleum Titleholders.	Associated cost of implementation is moderate to the environmental benefit gained. Woodside will continually engage with other Titleholders and Operators regarding activities within Australia and as available throughout the region to track rigs and explore rig availability during well intervention operations.	This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment.	**Yes**
Monitor status of Registered Operators/ Approved Safety cases for rigs	Woodside can monitor the status of Registered Operators for rigs operating within Australia (and therefore Safety Case status) on a monthly basis. This allows for a prioritised selection of rigs in the event of a response with priority given to those with an existing Safety Case.	The environmental benefit of monitoring rigs is for Woodside to understand what other rigs may be rapidly available for relief well operations if required, potentially reducing the time to drill the relief well, resulting in less hydrocarbon to the environment.	The cost is minimal.	This option is a low-cost control measure with potential to reduce the volume of hydrocarbon released to the environment.	**Yes**

6.2.7 Deployment Options Analysis

6.2.7.1 Alternative Control Measures

Alternative Control Measures considered *Alternative control measures, 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					

6.2.7.2 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**
Offset capping alternative to conventional capping stack deployment	While the use of an offset capping system could reduce the quantity of hydrocarbon entering the marine environment, deployment of an offset capping deployment in the water depths at the Pluto Facility Operations (829 m) is not deemed feasible – maximum safe water depths are stated by OSRL to be 600 m. Additionally, the mobilisation lead times for both a cap and required vessels/ support equipment, would minimise any environmental benefit gained for both PLA02 and Xena-03 wells.	Technical feasibility: • The base case considerations for OIE requires a coordinated response by 4 to 7 vessels working simultaneously outside of the 500m exclusion zone. In the event of a worst-case shallow water gas discharge, the 10% LEL modelled radius extends beyond the area of activity required for the OIE deployment thereby introducing health and safety risk to any vessels required for the initial deployment of the carrier and subsequent operations with ROV during capping operations. Though manageable for single vessels, it is prohibitive for operations requiring SIMOPs with numerous vessels working at 180 degrees from one another. • Water depth is also a key consideration as buoyancy modules have not been proven for use in 829 m water depth (PLA02) or with the expected worst-case gas blowout rates. Other factors: • Due to the OIE's size and scale, fabrication of equipment, e.g. mooring anchors, outside of the contractor's scope of supply is likely to require engagement of international suppliers, further increasing complexity and uncertainty in associated time frames. • Screening indicates that mobilising some components of the OIE, based in Italy, can only be done so by sea and is likely to erode any time savings realised through killing the well via a relief well. The March 2019 OSRL exercise in Europe tested deployment of the OIE and highlighted that it will require a 600+MT crane vessel for deployment to ensure there is useable hook height for the crane to conduct the lift of the carrier. Vessels with such capability and a current Australian vessel Safety Case are not locally or readily available.	Due to risks, uncertainty and complexity of this option, and the inability to realise any environmental gains, any cost would be disproportionate to the benefits gained.	Woodside has confidence in availability of suitable relief well MODUs across the required drilling time frame thus the OIE would provide no advantage. Implementation of OIE has been assessed as a complex and unfeasible SIMOPs operation, precluded by a combination of the site-specific metocean and worst-case discharge conditions at the Pluto location. Implementation of a novel technology such as OIE culminates in low certainty of success while at the same time increasing associated health and safety risks. As such the primary source control response and ALARP position remains drilling a relief well.	**No**

Dual vessel capping stack deployment	While the use of dual vessel to deploy the capping system could reduce the quantity of hydrocarbon entering the marine environment, this is an unproven technology. Additionally, mobilisation lead times for both a cap and required vessels and support equipment, would minimise any environmental benefit.	A dual vessel deployment is somewhat feasible provided a large enough deck barge can be located. Deck barges of 120 m are not, however, very common and will present a logistical challenge to identify and relocate to the region. Furthermore, the longer length barges may need mooring assist to remain centred over the well. The capping stack would be handed off from a crane vessel to the anchor handler vessel (AHV) work wire outside of the exclusion zone. The AHV would then manoeuvre the barge into the plume to get the capping stack over the well. In this method, the barge would be in the plume, but the AHV and all personnel would be able to maintain a safe position outside of the gas zone. The capping stack would actually be lowered on the AHV work wire so a crane would not be required on the barge.	Due to there being minimal environmental benefits gained by the prolonged lead times needed to execute this technique, plus a potential increase in safety issues, any cost would be disproportionate to the benefits gained.	Given there is minimal environmental benefit and an increase in safety issues surrounding SIMOPS and deployment in shallow waters, this option would not provide an environmental or safety benefit.	**No**
Subsea Containment System alternative to capping stack deployment	While the use of a subsea containment system could reduce the quantity of hydrocarbon entering the marine environment, this is an unproven technology. Additionally, the system is unlikely to be feasibly deployed and activated for at least 90 days following a blowout due to equipment requirements and logistics. No environmental benefit is therefore predicted given the release durations of 64 days (CS-01) and 77 days (MEE-01) before drilling of a relief well under the adopted control measure.	The timing for mobilisation, deployment and activation of the subsea containment system is likely to be longer (>90 days), than the expected 64 days (CS-01) and 77 days (MEE-01) relief well drilling timing based on the location, size and scale of the equipment required, including seabed piles that can only be transported by vessel.	Woodside has investigated the logistics of reducing this timeframe by pre-positioning equipment but the costs of purchasing dedicated equipment by Woodside for this PAP is not considered reasonably practical and are considered disproportionate to the environmental benefit gained.	This option would not provide an environmental benefit.	**No**
Pre-drilling top-holes	This option represents additional environmental impacts associated with discharge of additional drill cuttings and fluids along with benthic habitat disturbance. It is also not expected to result in a significant decrease in relief well timings	This option is not considered feasible due to the uncertainties related to the location and trajectory of the intervention well, which may vary according to the actual conditions at the time the loss of containment event occurs. Additionally, there is only expected to be a minor reduction in timing for this option of 1-2 days based on the drilling schedule. Duration to drill and kill may be reduced by 1-2 days, but top-hole may have to be relocated, due to location being unsafe or unsuitable and further works will be required each year to maintain the top holes.	Utilising an existing MODU and pre-drilling top-hole for relief well commencement would significantly increase costs associated the PAP. Estimated cost over the program's life is approximately A$555,000 per day over the PAP based on 2-4 days of top-hole drilling (plus standby time) for the 5 wells as the worst-case scenarios.	This option would not provide an environmental benefit due to the additional environmental impacts coupled with a lack of improved relief well timings.	**No**
Purchase and maintain mooring system	Purchasing and maintaining a mooring system could provide a moderate environmental benefit as it may reduce equipment sourcing time. However, due to the continued need for specialists to install the equipment plus sourcing a suitable vessel, the timeframe reduction would be minimal.	Woodside is not a specialist in installing and maintaining moorings so would require specialists to come in to install the moorings and would also require specialist vessels to be sourced to undertake the work.	The cost of purchasing, storing and maintaining pre-lay mooring systems with anchors, chains, buoys and ancillary equipment is considered grossly disproportionate to the environmental benefit gained.	This option would not provide an environmental benefit as timeframe reductions would be minimal.	**No**
Contract in place with Wild Well Control and Oceaneering	Woodside has an agreement in place with Wild Well Control Inc and Oceaneering to provide trained personnel in the event of an incident. This will ensure that competent personnel are available in the shortest possible timeframe.	Having contracts in place to access trained, competent personnel in the event of an incident would reduce mobilization times. This option is considered reasonably practicable.	Minimal cost implications – Woodside has standing contract in place to provide assistance across all activities.	This control measure is adopted as the costs and complexity are not considered disproportionate to any environmental benefit that might be realised.	**Yes**

6.2.7.3 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
Maintaining relief well drilling supplies	There is not predicted to be any reduction in relief well timing or spill duration from Woodside maintaining stocks of drilling supplies (mud, casing, cement, etc.)	It would be feasible to source some relief well drilling supplies such as casing but the actual composition of the cement and mud required will need to be specific to the well. This option is also not deemed necessary as the lead time for sourcing and mobilising these supplies is included in the 21 days for sourcing and mobilising a rig.	The capital cost of Woodside purchasing relevant drilling supplies is expected to be approximately A$600 k with additional costs for storage and ongoing costs for replenishment. These costs are considered disproportionate to the environmental benefit gained.	This option would not provide an environmental benefit.	**No**

6.2.8 Selected Control Measures

Following review of alternative, additional and improved control measures as outlined above, the following controls were selected for implementation for the PAP.

- alternative
  - none selected
- additional
  - implement and maintain minimum standards for Safety Case development
  - contract in place with Wild Well Control and Oceaneering to supply trained, competent personnel
- improved
  - monitor internal drilling programs for MODU availability
  - monitor external activity for MODU availability
  - monitor status of registered operators / approved Safety cases for MODUs.

6.3 Source Control via Vessel SOPEP – ALARP Assessment

Alternative, additional and improved control measure options have been assessed against the base capability described in Section 5. Those that have been selected for implementation highlighted in green. Items highlighted in red have been considered and rejected on the basis that they are not feasible, the costs are disproportionate to the environmental benefit, and/or the option is not reasonably practical. Control measures where there is not a clear justification for their inclusion or exclusion may be subject to a detailed ALARP assessment.

6.3.1 Source Control via Vessel SOPEP – Control Measure Options Analysis

6.3.1.1 Alternative Control Measures

Alternative Control Measures considered
Alternative control measures, 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					

6.3.1.2 Additional Control Measures

Additional Control Measures considered
Additional control measures are evaluated in terms of them reducing an environmental impact or an environmental risk when added to the existing suite of control measures

Option considered	Environmental consideration	Feasibility	Approximate Cost	Assessment conclusions	Implemented
No reasonably practical additional control measures identified					

6.3.1.3 Improved Control Measures

Improved Control Measures considered
Improved control measures are evaluated for improvements they could bring to the effectiveness of adopted control measures in terms of functionality, availability, reliability, survivability, independence and compatibility

Option considered	Environmental consideration	Feasibility	Approximate Cost	Assessment conclusions	Implemented
No reasonably practical improved control measures identified					

6.3.2 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.

6.4 Shoreline Protection and Deflection - ALARP Assessment

Alternative, additional and improved control measure options have been identified and assessed against the base capability described in Section 5. Those that have been selected for implementation are 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 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.

6.4.2 Response Planning: Pluto Facility Operations – Shoreline Protection and Deflection

Planning for shoreline protection is based upon identification of RPAs from deterministic 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 are no longer at risk. Woodside has identified the RPAs from deterministic modelling results provided from specific scenarios.

The control measures selected provide capability to mobilise shoreline protection equipment within 24 hours (if required). Deterministic modelling indicates that first shoreline impact at Dampier Archipelago and Legendre Island within 24 hours for the Pluto Facility Operations export pipeline loss of containment scenario (MEE-02b). The existing capability is considered sufficient to mobilise and deploy protection at RPAs within 72 hours, guided by the ongoing operational monitoring. The full list of RPAs predicted to be contacted by oil above response thresholds are detailed in Table 3-1.

Tactical response plans exist for many of the RPAs identified. The plans identify values and sensitivities that would be protected at location. To allow for the best use of available shoreline protection and deflection resources, operational monitoring (OM01 and OM02) will inform the response, targeting RPAs where contact is predicted above response threshold levels.

Table 6-4 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 meets the response planning need identified for shoreline protection and deflection operations at identified RPAs within 72 hours.

Table 6-4: Response Planning – Shoreline Protection and Deflection

Pluto Facility Operations - export pipeline loss of containment		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Week 2	Week 3	Week 4	Month 2	Month 3
	Oil on shoreline (from deterministic modelling) m^3	15	12	0	0	0	0	0	0	0	0	0	0
A	Capability Required												
A1	Number of RPAs contacted (> 100 g/m^2)	2	3	0	0	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
B2	SPD operations available – per day (upper)	1	2	3	4	6	8	10	84	84	848	336	336
C	Capability Gap (operations per day)												
C1	SPD operations gap – per day (lower)	2	2	-1	-2	-2	-4	-6	-70	-70	-70	-330	-330
C2	SPD operations gap – per day (upper)	3	4	-3	-4	-6	-8	-10	-84	-84	-84	-336	-336

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 5.4),
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 6-5: Indicative Tactical response plan, aims and methods for identified RPAs

Tactical Response Plan	Response aims and methods
Dampier Archipelago – applicable to RPAs including: Keast Island, Cape Bruguieres, and Cohen Island)	**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 and to assist in locating relevant booming areas. **Second response objective**: Recovery of floating oil at sea where possible through the use of skimming systems and other appropriate recovery devices to reduce shoreline impact. **Third response objective:** Protection of sensitive shorelines within Dampier Archipelago through use of shoreline booms. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/weather conditions. **Fourth response objective**: Clean-up of the shoreline. Manual clean up techniques, use of mechanical recovery methods and techniques where appropriate. NOTES: • Relevant permissions must be sought from DBCA to carry out any response operations within the limits of the area. • In the event that the existing Woodside equipment stockpile at the King Bay Supply Base becomes exhausted, Woodside has an MoU with AMSA and the DoT to provide surplus equipment from their stockpile. Additionally, Woodside is a member of both AMOSC and OSRL and has the ability to call upon their relevant technical advisory services and equipment stockpiles 24/7. This TRP should be considered a draft until it has been verified and tested.
Legendre Island – Dampier	**First Response objective:** Ongoing operational monitoring and evaluation of hydrocarbon spill to adapt aims and response tactics to evolving nature of the incident and to assist in locating relevant booming areas. **Second Response objective:** Protection of sensitive shorelines (mangrove) at Legendres Island through use of shoreline booms. Formation types to deploy will be dependent on the time available until the hydrocarbon impacts the shoreline and local geographical and tidal/ weather conditions. **Third Response objective:** Clean-up impacted shoreline. Manual clean-up techniques, use of mechanical recovery methods and techniques where appropriate. **Fourth response aim:** Collection and specialist cleaning/ rehabilitation of oiled wildlife NOTES: • Relevant permissions must be sought from DBCA to carry out any response operations within the limits of the area. • In the event that the existing Woodside equipment stockpile at the King Bay Supply Base becomes exhausted, Woodside has an MoU with AMSA and the DoT to provide surplus equipment from their stockpile. Additionally, Woodside is a member of both AMOSC and OSRL and has the ability to call upon their relevant technical advisory services and equipment stockpiles 24/7. This TRP should be considered a draft until it has been verified and tested.

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 only when operational monitoring operations identify a spill heading towards RPA(s) and there is sufficient time for deployment prior to shoreline contact.

6.4.3 Shoreline Protection and Deflection – Control Measure Options Analysis

6.4.3.1 Alternative Control Measures

Alternative Control Measures considered *Alternative control measures, 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 as the RPAs predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event making it impractical to preposition equipment in advance. Equipment is currently available to protect RPAs, however, deployment may be constrained by levels of volatile hydrocarbons arising from a condensate or MGO spill.	The incremental environmental benefit associated with these delivery options is 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, the costs and organisational complexity associated with prepositioning and maintenance of equipment, the sacrifice is considered disproportionate to the 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.	Total cost to preposition protection/ deflection packages at each site of potential impact would be approximately A$6100 per package per day.	This option is not adopted as pre-positioning shoreline protection and deflection capability is not considered practicable due to uncertainty of the sites that may be contacted during a real spill event and the predicted time frames prior to contact. Safety factors have also been considered, including the potential for personnel to be exposed to volatile hydrocarbons in the early stage of the response. Given the rapid natural weathering rate of condensate and MGO, mobilising additional capability is not expected to provide a material net environmental benefit, therefore the current capability is considered to reduce the risk to ALARP.	**No**

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**
Supplemented stockpiles of equipment 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 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.	Total cost for purchase supplemental protection and deflection equipment would be approximately A$455,000 per package.	This option is not adopted as addition shoreline protection and deflection capability is not considered practicable in the time frame prior to contact. Whilst modelling for this activity predicts contact at 8 RPAs within 24-48 hours, it should be noted that this is based upon 200 stochastic model runs thus it is unfeasible for this to all occur from a single release. Safety factors have also been considered, including the potential for personnel to be exposed to volatile hydrocarbons in the early stage of the response. Given the rapid natural weathering rate of condensate and MGO, mobilising additional capability is not expected to provide a material net environmental benefit, therefore the current capability is considered to reduce the risk to ALARP.	**No**
Additional trained personnel	The level of training and competency of the response personnel allows the shoreline protection and deflection operation to be 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 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	Additional specialist personnel would cost A$2000 per person per day.	This option is not adopted as the existing capability meets the need. Safety factors have also been considered, including the potential for personnel to be exposed to volatile hydrocarbons in the early stage of the response. Given the rapid natural weathering rate of condensate and MGO, mobilising additional capability is not expected to provide a material net environmental benefit, therefore the	**No**

		receive a full operational/safety briefing prior to commencing operations.		current capability is considered to reduce the risk to ALARP.	

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	Modelling predicts floating or shoreline accumulation at threshold on day 1 at Dampier Archipelago and Legendre Island (MEE-02b), thus faster response times are not practicable.	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 24-48 hrs of activation. Additional equipment from existing stockpiles and oil spill response service providers can be on scene within days.	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 addition shoreline protection and deflection capability is not considered practicable in the time frames prior to contact. Safety factors have also been considered, including the potential for personnel to be exposed to hydrocarbon gas vapours in the early stage of the response. Given the rapid natural weathering rate of Pluto Condensate, faster mobilisation is not expected to provide a material net environmental benefit, therefore the current capability is considered to reduce the risk to ALARP.	**No**

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
  - none selected
- improved
  - none selected.

6.5 Shoreline Clean-up – ALARP Assessment

Alternative, additional and improved control measure options have been identified and assessed against the base capability described in Section 5. Those that have been selected for implementation are 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.

6.5.1 Existing Capability – Shoreline Clean-up

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 Response planning: Pluto Facility Operations – 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. Woodside's capability can cover all required shoreline clean-up operations for the PAP.

Modelling predicts shoreline contact within 24 hours at Dampier Archipelago (9 m^3) and Legendre Island (6 m^3) for the MEE-02b. No shoreline contact is expected at 100 g/m^2 threshold from any other modelled scenario. The largest volumes ashore are Dampier Archipelago with approximately 9 m^3 predicted within 24 hours. These volumes assume no treatment of floating surface oil by containment and recovery or shoreline protection and deflection prior to contact so are considered very conservative. The full list of RPAs predicted to be contacted by oil above response thresholds are detailed in **Table 3-1**.

These figures have been combined into a single response planning need scenario that provides a worst-case scenario for planning purposes as outlined below. Given all other shoreline contact scenarios identified from modelling are longer time frames and lesser volumes, demonstration of capability against this need will enable Woodside to meet requirements for any other outcome.

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 Dampier to undertake clean-up operations and to manage wastes generated during the response effort. From previous assessment of facilities in Dampier, 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 control measures is summarised in Section 6.5.3.

Table 6-6: 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
	Oil on shoreline (from deterministic modelling) m^3													
	Shoreline accumulation (above 100 g/m^2) - m^3	15	12	0	0	0	0	0	0	0	0	0	0	0
	Oil remaining following response operations - m^3	15	4	5	2	1	0	0	0	0	0	0	0	0
A	**Capability Required (number of operations)**													
A1	SCU operations required (lower)	2	0	0	0	0	0	0	0	0	0	0	0	0
A2	SCU operations required (upper)	2	1	1	0	0	0	0	0	0	0	0	0	0
B	**Capability Available (number of operations)**													
B1	SCU operations available - Stage 2 - Manual (lower)	0	1	3	5	8	12	15	105	105	105	560	560	560
B2	SCU operations available - Stage 2 - Manual (upper)	0	2	5	8	10	15	20	140	140	140	560	560	560
C	**Capability Gap**													
C1	SHC operations gap (lower)	2	-1	-3	-5	-8	-12	-15	-105	-105	-105	-560	-560	-560
C2	SHC operations gap (upper)	2	-1	-4	-8	-10	-15	-20	-140	-140	-140	-560	-560	-560

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 5.5),
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

6.5.3 Shoreline Clean-up – Control measure options analysis

6.5.3.1 Alternative Control Measures

Alternative Control Measures considered *Alternative control measures, including potentially more effective and/or novel control measures are evaluated as replacements for an adopted control*					
Option considered	**Environmental consideration**	**Feasibility**	**Approximate Cost**	**Assessment conclusions**	**Implemented**
No reasonably practical alternative control measures identified					

6.5.3.2 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 allows the shoreline clean-up operation to be 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 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 briefing prior to commencing operations.	Additional specialist personnel would cost A$2000 per person per day.	Larger numbers of additional personnel may also be detrimental to sensitive shoreline areas. Safety factors have also been considered, including the potential for personnel to be exposed to volatile hydrocarbons in the early stage of the response. Given the rapid natural weathering rate of Pluto Condensate, mobilising additional capability is not expected to provide a material net environmental benefit, therefore the current capability is considered to reduce the risk to ALARP.	**No**
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 reduce the risk of 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 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 efficiently clean-up the shoreline. Additional personnel are available through existing contracts with oil spill response organisations, labour hire organisations and environmental panel contractors.	Additional specialist personnel would cost A$2000 per person per day.	Larger numbers of additional personnel may also be detrimental to sensitive shoreline areas. Safety factors have also been considered, including the potential for personnel to be exposed to volatile hydrocarbons in the early stage of the response. Given the rapid natural weathering rate of Pluto Condensate, mobilising additional capability is not expected to provide a material net environmental benefit, therefore the current capability is considered to reduce the risk to ALARP.	**No**

6.5.3.3 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	Modelling predicts floating or shoreline accumulation at threshold within 24 hours at Dampier Archipelago and Legendre Island (MEE-02b), thus faster response times are not practicable.	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	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 additional shoreline clean-up capability is not considered practicable in the time frames prior to contact. Safety factors have also been considered, including the potential for personnel to be exposed to hydrocarbon gas vapours in the early stage of the response. Given the rapid natural weathering rate of Pluto Condensate, faster mobilisation is not expected to	**No**

		response will be available for mobilisation within 24-48 hrs of activation. Additional equipment from existing stockpiles and oil spill response service providers can be on scene within days.		provide a material net environmental benefit, therefore the current capability is considered to reduce the risk to ALARP.	

6.5.4 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.

6.6 Oiled Wildlife Response – ALARP Assessment

Alternative, additional and improved control measure options have been identified and assessed against the base capability described in Section 5. Those that have been selected for implementation are 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.

6.6.1 Existing Capability – Oiled 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.

6.6.2 Oiled Wildlife Response – Control Measure Options Analysis

6.6.2.1 Alternative Control Measures

Alternative Control Measures considered
Alternative control measures, 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**

6.6.2.2 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
Additional wildlife treatment systems	The selected delivery options provide access to call-off contracts with selected specialist providers. The agreements allow these resources to 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 within 48 hours. 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 within 48 hours of the spill and there is no additional environmental benefit in adopting the improvements.	Although hydrocarbon contact above wildlife response threshold concentrations with offshore waters and shorelines is expected from day one(CS-01MEE-02b and CS-05), given the low likelihood of such an event occurring and that the current capability meets the need within 48 hours, thus the cost of implementing measures to reduce the mobilisation time is considered disproportionate to the benefit. Oiled wildlife response capacity would be addressed for open Commonwealth waters through the AMOSC arrangements, as informed by operational monitoring, and under the direction of DBCA in nearshore areas. 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 within 48 hours.	**No**
Additional trained wildlife responders	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.	Current numbers meet the needs required (from day 2) and additional personnel are available through existing contracts with oil spill response organisations and environmental panel contractors. Additional equipment and facilities would be required to support ongoing response, depending on the scale of the event and the impact to wildlife and may be sourced via existing contracts with OSROs. Materials for holding facilities, portable	Additional wildlife response personnel cost A$2000 per person per day	This option is not adopted as the existing capability meets the need from day 2.	**No**

		pools, enclosures and rehabilitation areas would be sourced as required.			

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 mobilisation time for wildlife response	This control measure provides increased effectiveness through faster mobilisation of specialists. Some net environmental benefit is expected if teams could be mobilised by day 1, however, the volatile nature of a spill of condensate or MGO may preclude access on day 1 for response personnel.	Pre-positioning vessels or equipment would reduce mobilisation time for oiled wildlife response activities. However, RPAs predicted to be contacted are based on modelling outputs and thus may differ under the prevailing conditions of a real event.	Wildlife response packages to preposition at vulnerable sites identified through the deterministic modelling cost A$700 per package per day. The cost of having dedicated equipment and personnel available to respond faster is considered disproportionate to the environmental benefit.	This option is not adopted as the existing capability meets the need from day 2.	**No**

6.6.3 Selected control measures

Following review of alternative, additional and improved control measures, the following controls were selected for implementation for the PAP.

- alternative
  - none selected
- additional
  - none selected
- improved
  - none selected.

6.7 Waste Management – ALARP Assessment

Alternative, additional and improved control measure options have been identified and assessed against the base capability described in Section 5. Those that have been selected for implementation are 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.

6.7.1 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.

6.7.2 Waste Management – Control Measure Options Analysis

6.7.2.1 Alternative Control Measures

Alternative Control Measures considered
Alternative control measures, 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					

6.7.2.2 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

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 Woodside's waste service provider'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 AMOSC/ OSRL. Existing arrangements meet identified need for the PAP from day 4 onwards.	Cost for increased waste disposal capability would be approximately A$1300 per m^3. Cost for increased onshore temporary waste storage capability would be approximately A$40 per unit per day.	This option is not adopted as the existing capability meets the need.	**No**

6.7.2.3 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	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.	**No**

	and transport will allow continuous response operations to occur. This delivery option would increase known available storage, eliminating the risk of additional resources not being available at the time of the event. However, the environmental benefit of Woodside procuring additional waste storage is considered minor as the risk of additional storage not being available at the time of the event is considered low and existing arrangements provide adequate storage to support the response.				

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
  - none selected
- improved
  - none selected.

6.8 Scientific Monitoring – ALARP Assessment

Alternative, additional and improved control measure options have been identified and assessed against the base capability described in Section 5. Those that have been selected for implementation are 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.

6.8.1 Existing Capability – Scientific Monitoring

Woodside's existing level of capability is based on internal and third-party resources that are available 24 hours, 7 days per week. The capability presented below is displayed as ranges to incorporate operational factors such as weather, crew/ vessel/ aircraft/ vehicle location and duties, survey or classification society inspection requirements, overflight/ port/ quarantine permits and inspections, crew/ pilot duty and fatigue hours, refuelling/ re-stocking provisions, and other similar logistic and operational limitation that are beyond Woodside's direct control.

6.8.2 Scientific Monitoring – Control Measure Options Analysis

6.8.2.1 Alternative Control Measures

Alternative Control Measures considered
Alternative control measures, 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
Analytical laboratory facilities closer to the likely spill affected area	The environmental consideration of having access to suitable laboratory facilities in 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).	SM01 water quality monitoring requires water samples to be transported to NATA-rated laboratories in Perth or over to the East coast. Consider the benefit of laboratory access and transportation times to deliver water samples and complete lab analysis. There is a time lag from collection of water samples to being in receipt of results and confirming hydrocarbon contact to sensitive receptors.	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.	This control measure is not adopted as the costs and complexity are considered disproportionate to any environmental benefit that might be realised.	**No**
Dedicated contracted SMP vessel (exclusive to Woodside)	Would provide faster mobilisation time of scientific monitoring resources, however, the 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 cost and organisational complexity of employing a dedicated response vessel is considered disproportionate to the potential environmental benefit by adopting these delivery options.	This control measure is not adopted as the costs and complexity are considered disproportionate to any environmental benefit that might be realised.	**No**

6.8.2.2 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
Determine baseline data needs and provide implementation plan in the event of an unplanned hydrocarbon release	Address resourcing needs to collect post spill (pre-contact) baseline data as spill expands in the event of a loss of containment from a vessel collision from the PAP activities.	As part of Woodside's Scientific Monitoring Program, the following are considered and incorporated into the spill response approach and the SMP Standby Service contract: • 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 well control from the PAP activities based on receptors predicted to have hydrocarbon contact >10 days. • It provide appropriate baseline for key receptors for all geographic locations that are potentially impacted <10 days of spill event. • It addresses resourcing needs to collect pre-emptive baseline as spill expands in the event	No cost associated with baseline for SM01.	This control measure is adopted as the costs and complexity are not disproportionate to any environmental benefit that might be realised.	**Yes**

		of a condensate or MGO from the PAP activities. • For SM01 pre-emptive baseline is not required as marine water quality is assumed to be pristine.			

6.8.2.3 Improved Control Measures considered

Improved Control Measures considered *Improved control measures, 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 improved control measures identified					

6.8.3 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 provide implementation plan in the event of an unplanned hydrocarbon release
- improved
  - none selected.

6.8.4 Operational Plan

Key actions from the Scientific Monitoring Program Operational Plan for implementing the response are outlined in **Table 6-7**.

Table 6-7: Scientific monitoring program operational plan actions

Responsibility	Action
Activation	
CIMT Planning (CIMT Planning – Environment Unit)	Mobilises SMP Lead/Manager and SMP Coordinator to the CIMT Planning Section.
CIMT Planning (CIMT Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	Constantly assesses all outputs from OM01, OM02 and OM03 (**Annex B**) to determine receptor locations and receptors at risk. Confirm sensitive receptors likely to be exposed to hydrocarbons, timeframes to specific receptor locations and which SMPs are triggered. Review baseline data for receptors at risk.
CIMT Planning (CIMT Planning – Environment Unit) (SMP Lead/Manager and SMP Coordinator)	SMP co-ordinator stands up SMP Standby contractor. Stands up subject matter experts, if required.
CIMT Planning (CIMT Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Establish if, and where, pre-contact baseline data acquisition is required. Determines practicable baseline acquisition program based on predicted timescales to contact and anticipated SMP mobilisation times. Determines scope for preliminary post-contact surveys during the Response Phase. Determines which SMP activities are required at each location based on the identified receptor sensitivities.
CIMT Planning (CIMT Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	If response phase data acquisition is required, stand up the contractor SMP teams for data acquisition and instruct them to standby awaiting further details for mobilisation from the CIMT.
CIMT Planning (CIMT Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	SMP standby contractor, to prepare the Field Implementation Plan. Prepare and obtain sign-off of the Response Phase SMP work plan and Field Implementation Plan. Update the IAP.
CIMT Planning (CIMT Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Liaise with CIMT Logistics, and determine the status and availability of aircraft, vessels and road transportation available to transport survey personnel and equipment to point of departure. Engage with SMP standby contractor, SMP Manager and CIMT Logistics Section 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

Responsibility	Action
	• land based operational centres and forward operations bases, accommodation and food requirements.
CIMT Planning (CIMT Planning – Environment Unit) (SMP Lead/Manager, SMP Coordinator, SMP Standby contractor)	Confirm communications procedures between Woodside SMP team, SMP standby contractor, SMP Team Leads and Operations Point Coordinator.
Mobilisation	
CIMT Logistics	Engage vessels and vehicles and arrange fitting out as specified by the mobilisation plan. Confirm vessel departure windows and communicate with the Service Provider's SMP Manager. Agree SMP mobilisation timeline and induction procedures with the Division and Sector Command Point(s).
CIMT Logistics	Coordinate with SMP standby contractor to mobilise teams and equipment according to the logistics plan and Sector Induction procedures.
SMP Survey Team Leads	SMP Survey Team Leader(s) coordinate on-ground/on-vessel mobilisations and support services with the Sector Command point(s).

6.8.5 ALARP and Acceptability Summary

ALARP and Acceptability Summary		
Scientific Monitoring		
ALARP Summary	X	All known reasonably practicable control measures have been adopted.
	X	No additional, alternative and improved control measures would provide further benefit.
		No reasonably practical additional, alternative, and/or improved control measure exists.
	The resulting scientific monitoring capability has been assessed against the credible spill scenarios. The range of techniques provide an ongoing approach to monitoring operations to assess and evaluate the scale and extent of impacts. All known reasonably practicable control measures have been adopted with the cost and organisational complexity of these options determined to be moderate and the overall delivery effectiveness considered medium. The SMP's main objectives can be met, with the addition of one alternative control measures to provide further benefit.	
Acceptability Summary	• 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. • Scientific Monitoring control and activities are compliant with relevant environmental legislation and regulations, including the EPBC Act. • Throughout the PAP, relevant Australian standards and codes of practice will be followed to evaluate the impacts from a loss of well control. • Consultation undertaken for the PAP did not receive feedback regarding concerns for Scientific Monitoring activities in response to a hydrocarbon spill. • 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 credible case scenarios, and uncertainty has not been used as a reason for postponing control measures.	
On the basis from the impact assessment above and in Section 6.8 of the EP, Woodside considers the adopted controls discussed manage the impacts and risks associated with implementing scientific monitoring activities to a level that is ALARP and acceptable.		

7 ENVIRONMENTAL RISK ASSESSMENT OF SELECTED RESPONSE TECHNIQUES

The implementation of response techniques may modify the impacts and risks identified in the EP and response activities can introduce additional impacts and risks from response operations themselves. Therefore, it is necessary to complete an assessment so these impacts and risks have been considered and specific measures are put in place to continually review and manage further impacts and risks to ALARP and an acceptable level. 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. Please refer to the EP for details regarding how these risks are being managed as they are not discussed further in this document. These risks include:

- atmospheric emissions
- routine and non-routine discharges
- physical presence, proximity to other vessels (shipping and fisheries)
- routine acoustic emissions vessels
- lighting for night work/navigational safety
- invasive marine species
- collision with marine fauna
- disturbance to seabed.

Additional impacts and risks associated with the control measures not included within the scope of the EP include:

- drill cuttings and drilling fluids environmental impact assessment for relief well drilling
- vessel operations and anchoring
- 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 and Groundwater	Marine Sediment Quality	Water Quality	Air Quality	Ecosystems/ Habitat	Species	Socio-Economic
Operational monitoring	✓		✓	✓		✓	
Source control		✓	✓	✓	✓		
Shoreline protection and deflection	✓	✓			✓	✓	✓
Shoreline clean-up	✓	✓			✓	✓	✓
Oiled wildlife				✓	✓	✓	
Scientific monitoring	✓	✓	✓	✓			
Waste management	✓	✓	✓				✓

7.3 Evaluation of impacts and risks from implementing response techniques

Drill cuttings and drilling fluids environmental impact assessment for relief well drilling

The identified potential impacts associated with the discharge of drill cuttings and fluids during a relief well drilling activity include a localised reduction in water and seabed sediment quality, and potential localised changes to benthic biota (habitats and communities).

Direct and indirect ecological impact pathways are identified for drill cuttings and drilling fluids as follows:

- temporary increase in total suspended solids (TSS) in the water column;
- attenuation of light penetration as an indirect consequence of the elevation of TSS and the rate of sedimentation;
- sediment deposition to the seabed leading to the alteration of the physio-chemical composition of sediments, and burial and potential smothering effects to sessile benthic biota; and
- potential contamination and toxicity effects to benthic and in-water biota from drilling fluids.

Potential impacts from the discharge of cuttings range from the complete burial of benthic biota in the immediate vicinity of the well site due to sediment deposition, smothering effects from raised sedimentation concentrations as a result of elevated TSS, changes to the physico-chemical properties of the seabed sediments (particle size distribution and potential for reduction in oxygen levels within the surface sediments due to organic matter degradation by aerobic bacteria) and subsequent changes to the composition of infauna communities to minor sediment loading above background and no associated ecological effects. Predicted impacts are generally confined to within a few hundred metres of the discharge point (International Association of Oil and Gas Producers 2016) (i.e. within the EMBA for a hydrocarbon spill event).

The discharge of drill cuttings and unrecoverable fluids from relief well drilling is expected to increase turbidity and TSS levels in the water column, leading to an increased sedimentation rate above ambient levels associated with the settlement of suspended sediment particles near to the seabed or below sea surface, depending on location of discharge. Cuttings with retained (unrecoverable) drilling fluids are discharged below the water line at the MODU location, resulting in drill cuttings and drilling fluids rapidly diluting, as they disperse and settle through the water column. The dispersion and fate of the cuttings is determined by particle size and density of the retained (unrecoverable) drilling fluids, therefore, the sediment particles will primarily settle in proximity to the well locations with potential for localised spread downstream (depending on the speed of currents throughout the water column and seabed) (IOGP

2016). The finer particles will remain in suspension and will be transported further before settling on the seabed.

These conclusions were supported by discharge modelling which was undertaken by Woodside in support of the Greater Enfield Development EP. Modelling results indicating that the TSS plume of suspended cuttings will typically disperse to the south-west while oscillating with the tide and diminish rapidly with increasing distance from the well locations. Maximum TSS concentrations predicted for 100 m; 250 m and 1 km distances from the wellsite were 7, 5 and 1 mg/L, respectively. Furthermore, water column concentrations below 10 mg/L remain within 235 m of the discharge location for each modelled well. For all well discharge locations (outside of direct discharge sites), TSS concentration did not exceed 10 mg/l. Nelson et al. (2016) identified <10 mg/L as a no effect or sub-lethal minimal effect concentration.

The low sensitivity of the deep-water benthic communities/habitats within and in the vicinity of relief well locations, combined with the relatively low toxicity of water based muds (WBM) and non-water based muds (NWBMs), there being no bulk discharges of NWBM and the highly localised nature and scale of predicted physical impacts to seabed biota indicate that any localised impact would likely be of a slight magnitude (especially when considering the broader consequence of the LOWC event that a relief well drilling activity would be responding too).

Vessel operations and anchoring

Typical booms used in shoreline protection and deflection 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 protection and deflection, and 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)
- 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), collected during shoreline clean-up and oiled wildlife response operations
- semi-solids/solids (oily solids), collected during shoreline clean-up and oiled wildlife response operations
- debris (e.g. seaweed, sand, woods, plastics), collected during shoreline clean-up and oiled wildlife response operations.

If not managed and disposed of correctly, wastes generated during the response have the potential for secondary contamination of previously uncontaminated areas and/ or 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 manage and mitigate further injury and the removal of water proofing feathers. Finally, during the release phase it is 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 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) 14.1, PS 17.1).
- Shallow draft vessels will be used to access remote shorelines to minimise the impacts associated with seabed disturbance on approach to the shorelines (PS 14.2, PS 17.2).

Presence of personnel on the shoreline

- Oversight by trained personnel who are aware of the risks (PS 17.6).
- Trained unit leader’s brief personnel of the risks prior to operations (PS 17.7).

Human Presence

- Shoreline access route (foot, car, vessel and helicopter) with the least environmental impact identified will be selected by a specialist in SCAT operations (PS 7.3, PS 17.5).
- Vehicular access will be restricted on dunes, turtle nesting beaches and in mangroves (PS 17.3).

Waste generation

- All shoreline clean-up sites will be zoned and marked before clean-up operations commence to prevent secondary contamination and minimise the mixing of clean and oiled sediment and shoreline substrates (PS 15.4).
- Removal of vegetation will be limited to moderately or heavily oiled vegetation (PS 17.4).
- Teams will segregate liquid and solid wastes at the earliest opportunity (PS 23.1).

Additional stress or injury caused to wildlife

- Oiled wildlife operations (including hazing) would be implemented with advice and assistance from the Oiled Wildlife Advisor from the DBCA, and in accordance with the processes and methodologies described in the WA OWRP and the relevant regional plan (PS 21.1).

8 ALARP CONCLUSION

An analysis of alternative, additional and improved control measures has been undertaken to determine their reasonableness and practicability. The tables in Section 6 document the considerations made in this evaluation. Where the costs of an alternative, additional, or improved control measure have been determined to be 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 the following criteria:

- Techniques are consistent with Woodside's processes and relevant internal requirements including policies, culture, processes, standards, structures and systems.
- Levels of risk/impact are deemed acceptable by relevant persons/organisations and are aligned with the uniqueness of, and/or the level of protection assigned to the environment, its sensitivity to pressures introduced by the activity, and the proximity of activities to sensitive receptors, and have been aligned with Part 3 of the EPBC Act.
- Selected control measures meet requirements of legislation and conventions to which Australia is a signatory (e.g. 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 an acceptable level. 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 GLOSSARY AND ABBREVIATIONS

10.1 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 can perform 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 its 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 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 so they reduce risk to ALARP. A statement of the key requirements (indicators) that the control measure must achieve to perform as intended in relation to its functionality, availability, reliability, survivability and dependencies.
Preparedness	Measures taken before an incident to improve the effectiveness of a response
Reasonably practicable	... a computation ... made by the owner, in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) [showing whether or not] that there is a gross disproportion between them ... made by the owner at a point of time anterior to the accident. (Judgement: Edwards v National Coal Board [1949])
Receptors at risk	Physical, biological and social resources identified as at risk from hydrocarbon contact using oil spill modelling predictions.
Receptor areas	Geographically referenced areas such as bays, islands, coastlines and/or protected area (WHA, Commonwealth or State marine reserve or park) containing one or more receptor type

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	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.

10.2 Abbreviations

Abbreviation	Meaning
ADIOS	Automated Data Inquiry for Oil Spills
AEP	Australian Energy Producers (formerly APPEA)
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
AUV	Autonomous Underwater Vehicle
BAOAC	Bonn Agreement Oil Appearance Code
BOP	Blowout Preventer
cSt	Centistokes
CIMT	Corporate Incident Management Team
DM	Duty Manager
DoT	Western Australia Department of Transport
DBCA	Western Australia Department of Biodiversity, Conservation and Attractions
DWER	Western Australia Department of Water and Environmental Regulation
EMBA	Environment that May Be Affected
EMSA	European Maritime Safety Agency
EP	Environment Plan
Environment Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023
ESI	Environmental Sensitivity Index
ESD	Emergency Shut Down
ESP	Environmental Services Panel
FPSO	Floating Production Storage Offloading
FSP	First Strike Plan
FST	Functional Support Team
GIS	Geographic Information System
GPS	Global Positioning System
HSP	Hydrocarbon Spill Preparedness
IAP	Incident Action Plan
IC	Incident Commander
ICS	Incident Command System
IMS	Incident Management System
IMT	Incident Management Team
IPIECA	International Petroleum Industry Environment Conservation Association
ITOPF	International Tanker Owners Pollution Federation
IUCN	International Union for Conservation of Nature
KBSF	King Bay Supply Facility
KSAT	Kongsberg Satellite

Abbreviation	Meaning
LOWC	Loss of Well Containment
MODU	Mobile Offshore Drilling Unit
MoU	Memorandum of Understanding
NEBA	Net Environmental Benefit Analysis
NOAA	National Oceanic and Atmospheric Administration
NRT	National Response Team
OILMAP	Oil Spill Model and Response System
OMP	Operational Monitoring Program
OPEA	Oil Pollution Emergency Arrangements
OPEP	Oil Pollution Emergency Plan
OPGGSA	Offshore Petroleum and Greenhouse Gas Storage Act
OSRL	Oil Spill Response Limited
OSTM	Oil Spill Trajectory Modelling
OWR	Oiled Wildlife Response
OWRP	Oiled Wildlife Response Plan
PAP	Petroleum Activities Program
PEARL	People, Environment, Asset, Reputation, and Livelihood
PBA	Pre-emptive Baseline Areas
PPB	Parts per billion
PPM	Parts per million
ROV	Remotely Operated Vehicle(s)
RPA	Response Protection Area
SCAT	Shoreline Contamination Assessment Techniques
S&EM	Security and Emergency Management
SIMA	Spill Impact Mitigation Assessment
SIMAP	Integrated Oil Spill Impact Model System
SSDI	Subsea Dispersant Injection
SFRT	Subsea First Response Toolkit
SMP	Scientific monitoring program
SOP	Standard Operating Procedure
TRP	Tactical Response Plan
UAS	Unmanned Aerial Systems
UAV	Unmanned Aerial Vehicles
VOC	Volatile Organic Compound
WHA	World Heritage Area
Woodside	Woodside Energy Limited
WCC	Woodside Communication Centre
WWCI	Wild Well Control Inc
WCCS	Worst Case Credible Scenario
ZoA	Zone of Application

11 REFERENCES

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 2018. Australian & New Zealand Guidelines for Fresh & Marine Water Quality Management Framework. https://www.waterquality.gov.au/anz-guidelines

Australian Maritime Safety Authority. The National Plan Oil Spill Control Agents List. Available from: https://www.amsa.gov.au/marine-environment/pollution-response/register-oil-spill-control-agents [Accessed 24 March 2024]

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 24 March 2024]

Australasian Fire and Emergency Service Authorities Council, 2011, Fundamentals of Doctrine: A best practice guide, East Melbourne, VIC, AFAC Limited.

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.

BSEE, 2016. https://www.bsee.gov/site-page/worst-case-discharge-scenarios-for-oil-and-gas-offshore-facilities-and-oil-spill-response. [Accessed 24 March 2024]

BSEE, 2016. https://www.bsee.gov/what-we-do/oil-spill-preparedness/response-system-planning-calculators. [Accessed 24 March 2024]

Department of Biodiversity, Conservation and Attractions, Department of Transport and Australian Marine Oil Spill Centre, 2022a. Western Australia Oiled Wildlife Response Plan for Maritime Environmental Emergencies. Available at: https://www.dbca.wa.gov.au/media/1887/download. [Accessed 24 March 2024]

Department of Biodiversity, Conservation and Attractions, Department of Transport and Australian Marine Oil Spill Centre, 2022b. Western Australia Oiled Wildlife Response Manual. Available at: https://www.dbca.wa.gov.au/media/1886/download. [Accessed 24 March 2024]

Edwards v National Coal Board, 1949. 1 All ER 743 CA

European Maritime Safety Agency, 2012. Manual on the Applicability of Oil Spill Dispersants, Version 2, p.57.

Fingas, M. 2001. The Basics of Oil Spill Cleanup. 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 Cleanup*, edited by M. Fingas. Elsevier, Inc.

Fingas, M. 2011b. Weather Effects on Oil Spill Countermeasures. *Oil Spill Science and Technology: Prevention, Response, and Cleanup*, edited by M. Fingas. Elsevier, Inc.

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. [Accessed 24 March 2024]

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

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.

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

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. 2022. ALARP, Guidance Note N-04300-GN0166, Perth, WA.

National Offshore Petroleum Safety and Environmental Management Authority. 2021. Oil Pollution Risk Management, Guidance Note N-04750-GN1488, Perth, WA.

National Offshore Petroleum Safety and Environmental Management Authority. 2016. Vessels Subject to the Australian Offshore Petroleum Safety Legislation, Guidance Note N-09000-GN1661, 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 https://cordc.ucsd.edu/projects/ospr/20070509/PECI_Rpt_20070509_final.pdf.[Accessed 24 March 2024]

Quigg, A., Farrington, J., Gilbert, S., Murawski, S., and John, V. (2021). A Decade of GoMRI Dispersant Science: Lessons Learned and Recommendations for the Future. *Oceanography*, Vol.34, No.1

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

Spence, A, McTaggart, A (2018) Defining response capability: effectiveness, limitations and determining ALARP. Interspill Conference, London 2018.

Wadsworth, T, 1995, Containment & Recovery of Oil Spills at Sea. Methods and limitations, ITOPF, London, United Kingdom.

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 loss of containment of Pluto condensate from the export pipeline (MEE-02b). The complete list of potential receptor locations within the EMBA within the PAP is included in Section 6 of the EP.

The locations utilised for the NEBA were limited to the identified RPAs of the PAP identified from modelling (see Section 3 for outline of selection). These include receptors which have potential for the following:

- Surface contact (>50 g/m^2)
- Shoreline accumulation (>100 g/m^2) at any time
- Entrained contact (>100 ppb) within 14 days

The detailed NEBA assessment outcomes are shown below. The Pluto Facility Operations preoperational NEBAs contains the full assessments.

Table A-1: NEBA assessment technique recommendations for loss of containment of Pluto condensate from the export pipeline (MEE-02b)

Receptor	Operational Monitoring	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	Well control and intervention
Cape Bruguieres	Yes	No	No	No	Yes	Yes	Potentially	Potentially	Yes	No	No	No
Dampier Archipelago	Yes	No	No	No	Yes	Yes	No	Potentially	Yes	No	No	No
Cohen Island	Yes	No	No	No	Yes	Yes	No	Potentially	Yes	No	No	No
Keast Island	Yes	No	No	No	Yes	Yes	No	Potentially	Yes	No	No	No
Legendre Island	Yes	No	No	No	Yes	Yes	No	Potentially	Yes	No	No	No
Rosemary Island	Yes	No	No	No	Yes	Yes	No	Potentially	Yes	No	No	No
Courtenay Shoal	Yes	No	No	No	No	No	No	No	Yes	No	No	No
Hammersley Shoal	Yes	No	No	No	No	No	No	No	Yes	No	No	No
Madeleine Shoal	Yes	No	No	No	No	No	No	No	Yes	No	No	No

Overall assessment

Sensitive receptor (sites identified in EP)	Operational Monitoring	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	Well control and intervention
Is this response Practicable?	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No
NEBA identifies response potentially of net environmental benefit?	Yes	No	No	No	Yes	Yes	Potentially	Potentially	Yes	No	No	No

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[7]	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))

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[7] NOTE: the maximum likely impact should be considered; for example, if a spill were to directly impact the behaviour that results in an impact to reproduction and/or the breeding population (such as fish failing to aggregate to spawn), then the score should be a 2 or 3 rather than a 1. Similarly, if a change in behaviour resulted in an increased risk of mortality of a population, then it should be scored as a 2 or 3

ANNEX B: OPERATIONAL MONITORING ACTIVATION AND TERMINATION CRITERIA

Table B-1: Operational monitoring objectives, triggers and termination criteria

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan – 01 (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 to reduce risks to ALARP	OM01 will be triggered immediately following a level 2/3 hydrocarbon spill.	The criteria for the termination of OM01 are: • The hydrocarbon discharge has ceased and no further surface oil is visible • Response activities have ceased • Hydrocarbon spill modelling (as verified by OM02 surveillance observations) predicts no additional natural resources will be impacted

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan – 02 (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 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 – 03 (OM03) Monitoring of hydrocarbon presence, properties, behaviour and weathering in water	OM03 will measure surface, entrained and dissolved hydrocarbons in the water column to inform decision-making for spill response activities. The specific objectives of OM03 are as follows: • Detect and monitor for the presence, quantity, properties, behaviour and weathering of surface, entrained and dissolved hydrocarbons. • Verify predictions made by OM01 and observations made by OM02 about the presence and extent of hydrocarbon contamination. Data collected in OM03 will also be used for the purpose of longer-term water quality monitoring during SM01.	OM03 will be triggered immediately following a level 2/3 hydrocarbon spill.	The criteria for the termination of OM03 are as follows: • The hydrocarbon release has ceased. • Response activities have ceased. • Concentrations of hydrocarbons in the water are below available ANZECC/ ARMCANZ (2018) trigger values for 99% species protection.

Operational Monitoring Operational Plan	Objectives	Activation triggers	Termination criteria
Operational Monitoring Operational Plan – 04 (OM04) Pre-emptive assessment of sensitive receptors at risk	OM04 aims to undertake a rapid assessment of the presence, extent and current status of shoreline sensitive receptors prior to contact from the hydrocarbon spill, by providing categorical or semi-quantitative information on the characteristics of resources at risk. The primary objective of OM04 is to confirm understanding of the status and characteristics of environmental resources predicted by OM01 and OM02 to be at risk, to further assist in making decisions on the selection of appropriate response actions and prioritisation of resources. Indirectly, qualitative/semi-quantitative pre-contact information collected by OM04 on the status of environmental resources may also aid in the verification of environmental baseline data and provide context for the assessment of environmental impacts, as determined through subsequent SMPs. OM04 would be undertaken in liaison with WA DoT as the control agency once the oil is in State Waters (if a Level 2/3 incident).	Triggers for commencing OM04 include: • Contact of a sensitive habitat or shoreline is predicted by OM01, OM02 and/or OM03. • The pre-emptive assessment methods can be implemented before contact from hydrocarbons (once a receptor has been contacted by hydrocarbons it will be assessed under OM05).	The criteria for the termination of OM04 at any given location are: • Locations predicted to be contacted by hydrocarbons have been contacted. • The location has not been contacted by hydrocarbons and is no longer predicted to be contacted by hydrocarbons (resources should be reallocated as appropriate).
Operational monitoring operational plan – 05 (OM05) Monitoring of contaminated resources	OM05 aims to implement surveys to assess the condition of wildlife and habitats contacted by hydrocarbons at sensitive habitat and shoreline locations. The primary objectives of OM05 are: • Record evidence of oiled wildlife (mortalities, sub-lethal impacts, number, extent, location) and habitats (mortalities, sub-lethal impacts, type, extent of cover, area, hydrocarbon character, thickness, mass and content) throughout the response and clean-up at locations contacted by hydrocarbons to inform and prioritise clean-up efforts and resources, while minimising the potential impacts of these activities. Indirectly, the information collected by OM05 may also support the assessment of environmental impacts, as determined through subsequent SMPs. OM05 would be undertaken in liaison with WA DoT as the control agency once the oil is in State Waters (if a Level 2/3 incident).	OM05 will be triggered when a sensitive habitat or shoreline is predicted to be contacted by hydrocarbons by OM01, OM02 and/or OM03.	The criteria for the termination of OM05 at any given location are: • No additional response or clean-up of wildlife or habitats is predicted. • Spill response and clean-up activities have ceased. OM05 survey sites established at sensitive habitat and shoreline locations will continue to be monitored during SM02. The formal transition from OM05 to SM02 will begin on cessation of spill response and clean-up activities.

ANNEX C: OIL SPILL SCIENTIFIC MONITORING PROGRAM

Oil spill environmental monitoring

The following provides some further detail on Woodside's oil spill scientific monitoring Program and includes the following:

- The organisation, roles and responsibilities of the Woodside oil spill scientific monitoring team and external resourcing.
- A summary table of the ten scientific monitoring programs as per the specific focus receptor, objectives, activation triggers and termination criteria.
- Details on the oil spill environmental monitoring activation and termination decision-making processes.
- Baseline knowledge and environmental studies knowledge access via geo-spatial metadata databases.
- An outline of the reporting requirements for oil spill scientific monitoring programs.

Oil Spill Scientific Monitoring – Delivery Team Roles and Responsibilities

Woodside Oil Spill Scientific Monitoring Delivery Team

The Woodside science team are responsible for the delivery of the oil spill scientific monitoring. The roles and responsibilities of the Woodside scientific monitoring delivery team are presented in Table C-1 and the organisational structure and Corporate Incident Management Team (CIMT) linkage provided in Figure C-1.

Woodside Oil Spill Scientific monitoring program – External Resourcing

In the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors, scientific monitoring personnel and scientific equipment to implement the appropriate SMPs will be provided by SMP Standby contractor who hold a standby contract for SMP via the Woodside Environmental Services Panel (ESP). If additional resources are required other consultancy capacity within the Woodside ESP will be utilised (as needed and may extend to specialist contractors such as research agencies engaged in long-term marine monitoring programs). In consultation with the SMP Standby Contractor and/or specialist contractors, the selection, field sampling and approach of the SMPs will be determined by the nature and scale of the spill.

Table C-1: Woodside and Environmental Service Provider – Oil Spill Scientific Monitoring Program Delivery Team Key Roles and Responsibilities

Role	Location	Responsibility
Woodside Roles		
SMP Lead/Manager	Onshore	• Approves the SMPs activated based on operational monitoring data provided by the Planning Section • Provides advice to the CIMT in relation to scientific monitoring • Provides technical advice regarding the implementation of scientific monitoring • Approves detailed sampling plans prepared for SMPs • Directs liaison between statutory authorities, advisors and government agencies in relation to SMPs.
SMP Co-Ordinator	Onshore	• Activates the SMPs based on operational monitoring data provided by the Planning Section • Sits in the Planning Section of the CIMT. • Liaises with other CIMT Sections to deliver required logistics, resources and operational support from Woodside to support the Environmental Service Provider in delivering on the SMPs. Acts as the conduit for advice from the SMP Lead/Manager to the Environmental Service Provider • Manages the Environmental Service Provider's implementation of the SMPs • Liaises with the Environmental Service Provider on delivery of the SMPs • Arranges all contractual matters, on behalf of Woodside, associated with the Environmental Service Provider's delivery of the SMPs.
Environmental Service Provider Roles		
SMP Standby Contractor – SMP Duty Manager/Project Manager (SMP Liaison Officer)	Onshore	• Coordinates the delivery of the SMPs • Provides costings, schedule and progress updates for delivery of SMPs • Determines the structure of the Environmental Service Provider's team to necessitate delivery of the SMPs • Verifies that HSE Plans, detailed sampling plans and other relevant deliverables are developed and implemented for delivery of the SMPs • Directs field teams to deliver SMPs • Arranges all contractual matters, on behalf of Environmental Service Provider, associated with the delivery of the SMPs to Woodside • Manages sub-consultant delivery to Woodside • Provides required personnel and equipment to deliver the SMPs.
SMP Field Teams	Offshore – Monitoring Locations	• Delivers the SMPs in the field consistent with the detailed sampling plans and HSE requirements, within time and budget. • Early communication of time, budget, HSE risks associated with delivery of the SMPs to the Environmental Service Provider – Project Manager • Provides start up, progress and termination updates to the Environmental Service Provider – Project Manager (will be led in-field by a party chief).

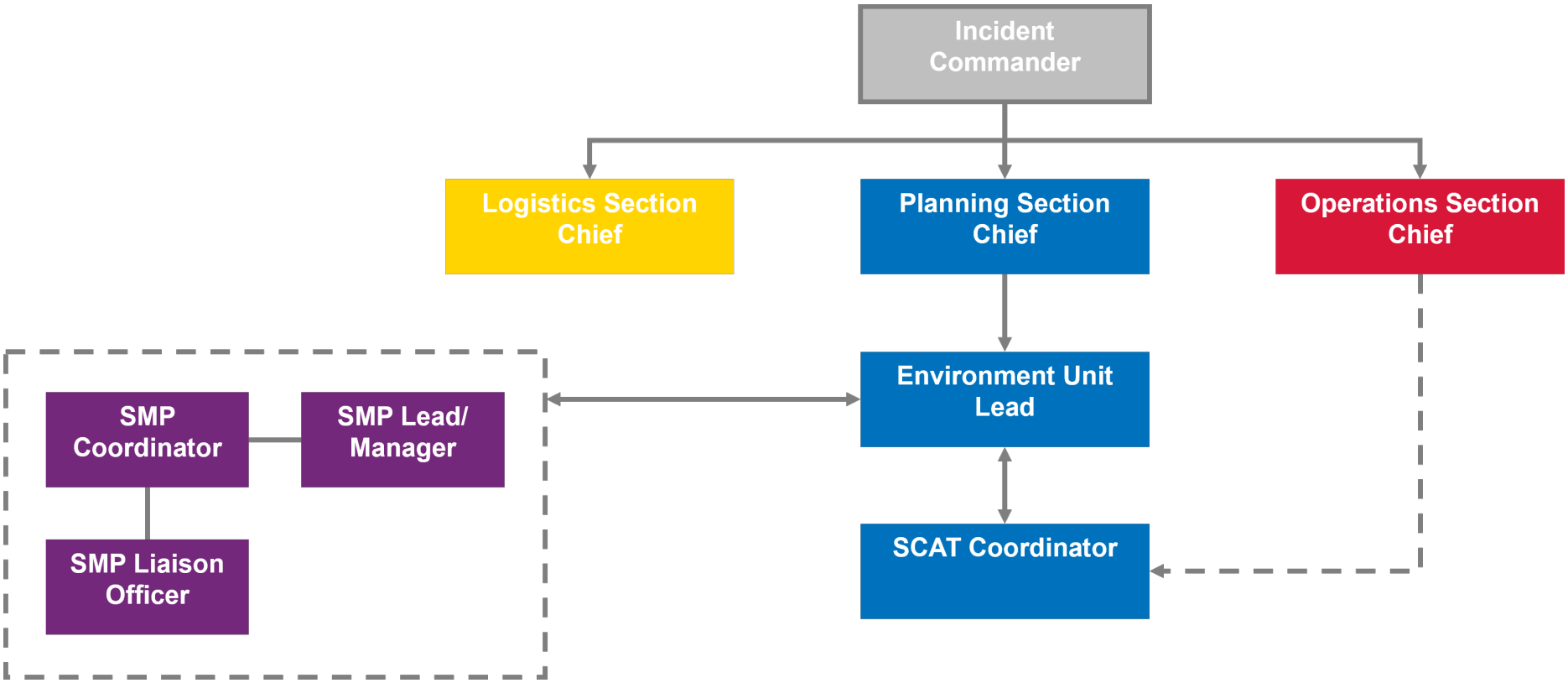


Figure C-1: Woodside Oil Spill Scientific Monitoring Program Delivery Team and Linkage to Corporate Incident Management Team (CIMT) organisational structure

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 (20198) concentrations of 1 g/m2 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/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² 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 (20139) 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/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² 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 persons/ organisations 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	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.

[8] NOPSEMA (2019) Bulletin #1 – Oil spill modelling – April 2019, https://www.nopsema.gov.au/assets/Bulletins/A652993.pdf
[9] 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
	• 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.	• Operational monitoring identified shoreline potential contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) for mangrove/saltmarsh habitat.	• Agreement with relevant persons/ organisations and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 5 (SM05) **Assessment of Impacts and Recovery of Seabird and Shorebird Populations**	The Objectives of SM05 are to: • Collate and quantify impacts to avian wildlife from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population level; and • Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to seabirds and shorebird populations at targeted breeding colonies / staging sites / important coastal wetlands where hydrocarbon contact was recorded.	SM05 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented as follows: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; • Operational monitoring predicts shoreline contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at important bird colonies / staging sites / important coastal wetland locations; or • Records of dead, oiled or injured bird species made during the hydrocarbon spill or response.	SM05 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to seabird and shorebird populations from hydrocarbon exposure have been quantified. • Recovery of impacted seabird and shorebird populations has been evaluated. • Agreement with relevant persons/ organisations and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 6 (SM06) **Assessment of Impacts and Recovery of Nesting Marine Turtle Populations**	The objectives of SM06 are to: • To quantify impacts of hydrocarbon exposure or contact on marine turtle nesting populations (including impacts associated with the implementation of response options); • Collate and quantify impacts to adult and hatchling marine turtles from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels (including impacts associated with the implementation of response options); .and • Undertake monitoring to quantify and assess impacts of hydrocarbon exposure to nesting marine turtle populations at known rookeries (including impacts associated with the implementation of response options).	SM06 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; • Predicted shoreline contact of hydrocarbons (at or above 0.5 g/m² surface, 5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at known marine turtle rookery locations; or • Records of dead, oiled or injured marine turtle species made during the hydrocarbon spill or response.	SM06 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to nesting marine turtle populations from hydrocarbon exposure have been quantified. • Recovery of impacted nesting marine turtle populations has been evaluated. • Agreement with relevant persons/ organisations and regulators based on the nature and scale of the hydrocarbon spill impacts and/or that observed impacts can no longer be attributed to the spill.
Scientific monitoring program 7 (SM07) **Assessment of Impacts to Pinniped Colonies including Haul-out Site Populations**	The objectives of SM07 are to: • Quantify impacts on pinniped colonies and haul-out sites as a result of hydrocarbon exposure/contact. • Collate and quantify impacts to pinniped populations from results recorded during OM02 and OM05 (such as mortalities, oiling, rescue and release counts) and undertake a desk-based assessment to infer potential impacts at species population levels.	SM07 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring has: • As part of a pre-emptive assessment of receptor locations identified by time to hydrocarbon contact >10 days; • Identified shoreline contact of hydrocarbons ((at or above 0.5 g/m² surface, ≥5 ppb for entrained/dissolved hydrocarbons and ≥1 g/m² for shoreline accumulation) at known pinniped colony or haul-out site(s) (i.e. most northern site is the Houtman Abrolhos Islands); or • Records of dead, oiled or injured pinniped species made during the hydrocarbon spill or response.	SM07 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Impacts to pinniped populations from hydrocarbon exposure have been quantified. • Recovery of pinniped populations has been evaluated. • Agreement with relevant persons/ organisations 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;	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.

Scientific monitoring Program (SMP)	Objectives	Activation Triggers	Termination Criteria
	• 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.		• Agreement with relevant persons/ organisations 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) **Assessment of Impacts and Recovery of Marine Fish associated with SM03 habitats**	The objectives of SM09 are: • Characterise the status of resident fish populations associated with habitats monitored in SM03 exposed/contacted by spilled hydrocarbons; • Quantify any impacts to species (abundance, richness and density) and resident fish population structure (representative functional trophic groups); and • Determine and monitor the impact of the hydrocarbon spill and potential subsequent recovery (including impacts associated with the implementation of response options).	SM09 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented with SM03.	SM09 will be undertaken and terminated concurrent with monitoring undertaken for SM03, as per the SMP termination criteria process • Agreement with relevant persons/ organisations 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) • PAH Biliary Metabolites • Oxidative DNA Damage • Serum SDH • Other physiological parameters, such as condition factor (CF), liver somatic index (LSI), gonado-somatic index (GSI) and gonad histology, total weight, length, condition, parasites, egg development, testes development, abnormalities. • Seafood tainting may be included (where appropriate) using applicable sensory tests to objectively assess targeted finfish and shellfish species for hydrocarbon contamination. Results will be used to make inferences on the health of commercial fisheries and the potential magnitude of impacts to fishing industries.	SM10 will be initiated in the event of a Level 2 or 3 hydrocarbon release, or any release event with the potential to contact sensitive environmental receptors and implemented if operational monitoring (OM01, OM02 and OM05) indicates the following: • The hydrocarbon spill will or has intersected with active commercial fisheries or aquaculture activities. • Commercially targeted finfish and/or shellfish mortality has been observed/recorded. • Commercial fishing or aquaculture areas have been exposed to hydrocarbons (≥0.5 g/m² surface and ≥5 ppb for entrained/dissolved hydrocarbons); and • Taste, odour or appearance of seafood presenting a potential human health risk is observed.	SM10 will be terminated once it is agreed that the receptor has returned to pre-spill condition. The SMP termination criteria process will be followed and include consideration of: • Physiological impacts to important commercial fish and shellfish species from hydrocarbon exposure have been quantified. • Recovery of important commercial fish and shellfish species from hydrocarbon exposure has been evaluated. • Impacts to seafood quality/safety (if applicable) have been assessed and information provided to the relevant persons/ organisations and regulators for the management of any impacted fisheries. • Agreement with relevant persons/ organisations 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 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 consider the full range of eventualities relating to the environmental, socio-economic and health consequences of the spill in the planning and execution of the SMP. The activation process also takes into consideration the management objectives, species recovery plans, conservation advices and conservations plans for any World Heritage Area (WHA), CMRs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the EPBC Act) potentially exposed to hydrocarbons. With the first 24-48 hours of a spill event, such information will be sourced and evaluated as part of the SMP planning process guided by Appendix D (identified receptors vulnerable to hydrocarbon contact), the information presented in the Existing Environment section of the EP as well as other information sources such as the Woodside Baseline Environmental Studies Database.

The starting point for decision-making on what SMPs are activated and spatial extent of monitoring activities will be based on the predictive modelling results (OM01) in the first 24-48 hours until more information is made available from other operational monitoring activities such as aerial surveillance and shoreline surveys. Pre-emptive Baseline Areas (WHA, CMRs and State Marine Parks encompassing key ecological and socio-economic values) are a key focus of the SMP activation decision-making process, particularly, in the early spill event/response phase. As the operational monitoring progresses and further situational awareness information becomes available, it will be possible to understand the nature and scale of the spill. The SMP activation and implementation decision-making will be revisited daily 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 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 25). Identification of relevant persons/ organisations, planning and engagement will be managed by Woodside's Public Information Functional Support Team (FST) .. These guidelines outline the FST roles and responsibilities, competencies, 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 relevant persons/ organisation objections. The final report following termination will include: monitoring results, expert opinion and consultation, including merits of any objections.
- Termination of SMPs will also consider applicable management objectives, species recovery plans, conservation advices and conservations plans for any World Heritage Area (WHA), CMRs, State Marine Parks, other protected area designations (e.g., State nature reserves) and Matters of National Environmental Significance (including listed species under part 3 of the EPBC Act).

The SMP termination decision-making process will be applied to each active SMP and an iterative process of decision steps continued until each SMP has been terminated (refer to decision-tree diagram for SMP termination criteria, Figure C-3).

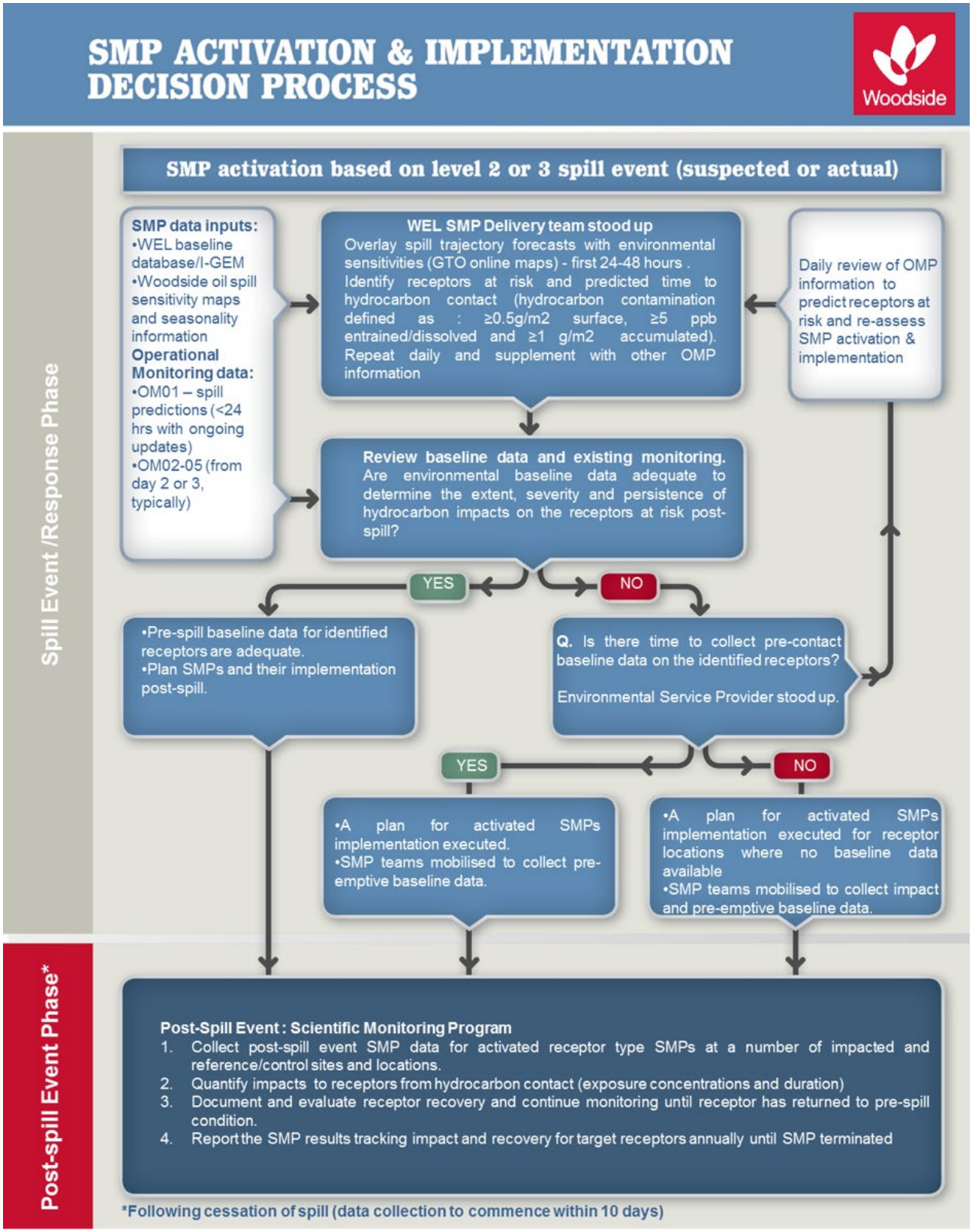


Figure C-2: Activation and implementation decision-tree for oil spill environmental monitoring

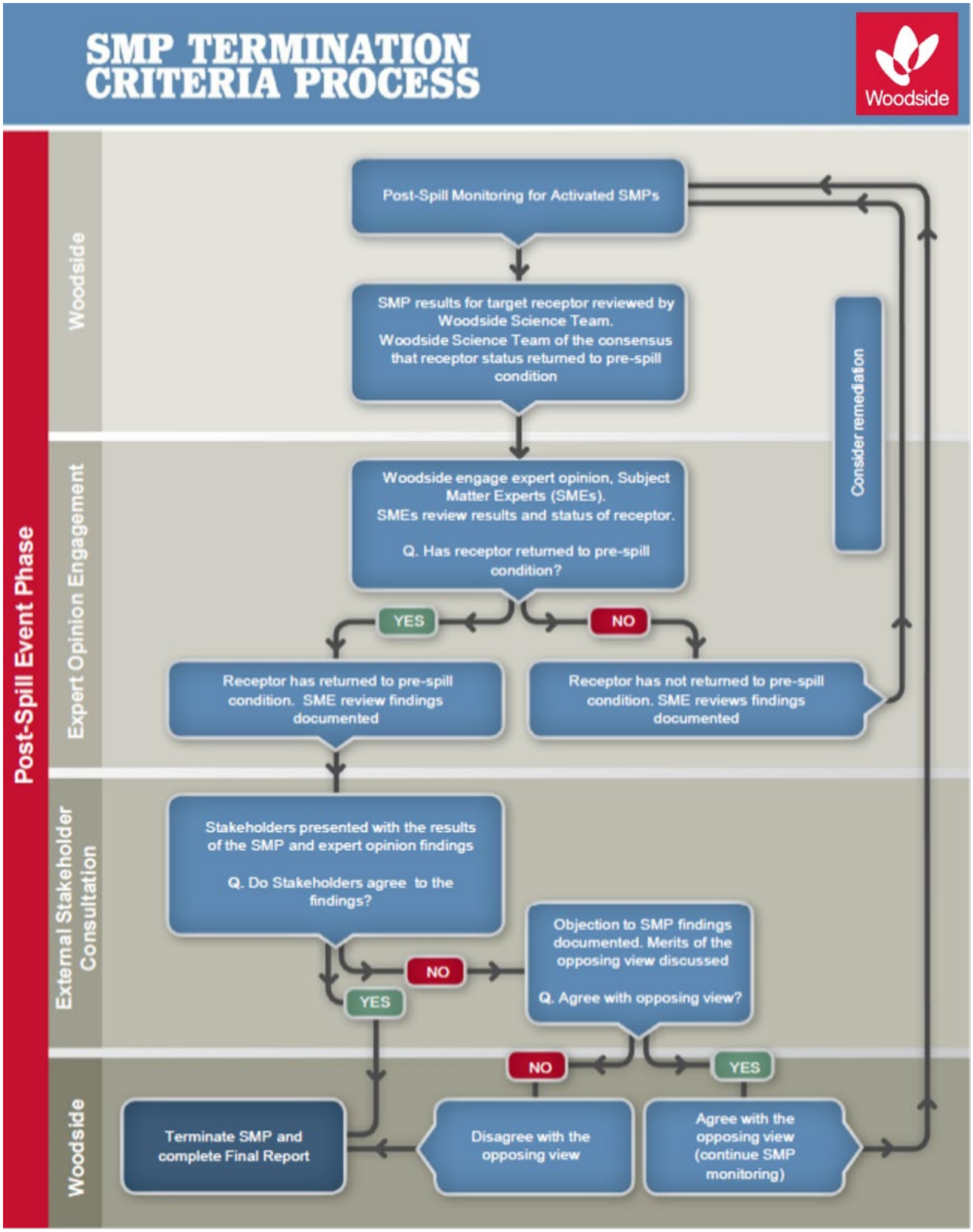


Figure C-3: Termination criteria decision-tree for oil spill environmental monitoring

Receptors at Risk and Baseline Knowledge

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 several data directories and an environmental baseline database, as well as folders within the 'Corporate Environment' server space. The environmental baseline database was set up to support Woodside's SMP preparedness and as a SMP resource in the event of an unplanned hydrocarbon spill. The environmental baseline database is subject to updates including annual reviews completed as part of SMP standby contract. This database is accessed pre-PAP to identify PBAs where hydrocarbon contact is predicted to occur <10 days.

In addition to Woodside's Environmental Knowledge Management System, 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). To understand the present status of environmental baseline studies a spatial environmental metadata database for Western Australia (Industry-Government Environmental Metadata, IGEM) 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 DWER IMSA[10] in 2020. IMSA is an online portal for information about marine-based environmental surveys in Western Australia. IMSA is a project of DWER for the systematic capture and sharing of marine data created as part of an environmental impact assessment (EIA).

In the event of an unplanned hydrocarbon release, Woodside intends to interrogate the information on baseline studies status as held by the various databases (e.g. Woodside Environmental Knowledge Management System, IMSA and other sources of existing baseline data) to identify Pre-emptive Baseline Areas (PBAs), i.e., receptors at risk where hydrocarbon contact is predicted to be >10 days, and baseline data can be collected before hydrocarbon contact.

Reporting

For the scientific monitoring program relevant regulators will be provided with:

- Annual reports summarising the SMPs deployed and active, data collection activities and available findings; and
- Final reports for each SMP summarising the quantitative assessment of environmental impacts and recovery of the receptor once returned to pre-spill condition and termination of the monitoring program.

The reporting requirements of the scientific monitoring program will be specific to the individual SMPs deployed and terms of responsibilities, report templates, schedule, quality assurance/ quality control (QA/QC) and peer-review will be agreed with the contractors engaged to conduct the SMPs. Compliance and auditing mechanisms will be incorporated into the reporting terms.

[10] https://biocollect.ala.org.au/imsa#max%3D20%26sort%3DdateCreatedSort

ANNEX D: MONITORING PROGRAM AND BASELINE STUDIES FOR THE PETROLEUM ACTIVITIES PROGRAM

Table D-1: Oil spill environmental monitoring – scientific monitoring program scope for the PAP based on Spill EMBAs

Receptors to be Monitored	Receptor Areas - Potential Impact and Reference Scientific Monitoring Sites (marked X)																																						
	Applicable SMP	Kimberley AMP	Agro-Rowley Terrace AMP	Montebello AMP	Dampier AMP	Carnarvon Canyon AMP	Ningaloo AMP	Gascoyne AMP	Shark Bay Open Ocean (including AMP)	Abrolhos AMP	Jurien AMP	Two Rocks AMP	Perth Canyon AMP	Geographe AMP	South-west Corner AMP	Ashmore Reef and AMP	Seringapatam Reef	Scott Reef (North and South)	Mermaid Reef and AMP	Clerke Reef and State Marine Park	Imperieuse Reef and State Marine Park	Rankin Bank	Glomar Shoals	Rowley Shoals (including Sate Maine Park)	Fantome Shoal	Adele Island	Lacepede Islands	Montebello Islands (including State Marine Park)	Lowendal Islands (including State Nature Reserves)	Barrow Island (including State Nature Reserves, State Marine Park, and Marine Management Area)	Muiron Islands (WHA, Marine Management Area)	Pilbara Islands – Middle and Southern Island Group (Serrurier, Thevenard and Bessieres Islands - State	Pilbara Islands - Northern Island Group (Sandy Island Passage Islands - State nature reserves)	Abrolhos Islands	Kimberley Coast	Dampier Archipelago	Northern Pilbara Shoreline	Ningaloo Coast (North/Northwest Cape, Middle and South) (WHA, and State Marine Park)	Shark Bay - Open Ocean Coast	Shark Bay (WHA, State Marine Park)	Ngari Capes State Marine Park
Habitat																																							
Water Quality	SM01	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
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
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	
Seagrass / Macro-Algae	SM03	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					X		X		
Mangroves and Saltmarsh	SM04																											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
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	
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
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
Dugongs	SM08	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	
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
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
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
Fisheries – Traditional	SM10															X	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

	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 Baseline 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 for the PAP

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Rankin Bank & Glomar Shoal	Barrow, Lowendal Montebello and Islands	Montebello AMP	Dampier Archipelago
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. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.	Barrow Island: East and West Coast baseline and monitoring for soft sediment, limestone pavement and coral assemblages (Chevron) Barrow, Montebello and Lowendal Islands: 1. Benthic community monitoring as part of DBCA Western Australian Marine Monitoring Program (2015-ongoing). 2. Pilbara Marine Conservation Partnership Seabed biodiversity survey (2013).	Coral Reefs & Filter Feeders 1. Montebello Marine Park, 2019, Identification and qualitative descriptions of benthic habitat. 2. Montebello Australian Marine Parks – 2019 – Baseline survey on benthic habitats. 3. Pluto Trunkline within Montebello Marine Park – Monitoring marine communities.	1. Coral Monitoring, Mermaid Sound. URS on behalf of Chevron, 2004. 2. Scarborough Trunkline Marine Habitat Survey 2018. 5. Benthic community monitoring as part of DBCA's Dampier Archipelago Marine Monitoring Program (2007-ongoing). 6. WA Museum study on the Scleractinian corals collected in 1998. (Griffith 2004). 7. Regional Biodiversity — Pilbara Seabed Biodiversity Mapping & Characterisation (2016). 9. Distribution, patterns and key processes of major marine communities and large marine fauna – DBCA Pluto Offset Program D. 11. Study of the spatial and temporal distribution of coral assemblages at Dampier Archipelago (Cape Preston to Delambre Island), using 871 datasets dating back to the early 1970s. Sites surveyed in May 2017.
		Methods:			
		1. Towed video transects, photo quadrats using towed video system. 2. Towed video transects, photo quadrats using towed video system. 3. Towed video transects, photo quadrats using towed video system. 4. Towed video transects, photo quadrats using towed video system.	Barrow Island: Coral habitat – mapping, rapid visual assessment, size-class frequency, photoquadrats – live coral cover and survival, tagged corals – growth and survival and coral recruitment Benthic macro-invertebrate surveys – video belt transects Barrow, Montebello and Lowendal Islands: 1. Fixed long-term monitoring sites. Diver video transect. 2. Towed video, benthic trawl and sled.	1.ROV Transects 2. Benthic habitat mapping, multibeam acoustic swathing. 3. ROV video.	1. Towed Video. 2. Towed video, 5. Diver swum – belt transects, photo quadrats. 6. Coral collection for taxonomic records. 7. Towed video, benthic trawl and sled. 9. Collection of fish, coral, mangrove and seagrass samples from reefs along the WA coast, including reefs within the proposed Dampier Archipelago Marine Park. Samples subject to genetic testing. 11. Photo quadrants and recruitment tiles
		References/ data:			
		1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3.Currey-Randall et. al., 2019. DATAHOLDER: AIMS 4. Currey-Randall et. al., 2019. DATAHOLDER: AIMS	Barrow Island: Chevron Australia (2015a and b) DATAHOLDER: Chevron Australia Barrow, Montebello and Lowendal Islands: 1. WA Department of Biodiversity, Conservation and Attractions (DBCA) DATAHOLDER: DBCA 2. Pitcher et al. 2016 DATAHOLDER: CSIRO	1. Advisian 2019 2. Keesing 2019 3. McLean et al. 2019	1. URS Australia Pty Ltd. 2004. DATAHOLDER: Woodside. 2. MSCIENCE, 2019. DATAHOLDER: MSCIENCE. 5. DBCA. 6. Griffith (2004) Western Australian Museum. 7. Pitcher et al. (2016). DATAHOLDER: CSIRO 9. DBCA (2023) 11. Moustaka, et al. 2019 Dataholder: DBCA
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:**			
			Barrow Island: East Barrow Island – Chevron baseline and monitoring	N/A – see Table D-1	1. West Australian Museum marine biodiversity collection. 2. Benthic community monitoring as part of DBCA's Dampier Archipelago Marine Monitoring Program (2007-ongoing). 3. Distribution, patterns and key processes of major marine communities and large marine fauna (Pluto Offset Program DBCA) 4. Establishment of long-term monitoring reference sites for the Pluto Offset Program – DBCA (in the proposed Dampier Archipelago Marine Park and Cape Preston Marine Management Area).
		Methods:			

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Rankin Bank & Glomar Shoal	Barrow, Lowendal Montebello and Islands	Montebello AMP	Dampier Archipelago
			East Barrow- seagrass photoquadrats (30 m transects) during spring/summer and winter periods Macroalgae photoquadrats, visual census and biomass and specimen sampling		1. Diving collection to establish diversity, distribution and abundance of biota. 2. Towed video, photoquadrats 3. Collection of fish, coral, mangrove and seagrass samples from reefs along the WA coast, including reefs within the proposed Dampier Archipelago Marine Park. Samples subject to genetic testing. 4. The major datasets collected in 2016/17 were for mangroves, seagrass, macroalgae, coral and fish communities. Several techniques were trialled for both seagrass and macroalgae monitoring; including benthic imagery, quadrat counts, line intercept measures, and laboratory analysed collections.
		References/ data:			
			Barrow Island: Chevron Australia (2015a and b) DATAHOLDER: Chevron Australia		1. West Australian Museum 2002. DATAHOLDER: WAM, Woodside. 2.DBCA. 3. DBCA (2017 and 2023) 4. DBCA (2017 and 2023)
Benthic Habitat (Deeper Water Filter Feeders)	**SM03** Quantitative assessment using image capture using towed video. Post analysis into broad groups based on taxonomy and morphology.	**Studies:**			
		As above (SM03 Coral Reefs)		As above (SM03 Coral Reefs)	1. Baseline Marine Habitat Survey for the Pluto LNG Project. A total of 315 km^2 of Mermaid Sound was mapped in high resolution to distinguish habitat location and extent and further verified with 389 km of towed video.
		Methods:			
					1. Drop camera surveys of Deepwater sites (approximately 10 – 35 m depth).
		References/ data:			
					1. SKM 2008. DATAHOLDER: Woodside.
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:**			
		N/A – See Table D-1	Barrow Island: East and West Coast baseline and monitoring – mapping (HR aerial imagery) and vegetation surveys	N/A – see Table D-1	1. Lymburner et al. (2019) applies quantitative analysis to assess the extent and canopy density of mangroves for each year between 1987 and 2018 2. Mangrove baseline data 2017 - Woodside has acquired satellite imagery of coastal areas of mainland and offshore islands from Geraldton and the Abrolhos Islands (in the south) to Dampier Archipelago (out to the Montebello Islands in the north), land classification completed and mangrove habitats identified and mapped
		Methods:			
			Barrow – Chevron (2015a and b) – HR mapping (aerial images) and vegetation surveys using belt transects – species composition, estimated total canopy cover, total number of trees, pneumatophore density and canopy density.		1. PCC% for mangroves using optical and radar data (Landsat sensor spectral composite data (all spectral wavebands) and Advanced Land Observing Satellite (ALOS) Phased Arrayed L-band Synthetic Aperture Radar (SAR) data). for the entire Australian coastline. 2. Land cover classification was performed based on atmospherically corrected Sentinel-2 data
		References/ data:			
			Barrow Island: Chevron Australia (2015a and b) DATAHOLDER: Chevron Australia		1. Lymburner et al. 2019. DATAHOULDER: Geoscience Australia, Author ([1]) 2. SOURCE: EOMAP 2017 report to Woodside
Seabirds	**SM05**	**Studies:**			

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Rankin Bank & Glomar Shoal	Barrow, Lowendal Montebello and Islands	Montebello AMP	Dampier Archipelago
	Visual counts of breeding seabirds, nest counts, intertidal bird counts at high tide.	N/A – See Table D-1	Barrow Island: Barrow Island Seabird Monitoring Program (Chevron) Barrow, Montebello and Lowendal Islands: 1. Johnston et al (2013) general inventory and distribution for the Pilbara region (WA Museum) 2. Santos – Integrated Shearwater Monitoring Program (1994-2016) 3. Santos – monitoring of seabird breeding colonies throughout the Lowendal Group of Islands.	N/A – see Table D-1	1. Baseline information in the Pilbara oiled wildlife response plan 2014. 2. Advisian (2021) NMWR Seabird and Shorebird baseline Desktop review (Woodside report)
		Methods:			
			Barrow Island – 2008-ongoing annual surveys: abundance, nest density, presence/absence of egg or chick/fledgling Barrow, Montebello and Lowendal Islands: 1. Desktop review (WA Museum) 2. Nest burrow density, presence/absence of eggs or chicks in burrows 3. The distribution and abundance of other nesting seabirds within the Lowendal Island group, including up to 45 islands and islets		1. Species, total numbers, Distribution, presence/absence of eggs or chicks in burrows. 2. Desktop literature review
		References/ data:			
			Barrow – Chevron (2015c) DATAHOLDER: Chevron Australia Barrow, Montebello and Lowendal Islands: 1. Johnstone et al (2013) DATAHOLDER: (WA Museum 2. Santos DATAHOLDER: Santos 3. Surman and Nicholson (2012) DATAHOLDER: Santos		1. AMOSC/DBCA 2014. DATAHOLDER: AMOSC/DBCA. 2. Report to Woodside commissioned study – Advisian (2021)
Turtles	**SM06** Beach surveys (recording species, nests, and false crawls).	**Studies:**			
		N/A – See Table D-1	Barrow Island: Chevron Australia: long term monitoring programs for flatback turtles Barrow, Montebello and Lowendal Islands: 1. Marine turtle monitoring as part of DBCA long-term turtle monitoring program (ongoing). 2. LTM Study of Green, Flatback, Hawksbill turtles on beaches within the Barrow, Lowendal and Montebello Island Complex. 3. Santos 2013 turtle nesting survey on the Lowendal islands. 4. Varanus Island Turtle monitoring program (2005 – present). North West Shelf Flatback Conservation Program – conserve North West Shelf stock – scope covers all summer nesting flatback turtles - https://flatbacks.dbca.wa.gov.au/about	N/A – see Table D-1	1. DBCA Photogrammetry survey of marine turtle nesting beaches in Dampier Archipelago 2019-2020 2.Holden Beach sea turtle habitat. Pendoley Environmental (2006) on behalf of Woodside for the Pluto Development. 3. Marine turtle monitoring as part of DPAWs long-term turtle monitoring program within the Dampier Archipelago (ongoing) 4. Nesting ecology of flatback sea turtles *Natator depressus* from Delambre Island collected over 2–3 weeks each nesting season across six nesting seasons (2010-2016).
		Methods:			

Major Baseline	Proposed Scientific monitoring operational plan and Methodology	Rankin Bank & Glomar Shoal	Barrow, Lowendal Montebello and Islands	Montebello AMP	Dampier Archipelago
			Barrow Island – Chevron Australia: 2005 -ongoing annual surveys, flatback turtles – nesting success, track counts and satellite tracking, hatchling survival and dispersal. Barrow, Montebello and Lowendal Islands: 1. Nesting demographics 2. Nesting demographics 3. Tagging and nest counts 4. Tagging and nest counts at Varanus, Beacon, Bridled, Abutilon and Parakeelya islands. North West Shelf Flatback Conservation Program - https://flatbacks.dbca.wa.gov.au/program-activities		1. High Resolution aerial surveys 2. Adult tracks, body pits, nests, emerged nests. 3. Adult tracks, body pits, nests, emerged nests. 4. Flipper tag resightings and track counts
		References/ data:			
			Barrow Island – Chevron (2015c) DATAHOLDER: Chevron Australia Barrow, Montebello and Lowendal Islands: 1. DBCA 2. Pendoley 2005. AMOSC/DBCA (DPaW) 2014. 3. Santos (2014) DATAHOLDER: Santos 4. Santos (2005-prsesent) DATAHOLDER: Santos North West Shelf Flatback Conservation Program https://flatbacks.dbca.wa.gov.au/program-activities		1. DBCA Karratha office 2. Pendoley Environmental 2006. DATAHOLDER: Woodside. 3. DBCA 4. Thums et al 2019 DATAHOLDER: AIMS
Fish	**SM09** Baited Remote Underwater Video Stations (BRUVS), Visual Underwater Counts (VUC), Diver Operated Video (DOV).	**Studies:**			
		1. Glomar Shoal and Rankin Bank Environmental Survey Report, 2013, quantitatively surveyed benthic habitats and communities. AIMS report to Woodside. Scientific Publication - Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems, 2018. 2. Rankin Bank Environmental Survey Extension, 2014, Habitat assessment of an area southeast of Rankin Bank. 3. Glomar Shoal and Rankin Bank surveys, 2017. GWF-2 Monitoring Programme. Quantitatively surveyed benthic habitats and communities. 4. Temporal Studies survey of Rankin Bank and Glomar Shoal, 2018.	Barrow Island: Chevron: East and West Coast intertidal and subtidal baseline and monitoring Barrow, Montebello and Lowendal Islands: 1. Pilbara Marine Conservation Partnership Stereo BRUVS drops in shallow water (~10m) from Exmouth to Barrow Islands in 2015. 2. Finfish monitoring as part of DBCAs Western Australian Marine Monitoring Program (2015-ongoing).	1. CSIRO – Fish Diversity. 2. Fish species richness and abundance.	1. Fish assemblages quantitatively described Mermaid Sound using BRUVs. Recorded main habitat types (sand, reef, coral and macroalgae) and at a total of 412 sites. 2. West Australian Museum of Fish of Dampier archipelago. 3. Pilbara Marine Conservation Partnership Stereo BRUVS drops in shallow water (~10m) in 2015 around the Dampier Archipelago. 4. Finfish community monitoring as part of DBCA Dampier Archipelago Marine Monitoring Program (2007-ongoing).
		Methods:			
		1. BRUVs. 2. BRUVs. 3. BRUVs. 4. BRUVs.	Barrow Island – Chevron (2015a and b) – demersal fish: stereo BRUVS (subtidal habitats) and netting combination for mangrove habitat Barrow, Montebello and Lowendal Islands: 1. Stereo BRUVS. 2. Diver underwater visual surveys (UVS)	1. Semi V Wing trawl net or an epibenthic sled. 2. ROV Video.	1. BRUVs, Stereo Baited Remote Underwater Video Systems. 2. Fish collected and species lists. 3. Stereo BRUVS. 4. Diver UVS.
		References/ data:			
		1. AIMS 2014a and Abdul Wahab et al., 2018. DATAHOLDER: AIMS. 2. AIMS 2014b. DATAHOLDER: AIMS. 3. Currey-Randall et. al., 2019. DATAHOLDER: AIMS 4. Currey-Randall et. al., 2019. DATAHOLDER: AIMS	Barrow Island – Chevron Australia (2015a and b) DATAHOLDER: Chevron Barrow, Montebello and Lowendal Islands: 1. Unpublished report CSIRO DATAHOLDER: CSIRO, CSIRO Data centre ([2]) 2. DBCA	1. Keesing 2019. 2. McLean et al. 2019.	1. SKM 2008. DATAHOLDER: Woodside. 2. Hutchins 2004. DATAHOLDER: Woodside and WAM. 3. CSIRO. DATAHOLDER: CSIRO ([2]). 4. DBCA.

References

Abdul Wahab, M, A., Radford, B., Cappo, C., Colquhoun, J., Stowar, M., Depczynski, M., Miller, K and Heyward, A. (2018). Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems. *Coral Reefs*. Vol. 37, Issue 2, pp. 327-343. https://doi.org/10.1007/s00338-017-1655-9

Advisian (2019) Montebello Marine Park Benthic Habitat Survey ROV Analysis of the Scarborough Pipeline Route. Report Prepared for Woodside Energy Ltd. 183 pp.

Advisian (2021) Northwest Marine Region Seabird and Shorebird Baseline and Threats Review. Desktop Literature Review, Report to Woodside.

AIMS (2014a). 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 (2014b). 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.).

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/

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 Science Program Data Report Series MSPDR4. January 2009. Marine Science Program, Science Division, Department of Environment and Conservation, Perth, Western Australia. 68p.

Currey-Randall L, Wakeford M, Colquhoun J, Cappo M, Stowar M, Birt M, Cure K, Vaughan B, Case M, Fisher R and Miller KJ (2019) Temporal trends in benthic communities and demersal fishes at Rankin Bank and Glomar Shoal. Report prepared for Woodside Energy Ltd. Australian Institute of Marine Science, Perth. 59 pp.

DBCA (2017). Pluto LNG Environmental Offset D. Research and Monitoring in the Proposed Dampier Marine Reserves Program. Annual report 2016-2017. Report prepared for Woodside.

DBCA (2023). Pluto LNG Environmental Offset D. Research and Monitoring in the Proposed Dampier Marine Reserves Program. Annual report 2022-2023. Report prepared for Woodside.

Griffith, J.K. (2004). Scleractinian corals collected during 1998 from the Dampier Archipelago, Western Australia. *Records of the Western Australian Museum* Supplement No. 66: 101-120pp.

Hutchins, J.B. (2004). Fishes of the Dampier Archipelago, Western Australia. *Records of the Western Australian Museum* Supplement No. 66: 343-398.

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

Keesing, J. K. (2019). Benthic habitats and biodiversity of the Dampier Archipelago and Montebello Australian Marine Parks. Report of the Director of Nationals Parks. CSIRO, Australia

Lymburner, L. et al. (2019). Remote Sensing of Environment. Mapping the multi-decadal mangrove dynamics of the Australian coastline. https://doi.org/10.1016/j.rse.2019.05.004

McLean, D., Taylor M., Vaughan B. (2019) Marine Communities of the Pluto Trunkline within the Montebello Marine Park. Report prepared for Woodside Energy Ltd. Australian Institute of Marine Science, Perth. 45 pp.

MScience, 2019. Scarborough Trunkline Marine Environmental Studies: Pre-dredging Coral Habitat Assessment. Unpublished report MSA275_2R01 to Advisian , Perth Western Australia, pp53.

Moustaka, M., Mohring. M.B., Holmes, T., Evans, R.D., Thomson, D., Nutt, C., Stoddart, J. and Wilson, S.K. (2019). Cross-shelf Heterogeneity of Coral Assemblages in Northwest Australia. Diversity 2019, 11, 15; doi:10.3390/d11020015

Pitcher, C., Miller, Margaret, Morello, Elisabetta & Fry, G. & Strzelecki, Joanna & McLeod, I. & Slawinski, Dirk & Ellis, N. & Thomson, Damian & Bearham, Douglas & Keesing, John & Donovan, A. & Mortimer, N. & Babcock, R. & Fromont, Jane & Gomez, Oliver & Hosie, Andrew & Hara, Ana & Moore, Glenn & Huisman, John. (2016). Environmental Pressures: Regional Biodiversity — Pilbara Seabed Biodiversity Mapping & Characterisation. https://www.researchgate.net/publication/310328261_Environmental_Pressures_Regional_Biodiversity_-_Pilbara_Seabed_Biodiversity_Mapping_Characterisation

ANNEX E: TACTICAL RESPONSE PLANS

TACTICAL RESPONSE PLANS
Exmouth
Mangrove Bay
Turquoise Bay
Yardie Creek
Muiron Islands
Jurabi to Lighthouse Beaches Exmouth
Ningaloo Reef – Refer to Mangrove/ Turquoise Bay and Yardie Creek
Exmouth Gulf
Shark Bay Area 1: Carnarvon to Wooramel
Shark Bay Area 2: Wooramel to Petite Point
Shark Bay Area 3: Petite Point to Dubaut Point
Shark Bay Area 4: Dubaut Point to Herald Bight
Shark Bay Area 5: Herald Bight to Eagle Bluff
Shark Bay Area 6: Eagle Bluff to Useless Loop
Shark Bay Area 7: Useless Loop to Cape Bellefin
Shark Bay Area 8: Cape Bellefin to Steep Point
Shark Bay Area 9: Western Shores of Edel Land
Shark Bay Area 10: Dirk Hartog Island
Shark Bay Area 11: Bernier and Dorre Islands
Abrohlos Islands: Pelseart Group
Abrohlos Islands: Wallabi Group
Abrohlos Islands: Easter Group
Dampier
Rankin Bank & Glomar Shoals
Barrow and Lowendal Islands
Pilbara Islands – Southern Island Group
Montebello Island – Stephenson Channel Nth TRP
Montebello Island – Champagne Bay and Chippendale channel TRP
Montebello Island – Claret Bay TRP
Montebello Island – Hermite/Delta Island Channel TRP
Montebello Island – Hock Bay TRP
Montebello Island – North and Kelvin Channel TRP
Montebello Island – Sherry Lagoon Entrance TRP
Withnell Bay
Holden Bay
King Bay
No Name Bay / No Name Beach
Enderby Island – Dampier
Rosemary Island – Dampier
Legendre Island – Dampier
Karratha Gas Plant

KGP to Withnell 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 I: PLUTO OFFSHORE OPERATIONS FIRST STRIKE PLAN

Pluto Facility Operations – Oil Pollution First Strike Plan

Corporate HSE

Hydrocarbon Spill Preparedness

July 2024
Revision 9b

TABLE OF CONTENTS

CONTROL AGENCIES AND INCIDENT CONTROLLERS

Source	Location	Level	Control Agency	Incident Controller
Spill from facility including subsea infrastructure *Note: pipe laying and accommodation vessels are considered a "facility" under Australian regulations*	Commonwealth waters	1	Woodside	Person In Charge (PIC) with support from Onshore Team Leader (OTL)
		2/3	Woodside	Corporate Incident Management Team (CIMT) Duty Manager
	State waters	1	Woodside	CIMT Duty Manager
		2/3	Department of Transport (DoT)	DoT Incident Controller
	Within port limits	1	Woodside	CIMT Duty Manager
		2/3	DoT	DoT Incident Controller
Spill from vessel Note: SOPEP should be implemented in conjunction with this document	Commonwealth waters	1	Australian Marine Safety Authority (AMSA)	Vessel Master
		2/3	AMSA	AMSA (with response assistance from Woodside)
	State waters	1	DoT	DoT Incident Controller
		2/3	DoT	DoT Incident Controller
	Within port limits	1	Port Authority	Port Harbour Master
		2/3	Port Authority/ DoT	Port Harbour Master/ DoT Incident Controller

SPILLS IN STATE WATERS

In the event of a hydrocarbon spill (hereafter 'spill') where Woodside Burrup Pty Ltd ('Woodside') is the responsible party and the spill may impact State waters and shorelines, Woodside (or the Vessel Master) will commence the initial response actions and notify the Western Australian Department of Transport (DoT). In the event that Woodside is the responsible party for a spill that occurs within port limits, Woodside will notify the Port Authority and DoT for all spill levels.

Initially Woodside will be required to make available an appropriate number of suitably qualified persons to work in the DoT IMT (APPENDIX F – Woodside Liaison Officer resources to DoT). DoT/ Port Authority's role as the Controlling Agency in State waters does not negate the requirement for Woodside to have appropriate plans and resources in place to adequately respond to a marine hydrocarbon spill incident in State Waters/ within port limits, or to commence the initial response actions to a spill prior to DoT establishing incident control in line with DoT *Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements* (July 2020). Cost recovery arrangements for offshore marine pollution incidents (MOP) are in accordance with Section 9 of the Guidance Note:

https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_Westplan_MOP_OffshorePetroleumIndGuidance.pdf

Woodside's Incident Management Structure for a hydrocarbon spill, including Woodside Liaison Officer's command structure within DoT can be seen at APPENDIX E – Woodside Incident Management structure.

The coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/ shorelines is shown in APPENDIX D – Coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/ shorelines.

RESPONSE PROCESS OVERVIEW

	For guidance on credible scenarios and hydrocarbon characteristics, refer to APPENDIX A	
ALL INCIDENTS	Notify the Woodside Communication Centre (WCC) on: [3]	
	Incident Controller or delegate to make relevant notifications in **Table 1-1** of this Oil Pollution First Strike Plan.	
LEVEL 1	**FACILITY INCIDENT**	**VESSEL INCIDENT**
	Coordinate pre-identified tactics in **Table 2-1** of this Oil Pollution First Strike Plan. Remember to download each Operational Plan.	Notify AMSA or Port Authority (if within port limits) and coordinate pre-identified tactics in **Table 2-1** of this Oil Pollution First Strike Plan Remember to download each Operational Plan.
	If the spill escalates such that the site cannot manage the incident, inform the WCC on: [3] and escalate to a level 2/3 incident.	
LEVEL 2/3	**FACILITY INCIDENT**	**VESSEL INCIDENT**
	Handover control to CIMT and notify DoT or Port Authority (if within port limits).	Handover control to AMSA or Port Authority (if within port limits) and stand up CIMT to assist.
	Commence quick revalidation of the recommended strategies in **Table 2-1** taking into consideration seasonal sensitivities and current situational awareness. Commence validated strategies.	If requested by AMSA/ Port Authority: Commence quick revalidation of the recommended strategies in **Table 2-1** taking into consideration seasonal sensitivities and current situational awareness. Commence validated strategies.
	Create an Incident Action Plan (IAP) for all ongoing operational periods. The content of the IAP should reflect the selected response strategies based on current situational awareness. For the full detailed pre-operational Net Environmental Benefit Analysis (NEBA) see the OSPRMA Appendix A.	If requested by AMSA/ Port Authority: Create an IAP for all ongoing operational periods. The content of the IAP should reflect the selected response strategies based on current situational awareness. For the full detailed pre-operational NEBA see the OSPRMA Appendix A.

1. NOTIFICATIONS

The Incident Controller or delegate must ensure the below notifications (Table 1-1) are completed within the designated timeframes.

For spills from a vessel, relevant notifications must be undertaken by a WEL representative.

Table 1-1: Notifications

In the event of an incident between campaign vessels, also activate relevant vessel Emergency Response Plans and/or Bridging Documents

Timing	By	To	Name	Contact	Instruction	Form	Complete? (ü)
NOTIFICATIONS FOR ALL LEVELS OF SPILL							
Immediately	Offshore Installation Manager (OIM) or Vessel Master	Woodside Communication Centre (WCC)	Duty Manager	[3]	Verbally notify WCC of event and estimated volume and hydrocarbon type.	Verbal	
Within 2 hours	Woodside Site Rep (WSR), Corporate Incident Management Team Duty Manager (CIMT DM) or Delegate	National Offshore Petroleum Safety Environmental Management Authority (NOPSEMA[1])	Incident notification office	[4]	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 DEMIRS).	Link	
Within 3 days	WSR, CIMT DM or Delegate				Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DEMIRS) NOPSEMA [4] NOPTA [5] DEMIRS [6]	[4]	
As soon as practicable	CIMT DM or Delegate	Woodside	Environment Duty Manager	As per roster	Verbally notify Duty Environment of event and seek advice on relevant performance standards from EP	Verbal	
Within 2 hours of becoming aware of a marine pollution incident (MOP) that occurs in or may impact state waters	CIMT DM or Delegate	WA Department of Transport	DoT Maritime Environmental Emergency Response Unit (MEER) Duty Officer	[7]	Verbally notify DoT MEER Duty Officer 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 Woodside IMT.	[7]	
As soon as practicable if spill arises in or is likely to extend into port limits.	CIMT IC or Delegate	Pilbara Ports Authority (PPA)	PPA Dampier Vessel Traffic Services (VTS)	[16]	Any spill within or close to the Dampier Port boundary should be reported immediately to the PPA Dampier VTS.	Verbal/ [16]	
As soon as practicable	CIMT DM or Delegate	Department of Climate Change, Energy, the Environment and Water (DCCEEW) Director of National Parks	Marine Park Compliance Duty Officer	[8]	The Marine Park Compliance Duty Officer is notified in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken. This notification should include: • titleholder details • time and location of the incident • proposed response arrangements and locations as per the OPEP • contact details for the response coordinator • confirmation of access to relevant monitoring and evaluation reports when available.	Verbal	
As soon as practicable if there is potential for oiled wildlife or the spill is expected to contact land or waters managed by WA Department of Biodiversity, Conservation and Attractions	CIMT DM or Delegate	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Duty Officer	[9]	Phone call notification	Verbal	

[1] Notification to NOPSEMA must be from a Woodside Representative.

As soon as practicable	Public Information	Relevant persons/ organisations	To be determined	To be determined	Should it be identified that additional persons such as, but not limited to, commercial fishers or tourism operators may be affected, Woodside would, at the relevant time, engage with these parties as appropriate and in alignment with the Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) for Pluto Facility Operations. Relevant persons/ organisations will be re-assessed throughout the response period.	Verbal initially	
As soon as practicable	Public Information	Relevant cultural authorities	To be determined	To be determined	Should it be identified that relevant cultural authorities may be affected, Woodside would, at the relevant time, engage with these parties as appropriate and in alignment with the Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) for Pluto Facility Operations. Relevant cultural authorities will be re-assessed throughout the response period.	Verbal initially	
ADDITIONAL NOTIFICATIONS TO BE MADE ONLY IF SPILL IS FROM A VESSEL							
"Without delay" as per *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cth) s 11(1)	Vessel Master	Australian Maritime Safety Authority (AMSA)	Response Coordination Centre (RCC)	[10]	Verbally notify AMSA RCC of the hydrocarbon spill. Follow up with written Harmful Substances Report (POLREP – AMSA) as soon as practicable.	[10]	
ADDITIONAL LEVEL 2/3 NOTIFICATIONS							
As soon as practicable	CIMT DM or Delegate	AMOSC	AMOSC Duty Manager	[11]	Notify AMOSC that a spill has occurred and follow-up with an email from the CIMT IC/ Deputy CIMT IC/CMT Leader to formally activate AMOSC. Determine what resources are required consistent with the AMOS Plan and detail in a Service Contract that will be sent to Woodside from AMOSC upon activation.	[11]	
As soon as practicable	CIMT DM or Delegate	Oil Spill Response Limited (OSRL)	OSRL Duty Manager	[12]	Contact OSRL Duty Manager and request assistance from technical advisor in Perth. Send the completed notification form to OSRL as soon as practicable.	[12]	
					For mobilisation of resources, send the mobilisation form to OSRL as soon as practicable. The mobilisation form must be signed by a nominated callout authority from Woodside. OSRL can advise the names on the call out authority list, if required.	[12]	
As soon as practicable if extra personnel are required for incident support	CIMT DM or Delegate	Marine Spill Response Corporation (MSRC)	MSRC Response Manager	[13]	Activate the contract with MSRC (in full) for the provision of up to 30 personnel depending on what skills are required. Please note that provision of these personnel from MSRC are on a best endeavours basis and are not guaranteed.	Verbal	

2. RESPONSE TECHNIQUES

Table 2-1: Response techniques

Technique	Spill type			Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
	MGO (CS-05)	Condensate (trunkline) (MEE-02b)	Condensate (LOWC) (MEE-01)					
Operational monitoring – tracking buoy (OM02)	Yes	Yes	Yes	ALL	If a vessel is on location, consider the need to deploy the oil spill tracking buoy. If no vessel is on location, consider the need to mobilise oil spill tracking buoys from the King Bay Supply Base (KBSB) Stockpile. If a surface sheen is visible from the facility, deploy the satellite tracking buoy within two hours.	Operations	**WITHIN 24 HOURS:** Tracking buoy deployed within 2 hours.	Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02) of The Operational Monitoring Operational Plan. Deploy tracking buoy in accordance with Link.
Operational monitoring – predictive modelling (OM01)	Yes	Yes	Yes	ALL	Undertake initial modelling using the Rapid Assessment Oil Spill Tool and weathering fate analysis using Automated Data Inquiry for Oil Spills (ADIOS) or refer to the hydrocarbon information in **Appendix A.**	Situation or Environment	**WITHIN 24 HOURS:** Initial modelling within 6 hours using the Rapid Assessment Tool.	Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01 of The Operational Monitoring Operational Plan). *Planning Section to download and follow steps*
	Yes	Yes	Yes	ALL	Send Oil Spill Trajectory Modelling (OSTM) form (Appendix B, Form 7) to RPS Response ([14]).	Situation	**WITHIN 24 HOURS:** Detailed modelling within 4 hours of RPS Response receiving information from Woodside.	
Operational monitoring – aerial surveillance (OM02)	Yes	Yes	Yes	ALL	Instruct Aviation Unit Leader to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in Appendix B Form 8.	Logistics – Aviation	**WITHIN 24 HOURS:** 2 trained aerial observers. 1 aircraft available. Report made available to the IMT within 2 hours of landing after each sortie.	Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan). *Planning Section to download and follow steps*
Operational monitoring – satellite tracking (OM02)	Yes	Yes	Yes	ALL	The Situation Unit Leader to action satellite imagery services. This may be obtained via: • AMOSC Duty Manager: [11] • OSRL Duty Manager: [12] • KSAT:[15] • Others identified by CIMT.	Situation	**WITHIN 24 HOURS:** Service provider will confirm availability of an initial acquisition within 2 hours. Data received to be uploaded into Woodside Common Operating Picture.	
Operational monitoring – monitoring hydrocarbons in water (OM03)	Yes	Yes	Yes	ALL	Consider the need to mobilise resources to undertake water quality monitoring (OM03).	Planning or Environment	**WITHIN 72 HOURS:** 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).
Operational monitoring – pre-emptive assessment of receptors at risk (OM04)	Potentially	Yes	Potentially	ALL	**MEE-02b:** Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04).	Planning or Environment	**WITHIN 24 HOURS:** In agreement with WA DoT, deployment of 1 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).
Operational monitoring – shoreline assessment (OM05)	Potentially	Yes	Potentially	ALL	**MEE-02b:** Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	**WITHIN 24 HOURS:** In agreement with WA DoT, deployment of 1 specialist trained in Shoreline Clean-up Assessment Technique (SCAT) for each of the RPAs with predicted impacts.	Shoreline Assessment (OM05 of The Operational Monitoring Operational Plan).
Surface dispersant	No	No	No	ALL	This response strategy is not recommended for spills of volatile hydrocarbons such as MGO and Pluto Condensate.			
Containment and recovery	No	No	No	ALL	This response strategy is not recommended for spills of volatile hydrocarbons such as MGO and Pluto Condensate.			
Mechanical dispersion	No	No	No	ALL	This response strategy is not recommended for spills of volatile hydrocarbons such as MGO and Pluto Condensate.			
In-situ burning	No	No	No	ALL	This response strategy is not recommended for spills of volatile hydrocarbons such as MGO and Pluto Condensate.			

Technique	Spill type			Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
	MGO (CS-05)	Condensate (trunkline) (MEE-02b)	Condensate (LOWC) (MEE-01)					
Shoreline protection and deflection	**No**	**Yes**	**No**	**ALL**	**MEE-02b:** Equipment from Woodside, PPA (if within port limits), AMOSC and AMSA Western Australian Stockpiles mobilised. Consideration of mobilisation of interstate/international shoreline protection equipment (i.e. OSRL).	Operations and Planning	**WITHIN 24 HOURS:** In agreement with WA DoT, activate relevant Tactical Response Plans (TRPs) within 12 hours. In agreement with WA DoT, mobilise teams to RPAs within 24 hours of operational monitoring predicting impacts. In agreement with WA DoT, equipment mobilised from closest stockpile within 24 hours. **WITHIN 48 HOURS:** Supplementary equipment mobilised from AMOSC, AMSA and State stockpiles within 48 hours. Supplementary equipment mobilised from OSRL within 48 hours.	Protection and Deflection Operational Plan *Logistics Section to download and follow steps*
Shoreline clean-up	**No**	**Yes**	**No**	**ALL**	**MEE-02b:** Equipment from Woodside, PPA (if within port limits), 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	**WITHIN 24 HOURS:** Relevant Tactical Response Plans (TRPs) will be identified in the First Strike Plan for activation within 24 hours of a release. In liaison with WA DoT (for Level 2/3 incidents), mobilise and deploy 1-2 shoreline clean-up operations within 24 hours. In agreement with WA DoT, equipment mobilised from closest stockpile within 24 hours. Access to ~124 m^3 of solid and liquid waste storage available within 24 hours upon activation of 3rd party contract. Access to 675 m^3 of solid and liquid waste storage available by end of day 4. **WITHIN 48 HOURS:** Supplementary equipment mobilised from AMOSC, AMSA and State stockpiles within 48 hours. Supplementary equipment mobilised from OSRL within 48 hours.	Shoreline Clean-up Operational Plan *Logistics Section to download and follow steps*
Oiled wildlife response	**Yes**	**Yes**	**Yes**	**ALL**	If oiled wildlife is a potential impact, request AMOSC to mobilise containerised oiled wildlife first strike kits and relevant personnel. Refer to relevant Tactical Response Plan for potential wildlife at risk. Mobilise AMOSC Oiled Wildlife Containers. Consider whether additional equipment is required from local suppliers.	Logistics and Planning	**WITHIN 24 HOURS:** Initiate a wildlife first strike response within 24 hours of confirmed or imminent wildlife contact as directed by relevant Operational Monitoring techniques (OM01-05) and in liaison with DBCA.	Oiled Wildlife Response Operational Plan
Scientific monitoring (type II)	**Yes**	**Yes**	**Yes**	**ALL**	Notify Woodside science team of spill event.	Environment		Oil Spill Scientific Monitoring Programme – Operational Plan
SOURCE CONTROL TECNIQUES								
Subsea First Response Toolkit	**N/A**	**N/A**	**Yes**	**L2/3**	Equipment from Oceaneering support staff all year round, via contract, to assist with the mobilisation, deployment, and operation of the SFRT equipment.	Operations – Source Control Unit	SFRT equipment mobilised to site for deployment within 11 days.	Source Control Emergency Response Planning Guideline
Subsea Dispersant	**N/A**	**N/A**	**No**	**L2/3**	This response strategy is not recommended.			
Capping Stack	**N/A**	**N/A**	**Yes**	**L2/3**	Wild Well Control Inc (WWCI) staff available all year round to assist with the mobilisation, deployment, and operation of the capping stack and well intervention equipment.	Operations – Source Control Unit	**WITHIN 24 HOURS:** Identify source control vessel availability within 24 hours.	

Technique	Spill type			Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
	MGO (CS-05)	Condensate (trunkline) (MEE-02b)	Condensate (LOWC) (MEE-01)					
							Capping stack on suitable vessel mobilised to site within 16 days. Deployment and well intervention attempt will be made once plume size is acceptable and safety and metocean conditions are suitable.	
Relief Well	**N/A**	**N/A**	**Yes**	**L2/3**	Relief MODU supply arrangements through the AEP MoU. Wild Well Control Inc (WWCI) staff available all year round to assist with the mobilisation, deployment, and operation well intervention equipment.	Operations – Source Control Unit	**WITHIN 24 HOURS** Identify source control vessel availability within 24 hours. MODU mobilised to site for relief well drilling within 21 days, with drilling to be completed within 77 days (LOWC during Pluto Facility Operations activities) or 64 days (LOWC for Xena-03 activities).	

3. RESPONSE PROTECTION AREAS

Action: Provide relevant Control Agency with applicable Tactical Response Plans for any Response Protection Areas (RPAs) identified during operational monitoring.

Based on hydrocarbon spill modelling results, the sensitive receptors outlined in **Table 3-1** are identified as priority protection areas, as they have the potential to be contacted by hydrocarbon at or above impact threshold levels within 48 hours of a spill. These arise from MEE-02b only (see **Table A-1**) and thus receptor distances are measured from the closest point of the trunkline Operational Area.

Table 3-1: Receptors for priority protection with potential impact within 48 Hours

Receptor	Distance and direction from trunkline Operational Area (km)	Minimum time to shoreline contact (above 100 g/m^2) in hours	Maximum shoreline accumulation (above 100 g/m^2) in m^3	Tactical Response Plans
Cape Bruguieres	12.7 km south-southeast	32 hours (4 m^3)	4 m^3 (32 hours)	Mermaid Sound - Dampier Archipelago Inshore Waters
Dampier Archipelago	Adjacent	21 hours (9 m^3)	9 m^3 (21 hours)	
Cohen Island	9.9 km southeast	30 hours (<1 m^3)	5 m^3 (31 hours)	
Keast Island	12.7 km southeast	32 hours (3 m^3)	3 m^3 (32 hours)	
Legendre Island	11.9 km east-southeast	22 hours (6 m^3)	6 m^3 (22 hours)	Legendre Island – Dampier

Hydrocarbon spill modelling results indicate no additional sensitive receptors have the potential to be contacted by hydrocarbons at response thresholds (>100 g/m^2) beyond 48 hours of a spill. In a real event, oil spill trajectory modelling specific to the spill will be required to determine the regional sensitive receptors to be contacted beyond 48 hours of a spill.

Tactical Response plans for these and other locations can be accessed via this link and include the details of potential forward operating bases and staging areas.

Figure 3-1 illustrates the location of regional sensitive receptors in relation to the Pluto Facility Operational Area and identifies priority protection areas.

Consideration should be given to other stakeholders (including mariners) in the vicinity of the spill location. **Table 3-2** indicates the assets within the vicinity of the PLA02 Operations Area.

Table 3-2: Assets in the vicinity of the Pluto Facility Operations Area Operational Area

Asset	Distance and Direction from PLA02 well	Operator
Wheatstone platform	26.1 km east-southeast	Chevron
Angel platform	159.2 km northeast	Woodside
John Brookes	61.8 km	Santos
Goodwyn Alpha platform	87.2 km northeast	Woodside
North Rankin Complex	110.2 km northeast	Woodside
Reindeer wellhead platform	123.8 km east-southeast	Santos
Stag A	126.7 km southeast	Jadestone

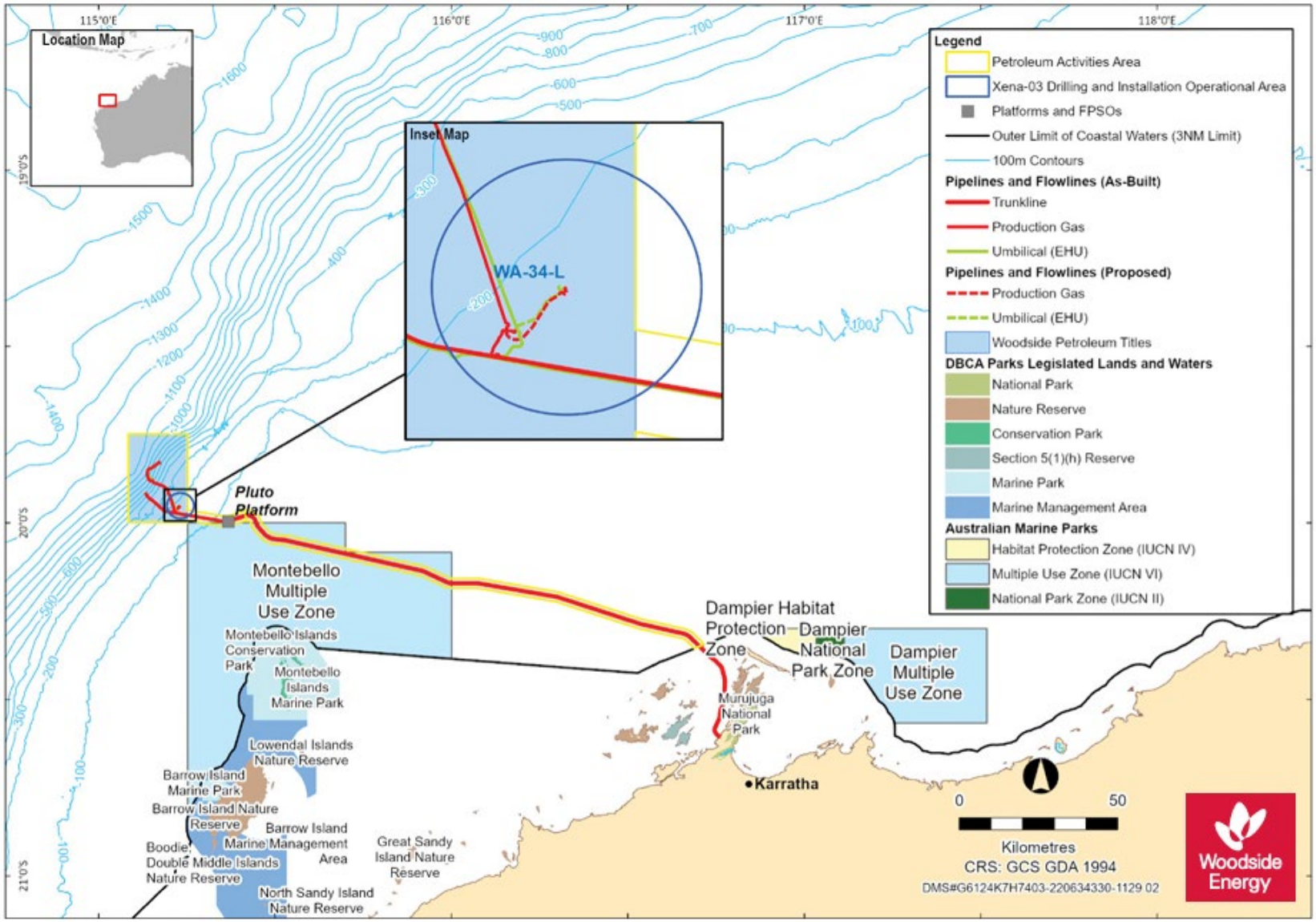


Figure 3-1: Operational area

4. DISPERSANT APPLICATION

Dispersant is not considered an appropriate response strategy for this activity as described in the Pluto Facility Operations Environment Plan Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment).

APPENDIX A – CREDIBLE SPILL SCENARIOS AND HYDROCARBON INFORMATION

Table A - 1: Credible spill scenarios and hydrocarbon information

Scenario	Product	Volume	Residue	Weathering rate		Suggested ADIOS2 Analogue[2]
CS-01: *A long-term (64-day) release of Eris-1 loss of well containment during drilling at the Xena-03 well*	*Eris-1 Condensate*	Total: 46,631 m^3 1880 m^3 (surface) 44,751 m^3 (subsea)	Surface: 10.01% (188.2 m^3) Seabed: 3.39% (1517.1 m^3)	12 hours (BP < 180 °C)	Surface: 14.97% Seabed: 65.99%	*Martin Linge Condensate API 42.2*
				24 hours (180 °C < BP < 265 °C)	Surface 48.43% Seabed: 21.6%	
				Several days (265 °C < BP < 380 °C)	Surface: 26.6% Seabed: 9.02%	
MEE-01 (WCCS): L*ong-term (77-day) subsurface release of Pluto Condensate caused by a loss of well containment from PLA02 well*	*Pluto Condensate*	59,459 m^3	2.53% (1504 m^3)	12 hours (BP < 180 °C)	67.97%	*NWS Condensate API 62.6*
				24 hours (180 °C < BP < 265 °C)	18.48%	
				Several days (265 °C < BP < 380 °C)	10.05%	
MEE-02a: *Loss of containment of the export pipeline at 29 km from Pluto A*	*Pluto Condensate*	479 tons (632 standard m^3)	0.5% (3.16 m^3)	12 hours (BP < 180 °C)	76%	*NWS Condensate API 62.6*
				24 hours (180 °C < BP < 265 °C)	14%	
				Several days (265 °C < BP < 380 °C)	9.5%	
MEE-02b (WCCS): *Loss of containment of the export pipeline at a location near-shore*	*Pluto Condensate*	607 tons (662 standard m^3)	0.5% (3.31 m^3)	12 hours (BP < 180 °C)	76%	*NWS Condensate API 62.6*
				24 hours (180 °C < BP < 265 °C)	14%	
				Several days (265 °C < BP < 380 °C)	9.5%	
CS-05: L*oss of vessel containment at the PLA platform*	*Marine Gas Oil*	1000 m^3	5.0% (50 m^3)	12 hours (BP < 180 °C)	6%	*Diesel Fuel Oil (Southern USA 1). API of 37.2*
				24 hours (180 °C < BP < 265 °C)	34.6%	
				Several days (265 °C < BP < 380 °C)	54.4%	

[2] Initial screening of possible ADIOS2 analogues considered hydrocarbons with similar APIs. Suggested selection is based on the closest distillation cut to the Woodside hydrocarbon. Only hydrocarbons with >380°C distillation cuts were included in selection process.

APPENDIX B – NOTIFICATION FORMS

Table B - 1: Notification forms

No.	Form Name	Link
1	Record of initial verbal notification to NOPSEMA template	Link
2	NOPSEMA Incident Report Form	[4]
3	Harmful Substances Report (POLREP – AMSA)	[10]
4	Marine Pollution Report (POLREP – DoT)	[7]
5	PPA Incident Reporting Form	[16]
6	AMOSC Service Contract	[11]
7a	OSRL Initial Notification Form	[12]
7b	OSRL Mobilisation Activation Form	[12]
8	RPS Response Oil Spill Trajectory Modelling Request	[14]
9	Aerial Surveillance Observer Log	Link
10	Tracking buoy deployment instructions	Link

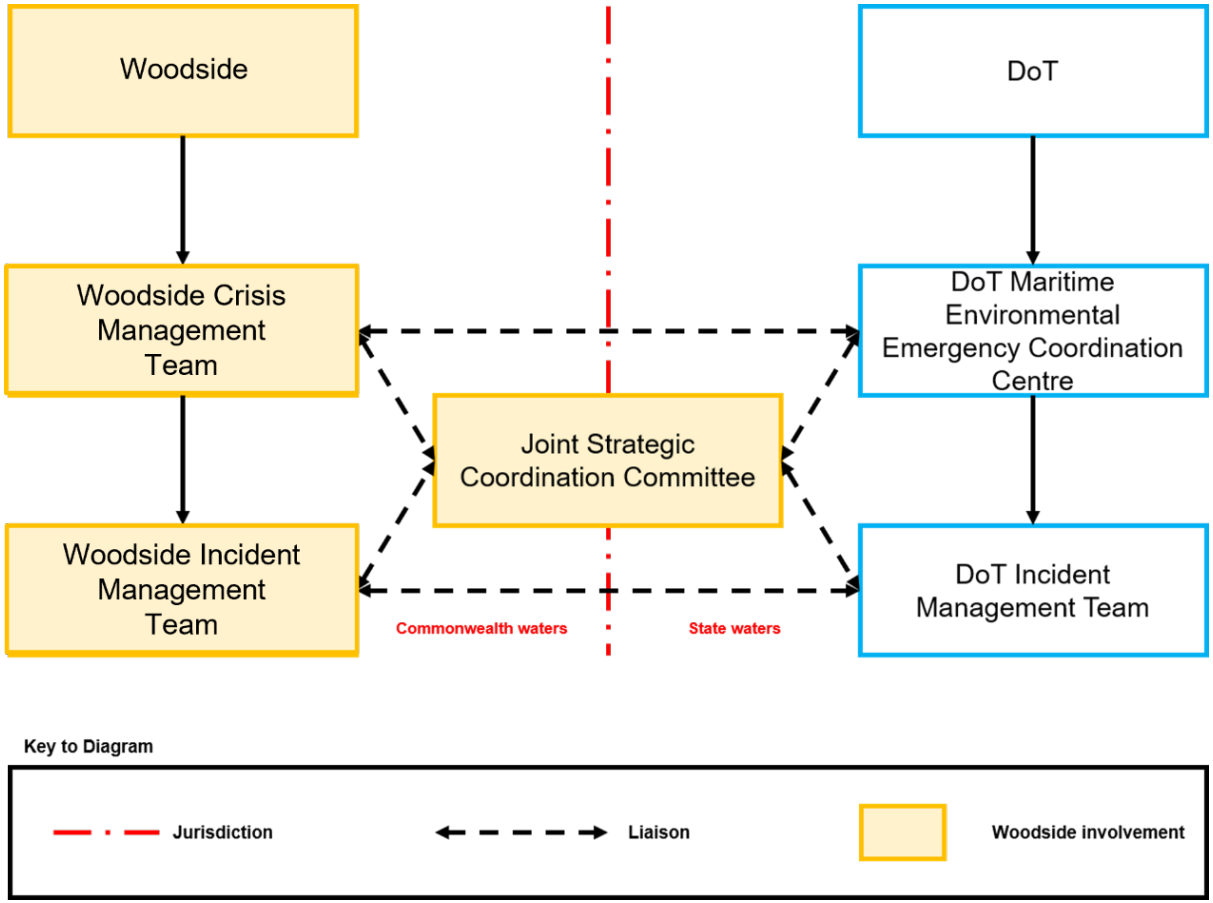
FORM 1 – RECORD OF INITIAL VERBAL NOTIFICATION TO NOPSEMA

NOPSEMA phone: [4]		
Date of call		
Time of call		
Call made by		
Call made to		
Information to be provided to NOPSEMA:		
Date and time of incident/ time caller became aware of incident		
Details of incident	**1. Location**	
	2. Title	
	3. Source	□ **Platform**
		□ **Pipeline**
		□ **FPSO**
		□ **Exploration drilling**
		□ **Well**
		□ **Other (please specify)**
	4. Hydrocarbon type	
	5. Estimated volume	
	6. Has the discharge ceased?	
	7. Fire, explosion or collision?	
	8. Environment Plan(s)	
	9. Other Details	
Actions taken to avoid or mitigate environmental impacts		
Corrective actions taken or proposed to stop, control or remedy the incident		
After the initial call is made to NOPSEMA, please send this record as soon as practicable to:		
NOPSEMA	**[4]**	
NOPTA	**[5]**	
DEMIRS	**[6]**	

APPENDIX C – SPILL ASSESSMENT QUESTIONS

What has happened?		
Date/time		
Spill source		
Spill cause		
Safety situation		
What is it?		
Oil type and name		
Oil properties	Specific gravity	
	Viscosity	
	Pour point	
	Asphaltenes	
	Wax content	
	Boiling point	
Where is it?		
Latitude and longitude		
Distance and bearing		
Affected area	☐ Offshore	
	☐ Subsea	
	☐ Shoreline	
	☐ Estuary	
	☐ Port	
	☐ Harbour	
	☐ Inland	
	☐ River	
	☐ Other (please detail):	
Water depth		
How big is it?		
Area		
Release type	☐ Instantaneous	Estimated volume:
	☐ Continuous release	Estimated release rate:
Where it is going?		
Metocean conditions		
Currents and tides		
What is in the way?		
Resources at risk		
Time until resource contact		
What's happening to it?		
Weathering processes		
Response actions underway		

APPENDIX D – COORDINATION STRUCTURE FOR A CONCURRENT HYDROCARBON SPILL IN BOTH COMMONWEALTH AND STATE WATERS/ SHORELINES[3]



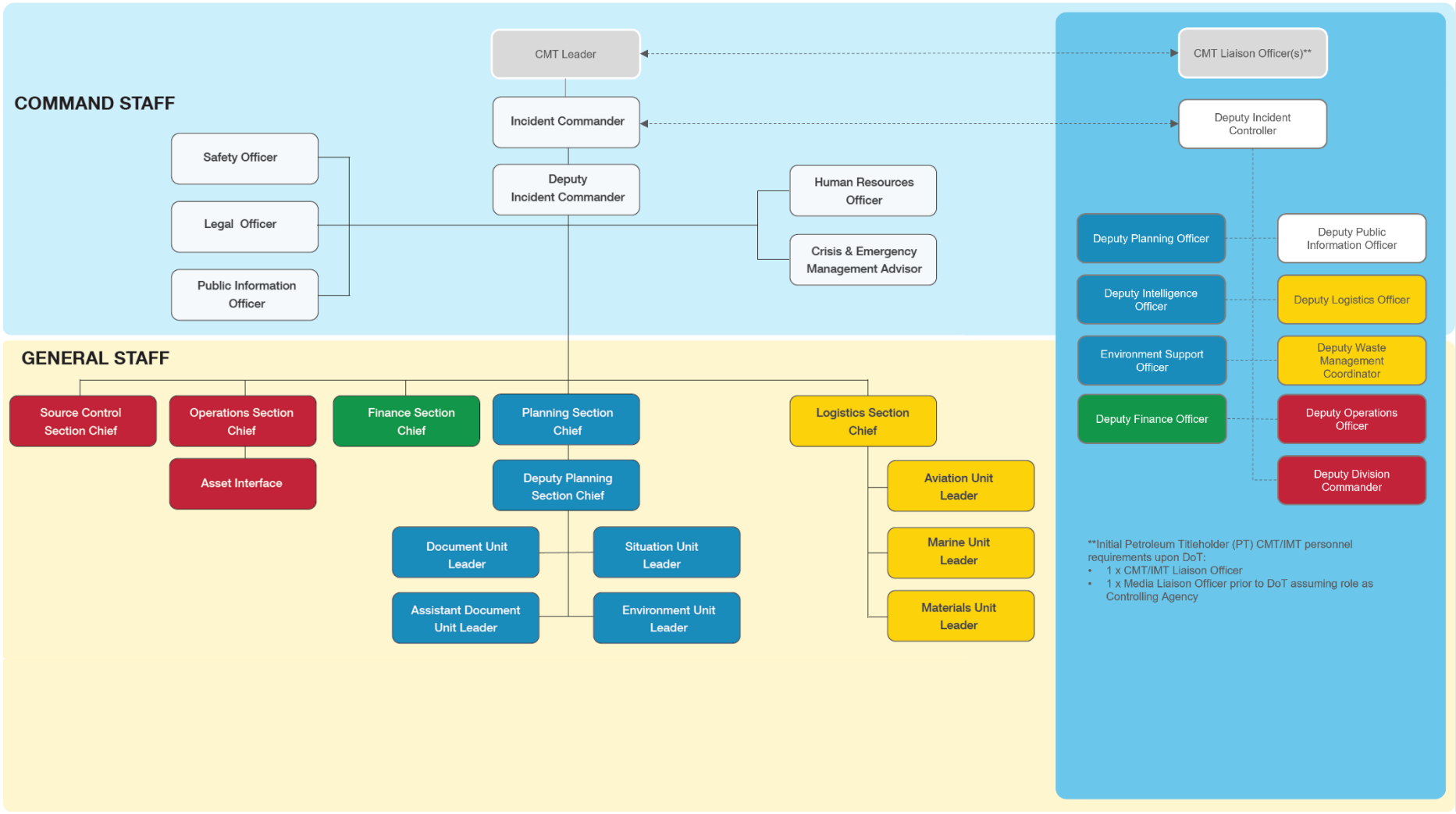
The Control Agency for a hydrocarbon spill in Commonwealth waters resulting from an offshore petroleum activity is Woodside (the Petroleum Titleholder).

The Control Agency/Hazard Management Agency (HMA) for a hydrocarbon spill in State waters/shorelines resulting from an offshore petroleum activity is DoT. DoT will appoint an Incident Controller and form a separate IMT to only manage the spill within State waters/shorelines.

[3] Adapted from DoT Offshore Petroleum Industry Guidance Note, Marine Oil Pollution: Response and Consultation Arrangements July 2020. Note: For full structure up to Commonwealth Cabinet/Minister refer to Marine Oil Pollution: Response and Consultation Arrangements Section 6.5, Figure 4.

APPENDIX E – WOODSIDE INCIDENT MANAGEMENT STRUCTURE

Woodside incident management structure for hydrocarbon spill (including Woodside Liaison Officers command structure within DoT IMT if required).



APPENDIX F – WOODSIDE LIAISON OFFICER RESOURCES TO DOT

In the event that DoT is required to establish an IMT, Woodside will make available an appropriate number of appropriately qualified persons to work within the DoT IMT. In the event the PPA is the Control Agency within the Dampier Port Limits, Woodside will make available similar roles as requested.

It is an expectation that Woodside's nominated CMT Liaison Officer and the Deputy Incident Controller attend the DoT Fremantle Incident Control Centre (ICC) as soon as possible after the formal request has been made by the State Marine Pollution Coordinator (SMPC), and that the remaining initial cohort will attend no later than 8 am on the day following the request being formally made to Woodside by the SMPC. For Woodside personnel designated to serve in DoT's Forward Operating Base (FOB), it is expected that they arrive at the FOB no later than 24 hours from the formal request being made by the SMPC.

Area	Role	Woodside Liaison Role[4]	Key Duties	#
DoT Maritime Environmental Emergency Coordination Centre (MEECC)	CMT Liaison Officer	CIMT Liaison	• Provide a direct liaison between the CMT and the MEECC. • Facilitate effective communications and coordination between the CIMT Leader and SMPC. • Offer advice to SMPC on matters pertaining to PT crisis management policies and procedures.	1
DoT IMT Incident Control	Deputy Incident Controller	Deputy Incident Commander (Deputy IC)	• 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	Deputy Intelligence Officer	Situation Unit Leader (Intelligence)	• 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

[4] *These positions would be mobilised, in consultation with DoT, to align to the actual spill scenario. The selected roles and/or individual personnel would be subject to continued evaluation to ensure continued 'best fit'. For CIMT roster arrangements, contact the WCC. During a prolonged response, additional personnel may be sourced through internal resourcing and mutual Aid agreements such as the AMOSC Core Group via [11].*

Area	Role	Woodside Liaison Role[4]	Key Duties	#
DoT IMT Intelligence – Environment	Environment Support Officer	Deputy Environment Unit Leader	• 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	Deputy Planning Section Chief	• As part of the Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub plans. • Facilitate the provision of relevant IAP and sub plans from the PT IMT. • Assist in the interpretation of the PT OPEP from the PT. • Assist in the interpretation of the PT IAP and sub plans from the PT IMT. • Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the PT IMT. • Assist in the interpretation of the PT existing resource plans. • Facilitate the provision of relevant components of the resource sub plan originating from the DoT IMT to the PT IMT. **(Note this individual must have intimate knowledge of the relevant PT OPEP and planning processes)**	1
DoT IMT Public Information-Media/ Community Engagement	Deputy Public Information Officer	Deputy Public Information Officer	• 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

Area	Role	Woodside Liaison Role[4]	Key Duties	#
DoT IMT Logistics	Deputy Logistics Officer	Deputy Logistics Section Chief	• 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	Deputy Finance Section Chief	• As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through the PTs existing OSRL, AMOSC and private contract arrangements. • Facilitate the communication of financial monitoring information to the PT to allow them to track the overall cost of the response. • Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DoT and to be charged back to the PT.	1
DoT IMT Operations	Deputy Operations Officer	Deputy Operations Section Chief	• 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	Deputy Waste Management Coordinator	Deputy Waste Coordinator (Materials)	• 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 Division Commander	FOB Deputy Incident Commander	• 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.	1

Area	Role	Woodside Liaison Role[4]	Key Duties	#
			• 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.	
			Total	11

APPENDIX G – DOT LIAISON OFFICER RESOURCES TO WOODSIDE

Once DoT activates a State waters/shorelines IMT, DoT will make available the following roles to Woodside.

Area	DoT Liaison Role	Personnel Sourced from:	Key Duties	#
Woodside CIMT	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
Woodside 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

APPENDIX J: XENA-03 DRILLING AND TIE-BACK FIRST STRIKE PLAN

Xena-03 Tie-back – Oil Pollution First Strike Plan

Corporate HSE

Hydrocarbon Spill Preparedness

July 2024
Revision 0a

TABLE OF CONTENTS

CONTROL AGENCIES AND INCIDENT CONTROLLERS

Source	Location	Level	Control Agency	Incident Controller
Spill from facility including subsea infrastructure *Note: pipe laying and accommodation vessels are considered a "facility" under Australian regulations*	Commonwealth waters	1	Woodside	Person In Charge (PIC) with support from Onshore Team Leader (OTL)
		2/3	Woodside	Corporate Incident Management Team (CIMT) Duty Manager
	State waters	1	Woodside	CIMT Duty Manager
		2/3	Department of Transport (DoT)	DoT Incident Controller
	Within port limits	1	Woodside	CIMT Duty Manager
		2/3	DoT	DoT Incident Controller
Spill from vessel Note: SOPEP should be implemented in conjunction with this document	Commonwealth waters	1	Australian Marine Safety Authority (AMSA)	Vessel Master
		2/3	AMSA	AMSA (with response assistance from Woodside)
	State waters	1	DoT	DoT Incident Controller
		2/3	DoT	DoT Incident Controller
	Within port limits	1	Port Authority	Port Harbour Master
		2/3	Port Authority/ DoT	Port Harbour Master/ DoT Incident Controller

SPILLS IN STATE WATERS

In the event of a hydrocarbon spill (hereafter 'spill') where Woodside Burrup Pty Ltd ('Woodside') is the responsible party and the spill may impact State waters and shorelines, Woodside (or the Vessel Master) will commence the initial response actions and notify the Western Australian Department of Transport (DoT).

Initially Woodside will be required to make available an appropriate number of suitably qualified persons to work in the DoT IMT (APPENDIX F – Woodside Liaison Officer resources to DoT). DoT role as the Controlling Agency in State waters 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 or to commence the initial response actions to a spill prior to DoT establishing incident control in line with DoT *Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements* (July 2020). Cost recovery arrangements for offshore marine pollution incidents (MOP) are in accordance with Section 9 of the Guidance Note:

https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_Westplan_MOP_OffshorePetroleumIndGuidance.pdf

Woodside's Incident Management Structure for a hydrocarbon spill, including Woodside Liaison Officer's command structure within DoT can be seen at APPENDIX E – Woodside Incident Management structure.

The coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/ shorelines is shown in APPENDIX D – Coordination structure for a concurrent hydrocarbon spill in both Commonwealth and State waters/ shorelines.

RESPONSE PROCESS OVERVIEW

	For guidance on credible scenarios and hydrocarbon characteristics, refer to APPENDIX A	
ALL INCIDENTS	Notify the Woodside Communication Centre (WCC) on: [3]	
	Incident Controller or delegate to make relevant notifications in **Table 1-1** of this Oil Pollution First Strike Plan.	
LEVEL 1	**FACILITY INCIDENT**	**VESSEL INCIDENT**
	Coordinate pre-identified tactics in **Table 2-1** of this Oil Pollution First Strike Plan. Remember to download each Operational Plan.	Notify AMSA and coordinate pre-identified tactics in **Table 2-1** of this Oil Pollution First Strike Plan Remember to download each Operational Plan.
	If the spill escalates such that the site cannot manage the incident, inform the WCC on: [3] and escalate to a level 2/3 incident.	
LEVEL 2/3	**FACILITY INCIDENT**	**VESSEL INCIDENT**
	Handover control to CIMT and notify DoT	Handover control to AMSA and stand up CIMT to assist.
	Commence quick revalidation of the recommended strategies in **Table 2-1** taking into consideration seasonal sensitivities and current situational awareness. Commence validated strategies.	If requested by AMSA: Commence quick revalidation of the recommended strategies in **Table 2-1** taking into consideration seasonal sensitivities and current situational awareness. Commence validated strategies.
	Create an Incident Action Plan (IAP) for all ongoing operational periods. The content of the IAP should reflect the selected response strategies based on current situational awareness. For the pre-operational Net Environmental Benefit Analysis (NEBA) see the related Pluto Facility Operations OSPRMA Appendix A	If requested by AMSA: Create an IAP for all ongoing operational periods. The content of the IAP should reflect the selected response strategies based on current situational awareness. For the pre-operational NEBA see the related Pluto Facility Operations OSPRMA Appendix A

1. NOTIFICATIONS

The Incident Controller or delegate must ensure the below notifications (Table 1-1) are completed within the designated timeframes.

For spills from a vessel, relevant notifications must be undertaken by a WEL representative.

Table 1-1: Notifications

In the event of an incident between campaign vessels, also activate relevant vessel Emergency Response Plans and/or Bridging Documents

Timing	By	To	Name	Contact	Instruction	Form	Complete? (✓)
NOTIFICATIONS FOR ALL LEVELS OF SPILL							
Immediately	Offshore Installation Manager (OIM) or Vessel Master	Woodside Communication Centre (WCC)	Duty Manager	[3]	Verbally notify WCC of event and estimated volume and hydrocarbon type.	Verbal	
Within 2 hours	Woodside Site Rep (WSR), Corporate Incident Management Team Duty Manager (CIMT DM) or Delegate	National Offshore Petroleum Safety Environmental Management Authority (NOPSEMA[1])	Incident notification office	[4]	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 DEMIRS).	Link	
Within 3 days	WSR, CIMT DM or Delegate				Provide a written NOPSEMA Incident Report Form as soon as practicable (no later than 3 days after notification) (cc to NOPTA and DEMIRS) NOPSEMA [4] NOPTA [5] DEMIRS [6]	[4]	
As soon as practicable	CIMT DM or Delegate	Woodside	Environment Duty Manager	As per roster	Verbally notify Duty Environment of event and seek advice on relevant performance standards from EP	Verbal	
Within 2 hours of becoming aware of a marine pollution incident (MOP) that occurs in or may impact state waters	CIMT DM or Delegate	WA Department of Transport	DoT Maritime Environmental Emergency Response Unit (MEER) Duty Officer	[7]	Verbally notify DoT MEER Duty Officer 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 Woodside IMT.	[7]	
As soon as practicable	CIMT DM or Delegate	Department of Climate Change, Energy, the Environment and Water (DCCEEW) Director of National Parks	Marine Park Compliance Duty Officer	[3]	The Marine Park Compliance Duty Officer is notified in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken. This notification should include: • titleholder details • time and location of the incident • proposed response arrangements and locations as per the OPEP • contact details for the response coordinator • confirmation of access to relevant monitoring and evaluation reports when available.	Verbal	
As soon as practicable if there is potential for oiled wildlife or the spill is expected to contact land or waters managed by WA Department of Biodiversity, Conservation and Attractions	CIMT DM or Delegate	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Duty Officer	[4]	Phone call notification	Verbal	
As soon as practicable	Public Information	Relevant persons/ organisations	To be determined	To be determined	Should it be identified that additional persons such as, but not limited to, commercial fishers or tourism operators may be affected, Woodside would, at the relevant time, engage with these parties as appropriate and in alignment with the related Oil Spill Preparedness and Response Mitigation Assessment (OSPRMA) for Pluto Facility Operations.	Verbal initially	

[1] Notification to NOPSEMA must be from a Woodside Representative.

					Relevant persons/ organisations will be re-assessed throughout the response period.		
As soon as practicable	Public Information	Relevant cultural authorities	To be determined	To be determined	Should it be identified that relevant cultural authorities may be affected, Woodside would, at the relevant time, engage with these parties as appropriate and in alignment with the related OSPRMA for Pluto Facility Operations. Relevant cultural authorities will be re-assessed throughout the response period.	Verbal initially	
ADDITIONAL NOTIFICATIONS TO BE MADE ONLY IF SPILL IS FROM A VESSEL							
"Without delay" as per *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cth) s 11(1)	Vessel Master	Australian Maritime Safety Authority (AMSA)	Response Coordination Centre (RCC)	[10]	Verbally notify AMSA RCC of the hydrocarbon spill. Follow up with written Harmful Substances Report (POLREP – AMSA) as soon as practicable.	[10]	
ADDITIONAL LEVEL 2/3 NOTIFICATIONS							
As soon as practicable	CIMT DM or Delegate	AMOSC	AMOSC Duty Manager	[11]	Notify AMOSC that a spill has occurred and follow-up with an email from the CIMT IC/ Deputy CIMT IC/CMT Leader to formally activate AMOSC. Determine what resources are required consistent with the AMOS Plan and detail in a Service Contract that will be sent to Woodside from AMOSC upon activation.	[11]	
As soon as practicable	CIMT DM or Delegate	Oil Spill Response Limited (OSRL)	OSRL Duty Manager	[12]	Contact OSRL Duty Manager and request assistance from technical advisor in Perth. Send the completed notification form to OSRL as soon as practicable.	[12]	
					For mobilisation of resources, send the Mobilisation Form to OSRL as soon as practicable. The mobilisation form must be signed by a nominated callout authority from Woodside. OSRL can advise the names on the call out authority list, if required.	[12]	
As soon as practicable if extra personnel are required for incident support	CIMT DM or Delegate	Marine Spill Response Corporation (MSRC)	MSRC Response Manager	[13]	Activate the contract with MSRC (in full) for the provision of up to 30 personnel depending on what skills are required. Please note that provision of these personnel from MSRC are on a best endeavours basis and are not guaranteed.	Verbal	

2. RESPONSE TECHNIQUES

Table 2-1: Response techniques

Technique	Spill type		Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
	MGO CS-05	Condensate CS-01					
Operational monitoring –tracking buoy (OM02)	Yes	Yes	ALL	If a vessel is on location, consider the need to deploy the oil spill tracking buoy. If no vessel is on location, consider the need to mobilise oil spill tracking buoys from the King Bay Supply Base (KBSB) Stockpile. If a surface sheen is visible from the facility, deploy the satellite tracking buoy within two hours.	Operations	**WITHIN 24 HOURS:** For manned facility/vessel, tracking buoy deployed within 2 hours. **WITHIN 48 HOURS:** For unmanned facility/vessel, deploy tracking buoy within 48 hours.	Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02) of The Operational Monitoring Operational Plan. Deploy tracking buoy in accordance with Link.
Operational monitoring – predictive modelling (OM01)	Yes	Yes	ALL	Undertake initial modelling using the Rapid Assessment Oil Spill Tool and weathering fate analysis using Automated Data Inquiry for Oil Spills (ADIOS) or refer to the hydrocarbon information in **Appendix A.**	Situation or Environment	**WITHIN 24 HOURS:** Initial modelling within 6 hours using the Rapid Assessment Tool.	Predictive Modelling of Hydrocarbons to Assess Resources at Risk (OM01 of The Operational Monitoring Operational Plan). *Planning Section to download and follow steps*
	Yes	Yes	ALL	Send Oil Spill Trajectory Modelling (OSTM) form (Appendix B, Form 7) to RPS Response ([14]).	Situation	**WITHIN 24 HOURS:** Detailed modelling within 4 hours of RPS Response receiving information from Woodside.	
Operational monitoring – aerial surveillance (OM02)	Yes	Yes	ALL	Instruct Aviation Unit Leader to commence aerial observations in daylight hours. Aerial surveillance observer to complete log in Appendix B Form 8.	Logistics – Aviation	**WITHIN 24 HOURS:** 2 trained aerial observers. 1 aircraft available. Report made available to the IMT within 2 hours of landing after each sortie.	Surveillance and Reconnaissance to Detect Hydrocarbons and Resources at Risk (OM02 of The Operational Monitoring Operational Plan). *Planning Section to download and follow steps*
Operational monitoring – satellite tracking (OM02)	Yes	Yes	ALL	The Situation Unit Leader to action satellite imagery services. This may be obtained via: • AMOSC Duty Manager: [11] • OSRL Duty Manager: [12] • KSAT:[15] • Others identified by CIMT.	Situation	**WITHIN 24 HOURS:** Service provider will confirm availability of an initial acquisition within 2 hours. Data received to be uploaded into Woodside Common Operating Picture.	
Operational monitoring – monitoring hydrocarbons in water (OM03)	Yes	Yes	ALL	Consider the need to mobilise resources to undertake water quality monitoring (OM03).	Planning or Environment	**DAY 3:** Water quality assessment access and capability Daily fluorometry reports will be provided to IMT.	Detecting and Monitoring for the Presence and Properties of Hydrocarbons in the Marine Environment (OM03 of The Operational Monitoring Operational Plan).
Operational monitoring – pre-emptive assessment of receptors at risk (OM04)	Potentially	Potentially	ALL	Modelling does not predict shoreline contact at response threshold (>100 g/m^2) any receptors. Consider the need to mobilise resources to undertake pre-emptive assessment of sensitive receptors at risk (OM04).	Planning or Environment	In agreement with WA DoT, deployment of 2 specialists for each of the Response Protection Areas (RPA) with predicted impacts.	Pre-emptive Assessment of Sensitive Receptors (OM04 of The Operational Monitoring Operational Plan).
Operational monitoring – shoreline assessment (OM05)	Potentially	Potentially	ALL	Modelling does not predict shoreline contact at response threshold (>100 g/m^2) any receptors. Consider the need to mobilise resources to undertake shoreline assessment surveys (OM05).	Planning or Environment	In agreement with WA DoT, deployment of 2 specialists trained in Shoreline Clean-up Assessment Technique (SCAT) for each of the RPAs with predicted impacts.	Shoreline Assessment (OM05 of The Operational Monitoring Operational Plan).
Surface dispersant	No	No	N/A	This response strategy is not recommended for Eris-1 condensate or marine gas oil (MGO) as there is no surface expression predicted above response threshold (>50 g/m^2). The addition of dispersant is not considered to have a net environmental benefit.			
Containment and recovery	No	No	N/A	This response strategy is not recommended for Eris-1 condensate or MGO as there is no surface expression predicted above response threshold (>50 g/m^2). Containment and recovery of condensate or MGO poses a significant safety risk due to low flash points. Corralling low			

Technique	Spill type		Level	Pre- Identified Tactics	Responsible	ALARP Commitment Summary	Link to Operational Plans for notification numbers and actions
	MGO CS-05	Condensate CS-01					
				flash point substances should be avoided, therefore, this response technique is not feasible.			
Mechanical dispersion	**No**	**No**	**N/A**	This response strategy is not recommended.			
In-situ burning	**No**	**No**	**N/A**	This response strategy is not recommended.			
Shoreline protection and deflection	**No**	**No**	**N/A**	This response strategy is not recommended for Eris-1 condensate or MGO as there is no shoreline accumulation predicted above response threshold (>100 g/m^2) at any RPA.			
Shoreline clean-up	**No**	**No**	**N/A**	This response strategy is not recommended for Eris-1 condensate or MGO as there is no shoreline accumulation predicted above response threshold (>100 g/m^2) at any RPA.			
Oiled wildlife response	**Yes**	**Yes**	**ALL**	If oiled wildlife is a potential impact, request AMOSC to mobilise containerised oiled wildlife first strike kits and relevant personnel. Refer to relevant Tactical Response Plan for potential wildlife at risk. Mobilise AMOSC Oiled Wildlife Containers. Consider whether additional equipment is required from local suppliers.	Logistics and Planning		Oiled Wildlife Response Operational Plan
Scientific monitoring (type II)	**Yes**	**Yes**	**ALL**	Notify Woodside science team of spill event.	Environment		Oil Spill Scientific Monitoring Programme – Operational Plan
SOURCE CONTROL TECNIQUES							
Subsea First Response Toolkit	**N/A**	Yes	**L2/3**	Debris clearance equipment to be mobilised prior to deployment of capping stack (if feasible).	Source Control	**WITHIN 48 HOURS:** Remotely Operated Vehicle (ROV) on Mobile Offshore Drilling Unit (MODU) ready for deployment within 48 hours. SFRT equipment mobilised to site for deployment within 11 days.	Source Control Emergency Response Planning Guideline Activity Source Control Emergency Response Plan
Subsea Dispersant	**N/A**	No	**N/A**	This response strategy is not recommended. Whilst the Eris-1 well is in water depths of 178 m, which greater than the 100 m minimum water depth recognised for feasible use of subsea dispersant, modelling predicts that the LOWC scenario will not result in any surface or shoreline oil at any RPA for the duration of the spill event. The use of subsea dispersant would increase dispersed/ entrained hydrocarbon levels and exposure of subsea biota to potentially higher toxicity substances and thus not provide a net environmental benefit.			
Capping Stack	**N/A**	Yes	**L2/3**	Conventional/vertical capping stack deployment with a heavy lift vessel will be attempted if plume radius is ~25 m and environmental conditions permit (wind speed, wave height, current and plume radius).	Source Control	**WITHIN 24 HOURS:** Identify source control vessel availability within 24 hours. Capping stack on suitable vessel mobilised to site within 16 days. Deployment and well intervention attempt will be made once plume size is acceptable and safety and metocean conditions are suitable.	
Relief Well	**N/A**	Yes	**L2/3**	Undertake tactics per Source Control Emergency Response Plan (SCERP).	Source Control	**WITHIN 24 HOURS** Identify source control vessel availability within 24 hours. MODU mobilised to location within 21 days, with drilling to be completed within 64 days.	

3. RESPONSE PROTECTION AREAS

Action: Provide relevant Control Agency with applicable Tactical Response Plans for any Response Protection Areas (RPAs) identified during operational monitoring.

Based on hydrocarbon spill modelling results, no sensitive receptors are predicted to be contacted at response threshold (>100 g/m^2) for the duration of the spill event.

Hydrocarbon spill modelling results indicate the following sensitive receptors may have the potential to be contacted by hydrocarbons below response threshold (>10 g/m^2):

- Montebello Islands including Marine Park, and Hermite Island – 10.4 days, 2 m^3
- Barrow Island including Boodie, Double and Middle Islands Nature Reserves – 77.9 days, <1 m^3
- Muiron Islands and MMA – 35.2 days, <1 m^3

In a real event, oil spill trajectory modelling specific to the spill will be required to determine the regional sensitive receptors to be contacted.

Tactical Response plans for these and other locations can be accessed via this link and include the details of potential forward operating bases and staging areas.

Figure 3-1 illustrates the location of regional sensitive receptors in relation to the Xena-03 Tie-back Operational Area and identifies priority protection areas.

Consideration should be given to other stakeholders (including mariners) in the vicinity of the spill location. **Table 3-1** indicates the assets within the vicinity of the Xena-03 Tie-back Operational Area.

Table 3-1: Assets in the vicinity of the Xena-03 Tie-back Operational Area

Asset	Distance and direction from Xena-03 well	Operator
Wheatstone platform	17.6 km east	Chevron
Angel platform	153 km north-northwest	Woodside
John Brookes	56.3 km south-southwest	Santos
Goodwyn Alpha platform	81.7 km northwest	Woodside
North Rankin Complex	104.8 km northwest	Woodside
Reindeer wellhead platform	114.8 km east-southeast	Santos
Stag A	116.8 km south-east	Jadestone

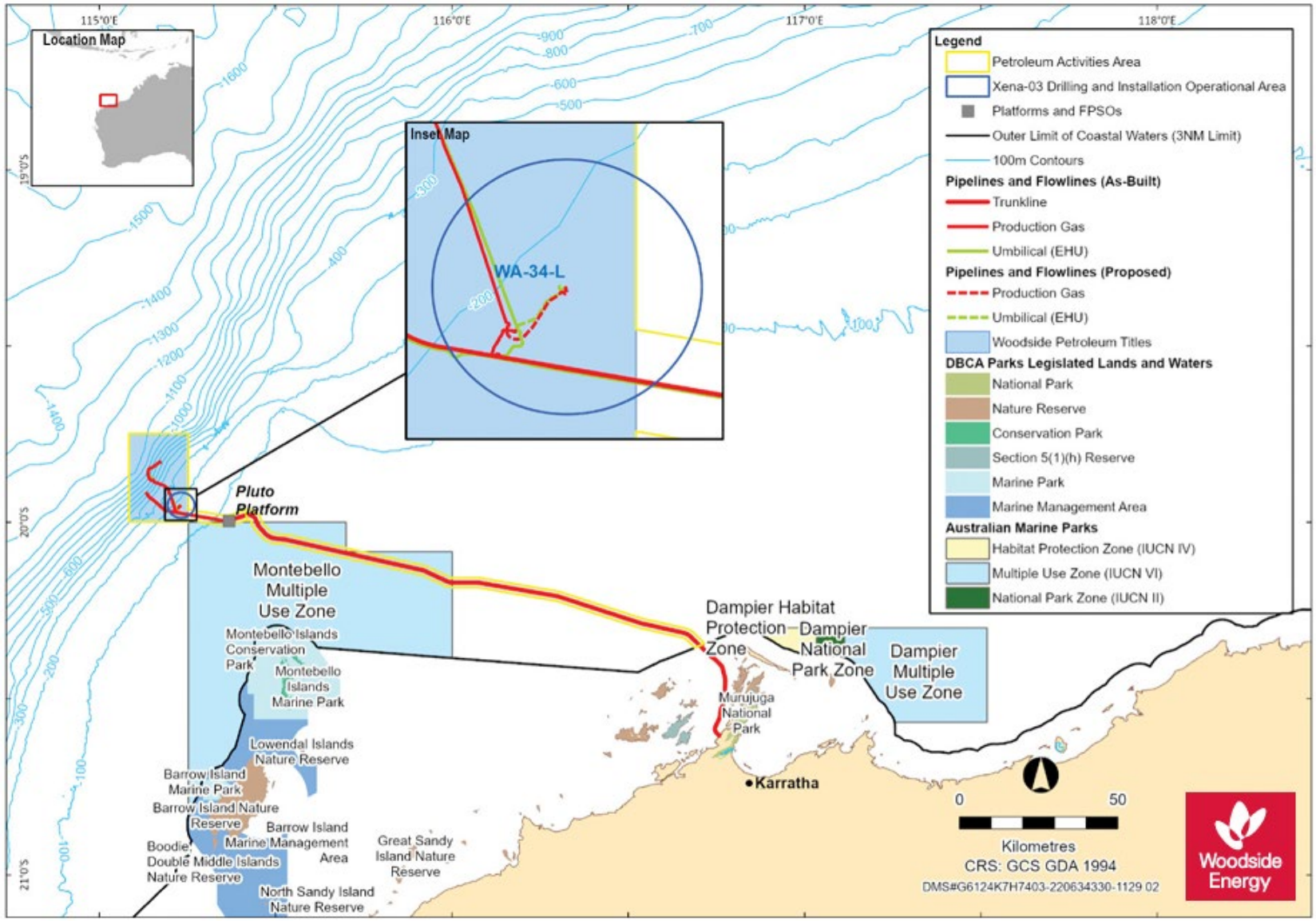


Figure 3-1: Operational area

4. DISPERSANT APPLICATION

Dispersant is not considered an appropriate response strategy for this activity as described in the related Pluto Facility Operations Environment Plan Appendix D (Woodside's Oil Spill Preparedness and Response Mitigation Assessment).

APPENDIX A – CREDIBLE SPILL SCENARIOS AND HYDROCARBON INFORMATION

Table A - 1: Credible spill scenarios and hydrocarbon information

Scenario	Product	Volume	Residue	Weathering rate		Suggested ADIOS2 Analogue[2]
CS-01 (WCCS): *A long-term (64-day) release of Eris-1 loss of well containment during drilling at the Xena-03 well*	*Eris-1 Condensate*	Total: 46,631 m^3 1880 m^3 (surface) 44,751 m^3 (subsea)	Surface: 10.01% (188.2 m^3) Seabed: 3.39% (1517.1 m^3)	12 hours (BP < 180 °C)	Surface: 14.97% Seabed: 65.99%	*Martin Linge Condensate API 42.2*
				24 hours (180 °C < BP < 265 °C)	Surface 48.43% Seabed: 21.6%	
				Several days (265 °C < BP < 380 °C)	Surface: 26.6% Seabed: 9.02%	
CS-05: Loss of vessel containment at the PLA platform	*Marine Gas Oil*	1000 m^3	5.0% (50 m^3)	12 hours (BP < 180 °C)	6%	*Diesel Fuel Oil (Southern USA 1). API of 37.2*
				24 hours (180 °C < BP < 265 °C)	34.6%	
				Several days (265 °C < BP < 380 °C)	54.4%	

[2] Initial screening of possible ADIOS2 analogues considered hydrocarbons with similar APIs. Suggested selection is based on the closest distillation cut to the Woodside hydrocarbon. Only hydrocarbons with >380°C distillation cuts were included in selection process.

APPENDIX B – NOTIFICATION FORMS

Table B - 1: Notification forms

No.	Form Name	Link
1	Record of initial verbal notification to NOPSEMA template	Link
2	NOPSEMA Incident Report Form	[4]
3	Harmful Substances Report (POLREP – AMSA)	[10]
4	Marine Pollution Report (POLREP – DoT)	[7]
5	AMOSC Service Contract	[11]
6a	OSRL Initial Notification Form	[12]
6b	OSRL Mobilisation Activation Form	[12]
7	RPS Response Oil Spill Trajectory Modelling Request	[14]
8	Aerial Surveillance Observer Log	Link
9	Tracking buoy deployment instructions	Link

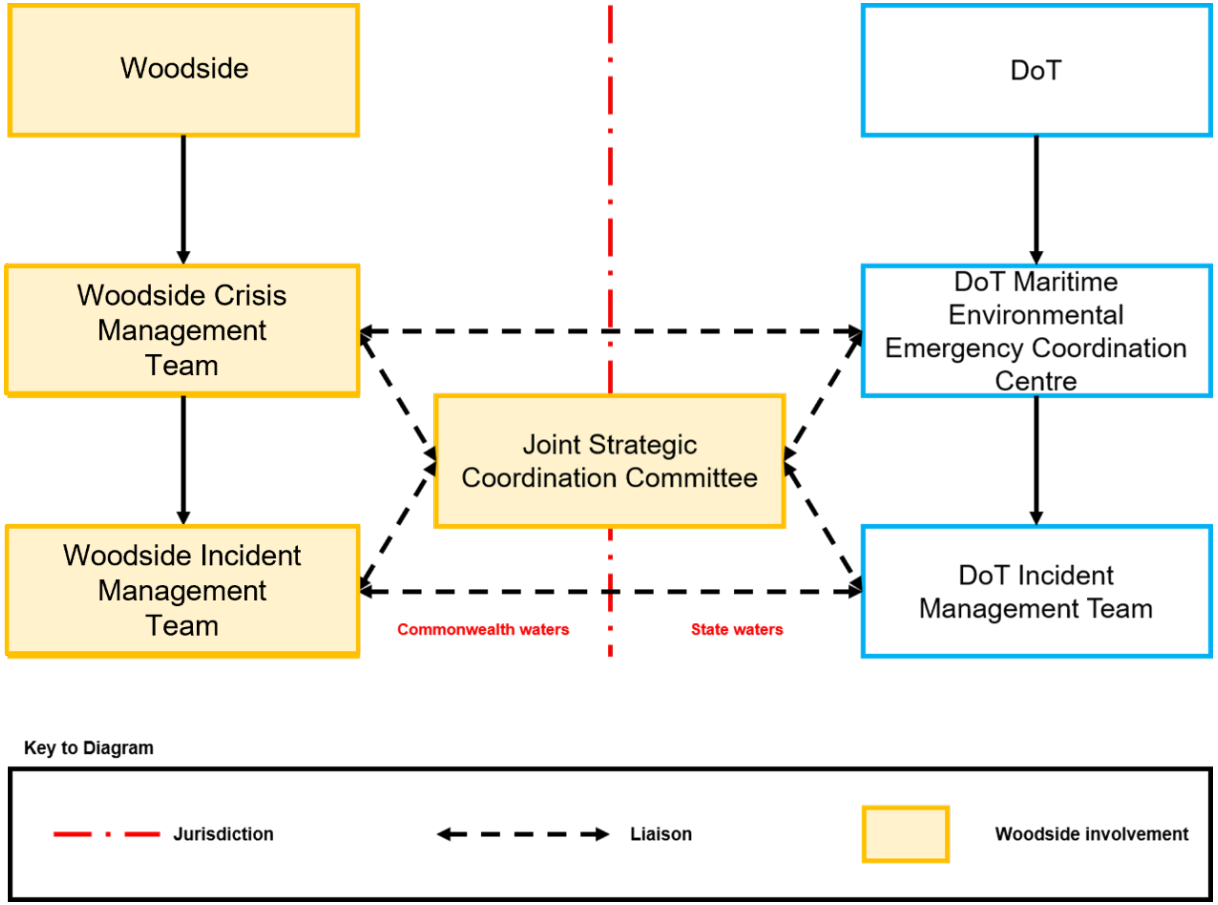
FORM 1 – RECORD OF INITIAL VERBAL NOTIFICATION TO NOPSEMA

NOPSEMA phone: [4]		
Date of call		
Time of call		
Call made by		
Call made to		
Information to be provided to NOPSEMA:		
Date and time of incident/ time caller became aware of incident		
Details of incident	**1. Location**	
	2. Title	
	3. Source	□ **Platform**
		□ **Pipeline**
		□ **FPSO**
		□ **Exploration drilling**
		□ **Well**
		□ **Other (please specify)**
	4. Hydrocarbon type	
	5. Estimated volume	
	6. Has the discharge ceased?	
	7. Fire, explosion or collision?	
	8. Environment Plan(s)	
	9. Other Details	
Actions taken to avoid or mitigate environmental impacts		
Corrective actions taken or proposed to stop, control or remedy the incident		
After the initial call is made to NOPSEMA, please send this record as soon as practicable to:		
NOPSEMA	**[4]**	
NOPTA	**[5]**	
DEMIRS	**[6]**	

APPENDIX C – SPILL ASSESSMENT QUESTIONS

What has happened?		
Date/time		
Spill source		
Spill cause		
Safety situation		
What is it?		
Oil type and name		
Oil properties	Specific gravity	
	Viscosity	
	Pour point	
	Asphaltenes	
	Wax content	
	Boiling point	
Where is it?		
Latitude and longitude		
Distance and bearing		
Affected area	☐ Offshore	
	☐ Subsea	
	☐ Shoreline	
	☐ Estuary	
	☐ Port	
	☐ Harbour	
	☐ Inland	
	☐ River	
	☐ Other (please detail):	
Water depth		
How big is it?		
Area		
Release type	☐ Instantaneous	Estimated volume:
	☐ Continuous release	Estimated release rate:
Where it is going?		
Metocean conditions		
Currents and tides		
What is in the way?		
Resources at risk		
Time until resource contact		
What's happening to it?		
Weathering processes		
Response actions underway		

APPENDIX D – COORDINATION STRUCTURE FOR A CONCURRENT HYDROCARBON SPILL IN BOTH COMMONWEALTH AND STATE WATERS/ SHORELINES[3]



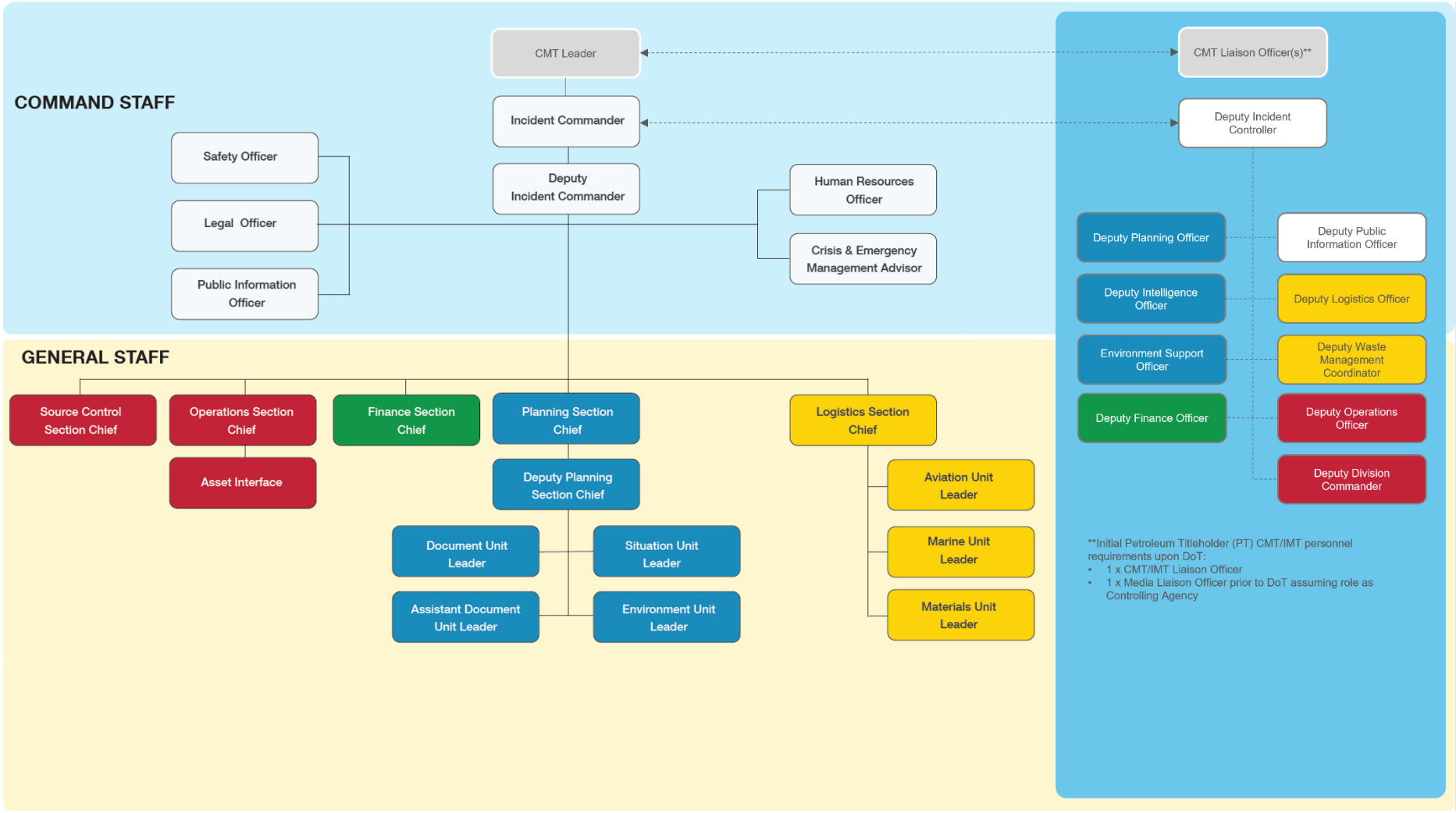
The Control Agency for a hydrocarbon spill in Commonwealth waters resulting from an offshore petroleum activity is Woodside (the Petroleum Titleholder).

The Control Agency/Hazard Management Authority (HMA) for a hydrocarbon spill in State waters/shorelines resulting from an offshore petroleum activity is DoT. DoT will appoint an Incident Controller and form a separate IMT to only manage the spill within State waters/shorelines.

[3] Adapted from DoT Offshore Petroleum Industry Guidance Note, Marine Oil Pollution: Response and Consultation Arrangements July 2020. Note: For full structure up to Commonwealth Cabinet/Minister refer to Marine Oil Pollution: Response and Consultation Arrangements Section 6.5, Figure 4.

APPENDIX E – WOODSIDE INCIDENT MANAGEMENT STRUCTURE

Woodside incident management structure for hydrocarbon spill (including Woodside Liaison Officers command structure within DoT IMT if required).



APPENDIX F – WOODSIDE LIAISON OFFICER RESOURCES TO DOT

In the event that DoT is required to establish an IMT, Woodside will make available an appropriate number of appropriately qualified persons to work within the DoT IMT.

It is an expectation that Woodside's nominated CMT Liaison Officer and the Deputy Incident Controller attend the DoT Fremantle Incident Control Centre (ICC) as soon as possible after the formal request has been made by the State Marine Pollution Coordinator (SMPC), and that the remaining initial cohort will attend no later than 8 am on the day following the request being formally made to Woodside by the SMPC. For Woodside personnel designated to serve in DoT's Forward Operating Base (FOB), it is expected that they arrive at the FOB no later than 24 hours from the formal request being made by the SMPC.

Area	Role	Woodside Liaison Role[4]	Key Duties	#
DoT Maritime Environmental Emergency Coordination Centre (MEECC)	CMT Liaison Officer	CIMT Liaison	• Provide a direct liaison between the CMT and the MEECC. • Facilitate effective communications and coordination between the CIMT 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	Deputy Incident Controller	Deputy Incident Commander (Deputy IC)	• 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	Deputy Intelligence Officer	Situation Unit Leader (Intelligence)	• 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

[4] *These positions would be mobilised, in consultation with DoT, to align to the actual spill scenario. The selected roles and/or individual personnel would be subject to continued evaluation to ensure continued 'best fit'. For CIMT roster arrangements, contact the WCC. During a prolonged response, additional personnel may be sourced through internal resourcing and mutual Aid agreements such as the AMOSC Core Group via [11]*

Area	Role	Woodside Liaison Role[4]	Key Duties	#
DoT IMT Intelligence – Environment	Environment Support Officer	Deputy Environment Unit Leader	• 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	Deputy Planning Section Chief	• As part of the Planning Team, assist the Planning Officer in the performance of their duties in relation to the interpretation of existing response plans and the development of incident action plans and related sub plans. • Facilitate the provision of relevant IAP and sub plans from the PT IMT. • Assist in the interpretation of the PT OPEP from the PT. • Assist in the interpretation of the PT IAP and sub plans from the PT IMT. • Facilitate the provision of relevant IAP and sub plans originating from the DoT IMT to the PT IMT. • Assist in the interpretation of the PT existing resource plans. • Facilitate the provision of relevant components of the resource sub plan originating from the DoT IMT to the PT IMT. **(Note this individual must have intimate knowledge of the relevant PT OPEP and planning processes)**	1
DoT IMT Public Information-Media/ Community Engagement	Deputy Public Information Officer	Deputy Public Information Officer	• 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

Area	Role	Woodside Liaison Role[4]	Key Duties	#
DoT IMT Logistics	Deputy Logistics Officer	Deputy Logistics Section Chief	• 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	Deputy Finance Section Chief	• As part of the Finance Team, assist the Finance Officer in the performance of their duties in relation to the setting up and payment of accounts for those services acquired through the PTs existing OSRL, AMOSC and private contract arrangements. • Facilitate the communication of financial monitoring information to the PT to allow them to track the overall cost of the response. • Assist the Finance Officer in the tracking of financial commitments through the response, including the supply contracts commissioned directly by DoT and to be charged back to the PT.	1
DoT IMT Operations	Deputy Operations Officer	Deputy Operations Section Chief	• 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	Deputy Waste Management Coordinator	Deputy Waste Coordinator (Materials)	• 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 Division Commander	FOB Deputy Incident Commander	• 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.	1

Area	Role	Woodside Liaison Role[4]	Key Duties	#
			• 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.	
			Total	11

APPENDIX G – DOT LIAISON OFFICER RESOURCES TO WOODSIDE

Once DoT activates a State waters/shorelines IMT, DoT will make available the following roles to Woodside.

Area	DoT Liaison Role	Personnel Sourced from:	Key Duties	#
Woodside CIMT	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
Woodside 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

APPENDIX K: WOODSIDE MASTER EXISTING ENVIRONMENT

Description of the Existing Environment

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1. INTRODUCTION

1.1 Purpose

This document applies, where indicated in the relevant Environment Plan, to Woodside Energy Ltd. (Woodside) activities and operations.

1.2 Scope

This document describes the existing environment within the Woodside areas of activity located in Commonwealth waters off north-western Western Australia (WA), with a focus on the North-west Marine Region (NWMR) (**Figure 1-1**). This document includes details of the particular and relevant values and sensitivities of the environment as required by the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 in order to inform the impact and risk evaluation of Woodside's activities within the NWMR. Furthermore, the key values of the South-west Marine Region (SWMR) and the North Marine Region (NMR) are summarised to encompass areas outside the NWMR. This is with reference to the environment that may be affected (EMBA), as defined and described in individual EPs, for unplanned hydrocarbon spill risks. Additional information appropriate to the nature and scale of the impacts and risks of activities that may interact with the environment will be used to further inform impact and risk assessments and included in the Description of the Existing Environment of individual EPs.

This document is informed by a variety of resources that includes: a search of the Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) for the marine bioregions (NWMR, SWMR and NMR) and the three PMST reports provided in **Appendix A**; State (WA)/Commonwealth Marine Park Management Plans, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Species Profile and Threats Database (SPRAT), Part 13 statutory instruments (recovery plans, conservation advices and wildlife conservation plans for listed threatened and migratory species); and peer reviewed scientific publications, as well as Woodside and Joint Venture (JV) funded studies and other titleholder funded study findings available in the public domain.

1.3 Review and Revision

The information presented in this document is reviewed and updated, where relevant, on at least an annual basis to address any relevant changes, which includes but is not limited to the status of EPBC Act listed species, Part 13 Instruments, policies and guidelines and recently published scientific literature.

1.4 Regional Context

Where relevant, the physical, biological and social environments within the areas of interest are discussed with reference to the three marine bioregions of Australia—NWMR, SWMR and NMR (**Table 1-1)**. The NWMR is the focal marine bioregion for the Description of the Existing Environment as this is currently the location of most of Woodside's activities.

Table 1-1. Description of the Marine Bioregions

Marine Bioregion	Description
North-west	The NWMR includes all Commonwealth waters (from 3 nautical mile [nm] from the Territorial Sea Baseline [TSB] to the 200 nm Exclusive Economic Zone [EEZ] boundary) extending from the WA/Northern Territory (NT) border to Kalbarri, south of Shark Bay in WA, covering an area of approximately 1.07 million square kilometres and includes extensive areas of shallower waters on the continental shelf, as well as deep areas of abyssal plain where water depths are 5000 m or greater.
South-west	The SWMR comprises Commonwealth waters from the eastern end of Kangaroo Island in SA to Shark Bay in WA. The region spans approximately 1.3 million square kilometres of temperate and subtropical waters and abuts the coastal waters of SA and WA.
North	The NMR comprises Commonwealth waters from west Cape York Peninsula to the NT/WA border). The region covers approximately 625,689 square kilometres of tropical waters in the Gulf of Carpentaria and Arafura and Timor seas, and abuts the coastal waters of Queensland and the NT.

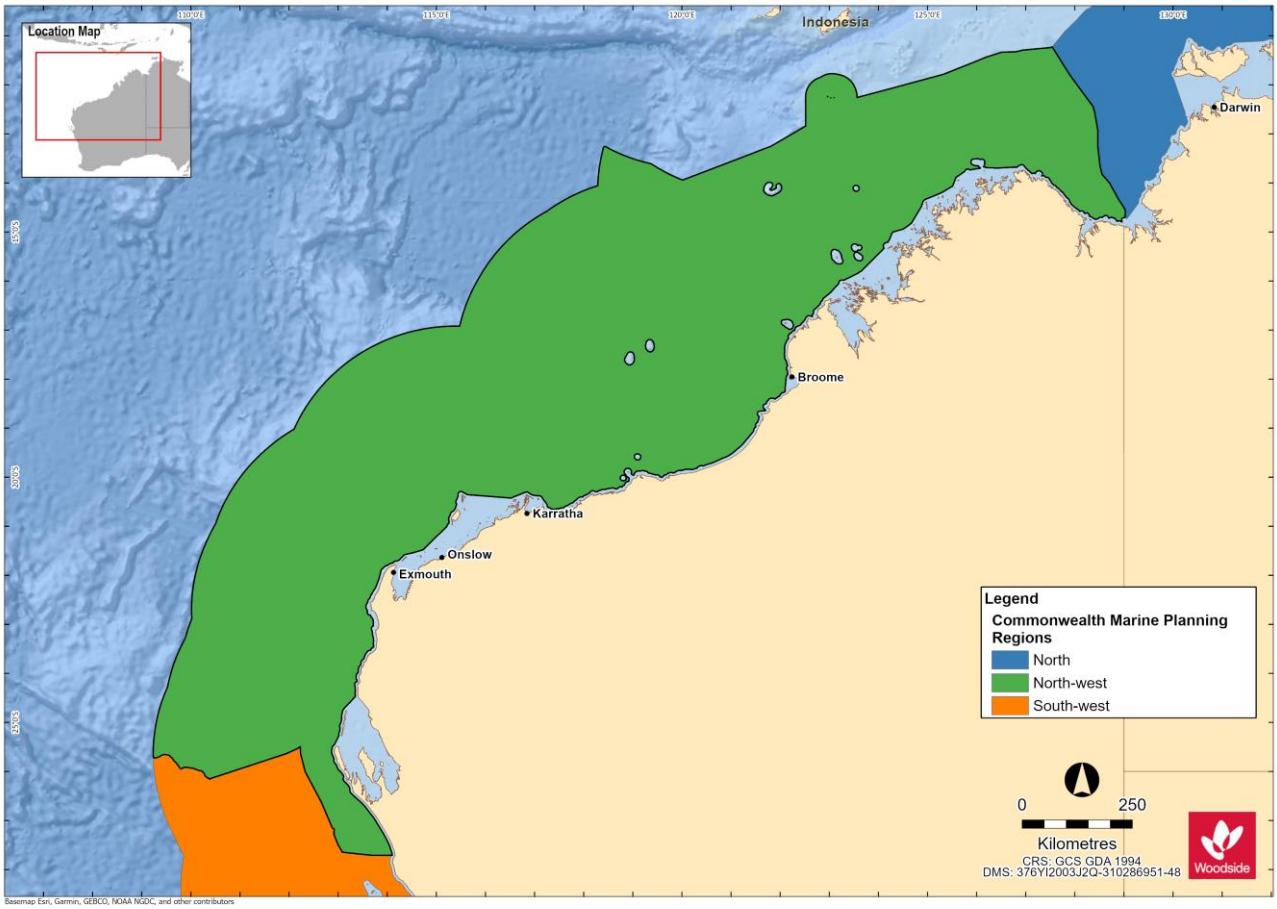

Figure 1-1. Marine Bioregions: North-west (NWMR), South-west (SWMR) and North (NMR)

2. PHYSICAL ENVIRONMENT

2.1 Regional Context

The key physical characteristics of the NWMR, SWMR and NMR are presented in **Table 2-1**.

Table 2-1 Key physical characteristics of the NWMR, SWMR and NMR

Bioregion	Key Characteristics
North-west Marine Region	The NWMR experiences a tropical monsoonal climate towards the northern extent of the region, transitioning to tropical arid and subtropical arid within the central and southern areas of the region (DSEWPAC, 2012a).
	The NWMR is part of the Indo-Australian Basin, the ocean region between the north-west coast of Australia and the Indonesian islands of Java and Sumatra. Dominant currents in the Region include: the South Equatorial Current, the Indonesian Throughflow; the Eastern Gyral Current, and the Leeuwin Current (DEWHA, 2007a).
	The seafloor of the NWMR consists of four general feature types: continental shelf; continental slope; continental rise; and abyssal plain and is distinguished by a range of topographic features including canyons, plateaus, terraces, ridges, reefs, and banks and shoals.
South-west Marine Region	The SWMR contains both subtropical and temperate climates, with overall light climatic cycles.
	The SWMR experiences complex and unusual oceanographic patterns, driven largely by the Leeuwin Current and its associated currents that have a significant influence on biodiversity distribution and abundance.
	The major seafloor features of the SWMR include a narrow continental shelf on the west coast to the waters off south-west WA, and a wide continental shelf dominated by sandy carbonate sediments of marine origin in the Great Australian Bight, the region also contains a steep, muddy continental slope, many canyons and large tracts of abyssal plains (DSEWPAC, 2012b).
North Marine Region	The NMR experiences a tropical monsoonal climate with complex weather cycles, including high temperatures and heavy seasonal yet variable rainfall and cyclones, which can be both destructive (loss of seagrass and mangroves) and constructive (mobilisation of sediment into coastal habitats).
	The NMR comprises Commonwealth waters from west Cape York Peninsula to the NT–WA border, covering tropical waters in the Gulf of Carpentaria and Arafura and Timor seas. Currents in the NMR are driven largely by strong winds and tides, with only minor influences from oceanographic currents such as the Indonesian Throughflow and the South Equatorial Current (DSEWPAC, 2012c).
	The seafloor of the NMR consists mainly of a wide continental shelf, as well as other geomorphological features such as shoals, banks, terraces, valleys, shallow canyons and limestone pinnacles.

2.2 Marine Systems of the North-west Marine Region.

The NWMR can be divided into three large scale ecological marine systems on the basis of the influence of major ocean currents, seafloor features and eco-physical processes (e.g. climate, tides, freshwater inflow) upon the Region (DSEWPAC, 2012a). The three large scale marine systems approximate the Woodside activity areas within the NWMR (**Figure 2-1**). The key characteristics of each marine system are outlined below in **Table 2-2**.

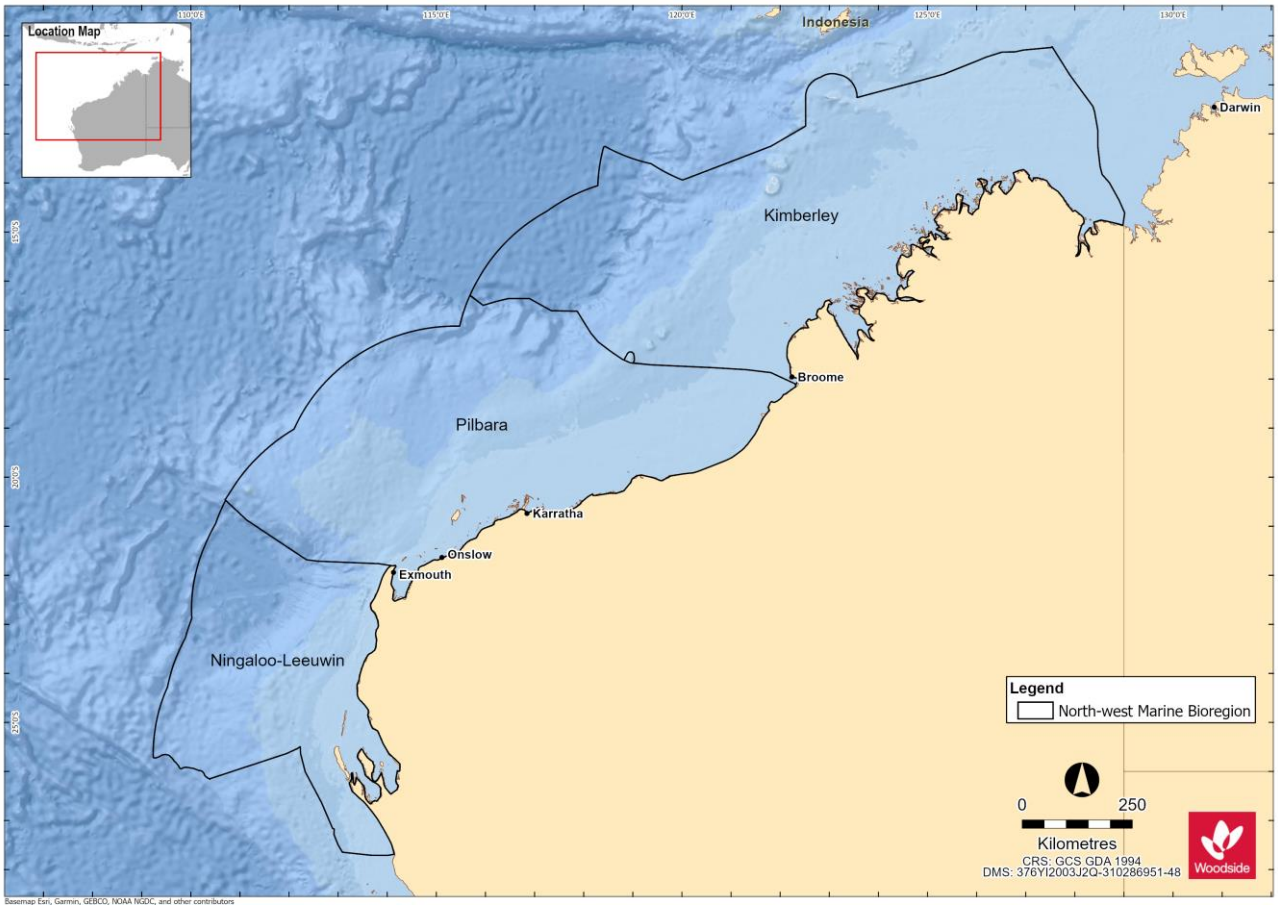

Figure 2-1. The marine systems of the North-west Marine Region (NWMR)

Table 2-2. Key characteristics of the Marine Systems of the NWMR

Note: Woodside areas align with the marine systems as described in DEWHA (2007a)

Marine System	Woodside Activity Area	Key Characteristics
Kimberley	Browse	Tropical monsoonal climate Strong influence from Indonesian Throughflow Predominantly tropical Indo-Pacific species Subject to episodic offshore cyclonic activity, rarely crossing the coast Large tidal regimes Freshwater input from terrestrial monsoonal run-off Turbid coastal waters (i.e. light limited systems) Dominated by shelf environments Predominantly hard substrates in inner to mid-shelf environments Includes a number of shelf-edge atolls (i.e. Scott Reef, Rowley Shoals)
Pilbara	North-west Shelf (NWS) / Scarborough	Tropical arid climate Transition between Indonesian Throughflow and Leeuwin Current dominated areas Predominantly tropical species High cyclone activity with frequent crossing of the coast Transitional tidal zone Internal tide activity Large areas of shelf and slope Dry coast with ephemeral freshwater inputs
Ningaloo-Leeuwin	North-west Cape	Subtropical arid climate Leeuwin Current consolidates Transitional tropical/temperate faunal area Higher water clarity in near-shore and offshore environments Narrow shelf and slope Marginal tidal range Seasonal wind forcing more dominant influence on marine environment

2.3 Meteorology and Oceanography

This section describes the general meteorological conditions and oceanography for the NWMR and provides further detail for the three Woodside activity areas. The NWMR is influenced by a complex system of ocean currents that change between seasons and between years, which generally result in its surface waters being warm and nutrient-poor, and of low salinity (DEWHA, 2007a). The mix of bathymetric features, complex topography and oceanography across the whole north-west marine environment has created and supports a globally important marine biodiversity hotspot (Wilson, 2013).

Table 2-3 NWMR climate and oceanography summary

Receptor	Description
Meteorology	
Seasonal patterns	The NWMR associated land mass of the Australian continent is characterised as a hot and humid summer climate zone. The broader NWMR experiences variations of a tropical or monsoon climate. In the far north-west (Kimberley), there is a hot summer season from December to March and a milder winter season between April and November. The Pilbara area is described as having a tropical arid climate with high cyclone activity (DEWHA, 2007a). The Pilbara and North-west Cape has a hot summer season from October to April and a milder winter season between May and September with transition periods between the summer and winter regimes.
Air temperature and rainfall	In summer (between September and March), maximum daily temperatures range from 31ºC to 33ºC. During winter (May to July), mean daily temperatures range from 18ºC to 31ºC (BOM[1]), refer to **Figure 2-2a** and **b**. Rainfall in the region typically occurs during the summer, with highest falls observed late in the season. This is often associated with the passage of tropical low-pressure systems and cyclones.
Wind	Wind patterns in north-west WA are dictated by the seasonal movement of atmospheric pressure systems. During summer, high-pressure cells produce prevailing winds from the north-west and south-west, which vary between 10 and 13 ms^{-1}. During winter, high-pressure cells over central Australia produce north-easterly to south-easterly winds with average speeds of between 6 and 8 ms^{-1}. Refer to **Figure 2-3a** and **b**.
Tropical cyclones	The NWS and Pilbara coast (within the NWMR) experiences more cyclonic activity than any other region of the Australian mainland coast (BOM, 2021a). Tropical cyclone activity typically occurs between November and April and is most frequent in the region during December to March (i.e. considered the peak period), with an average of about one cyclone per month (BOM, 2021a). Refer to **Figure 2-4**.
Oceanography	
Ocean temperature	Waters in NWMR are tropical year-round, with sea surface temperature in open shelf waters reaching ~26°C in summer and dropping to ~22°C in winter. Nearshore temperatures (as recorded for the NWS area) fluctuate more widely on an annual basis from ~17°C in winter to ~31°C in summer (Chevron Australia, 2010). Refer to **Figure 2-5a** and **b**.
Currents	The major surface currents influencing north-west WA flow towards the poles and include the Indonesian Throughflow, the Leeuwin Current, the South Equatorial Current, and the Eastern Gyral Current. The Ningaloo Current, the Holloway Current, the Shark Bay Outflow, and the Capes Current are seasonal surface currents in the region. Below these surface currents are several subsurface currents, the most important of which are the Leeuwin Undercurrent and the West Australian Current. These subsurface currents flow towards the equator in the opposite direction to surface currents (DEWHA, 2007a). Refer to **Figure 2-6**. The offshore waters of the NWMR are characterised by surface and subsurface boundary currents that flow along the continental shelf/slope and are enhanced through inflows from the ocean basins and are an important conduit for the poleward heat and mass transport along the west coast (Wijeratne *et al.*, 2018). Local physical oceanography is strongly influenced by the large-scale water movements of the Indonesian Throughflow (Liu *et al*. 2015; Sutton *et al*. 2019). Typically, a warm and well-mixed oligotrophic surface layer and a cooler and more nutrient rich, deeper water layer (Menezes *et al*. 2013).
Waves	Sea surface waves within the NWMR, generally reflect the direction of the synoptic winds and flow predominately from the south-west in the summer and east in winter (Pearce *et al.*, 2003). The NWS within the NWMR is a known area of internal wave generation. Both internal tides and internal waves are thought to be more prevalent during summer months due to the increased stratification of the water column (DEWHA, 2007a). Along the continental slope of the NWMR, strong internal waves and interaction between semi-diurnal tidal currents and seabed topographic features facilitates upwelling events and localised productivity events (Holloway, 2001).
Tides	Tides on the NWS (NWMR) increase as the water moves from deep towards the shallower coast. The highest offshore tides are experienced at the border of the Browse and Canning basins. The smallest tides are experienced at the Exmouth Plateau, near the coast. Tides of NWS (NWMR) are predominantly semi-diurnal (two highs and two lows each day), but with increasing importance of the diurnal (once per day) inequality at the southern and northern extremities of the NWS.

[1] http://www.bom.gov.au/jsp/ncc/climate_averages/temperature/index.jsp, accessed 21 January 2021.

Receptor	Description
	The tide range—represented by the Mean Spring Range (MSR)—increases northwards along the coast from 1.4 m at North-west Cape (Point Murat) to 7.7 m at Broome, before decreasing again (apart from local amplification in King Sound and Collier Bay) to about 5 m off Cape Londonderry. The MSR then increases again through Joseph Bonaparte Gulf and on up 5.5 m at Darwin (RPS, 2016).

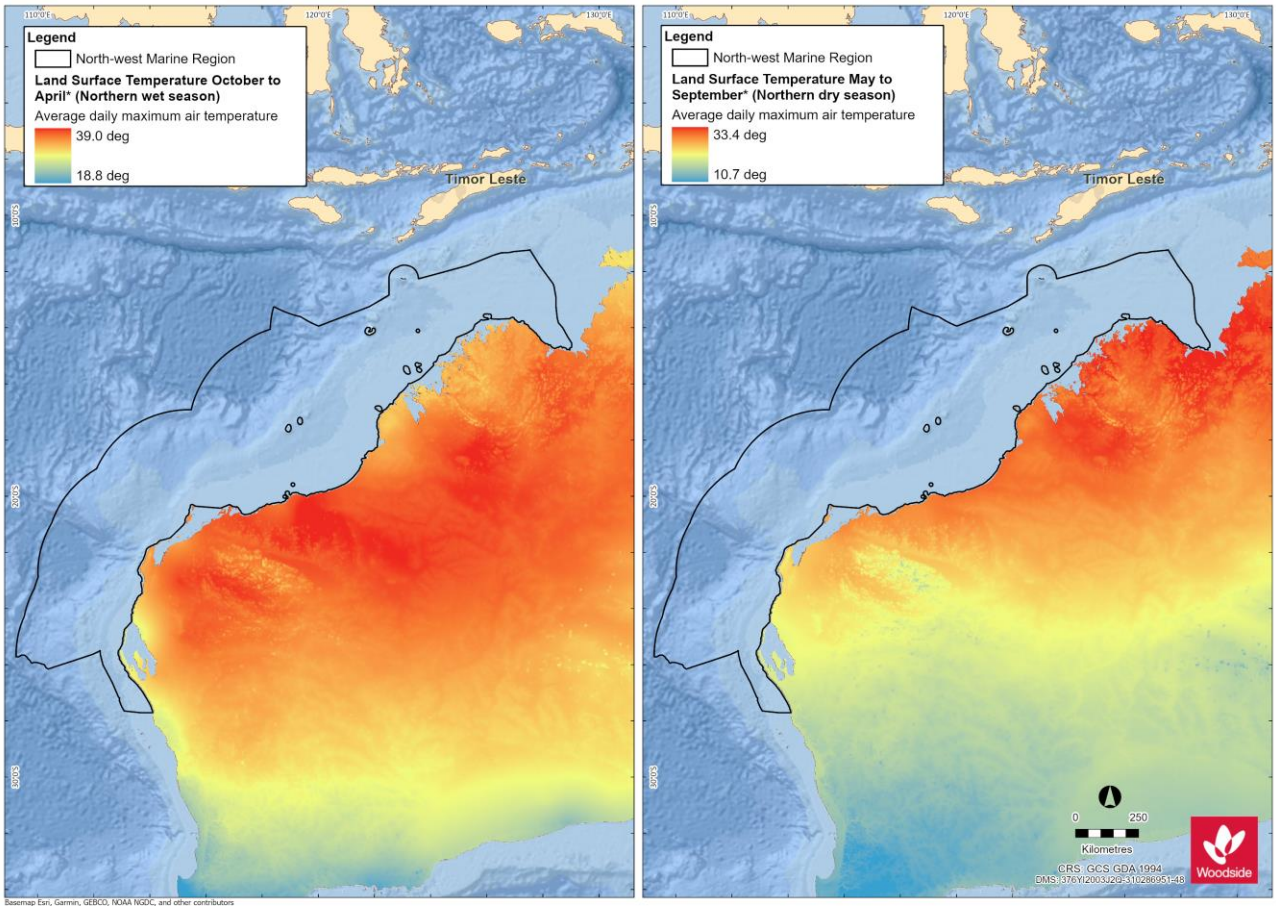

Figure 2-2. Average daily maximum air temperature for land surface adjacent to NWMR: (a) summer (northern wet season) and (b) winter (northern dry season)

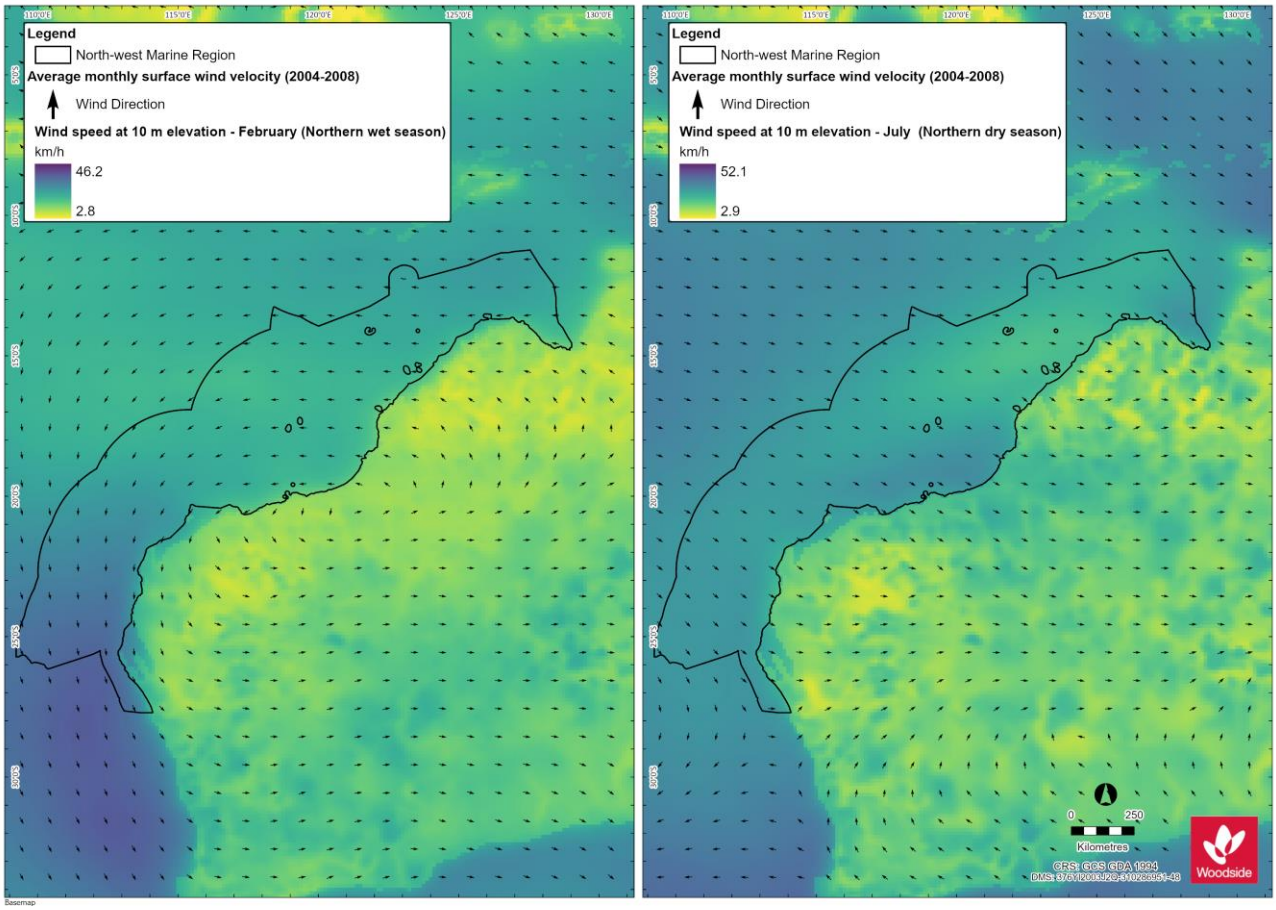

Figure 2-3. Average monthly surface wind direction and velocity for NWMR: (a) summer (February, northern wet season) and (b) winter (July, northern dry season)

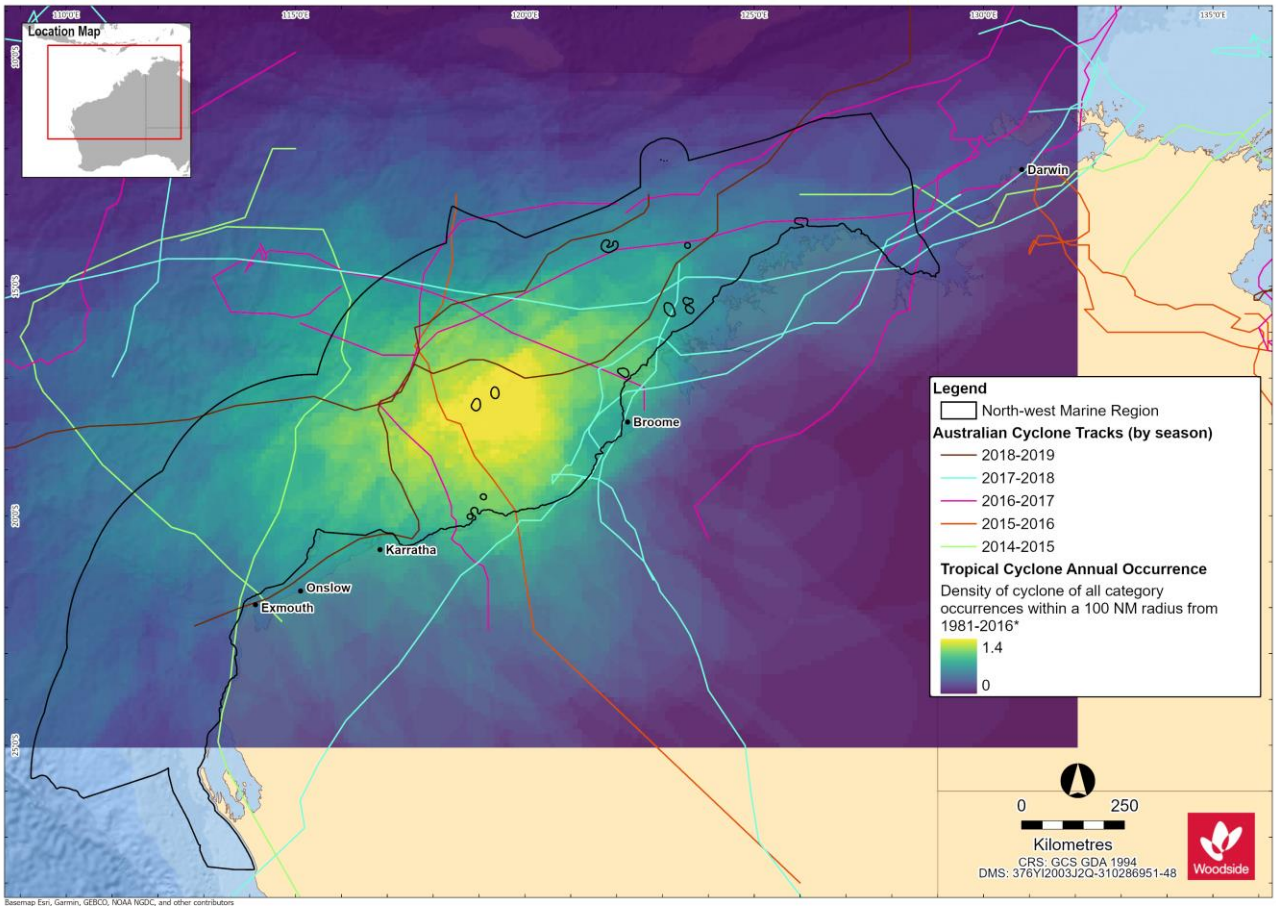

Figure 2-4. Tropical cyclone annual occurrence and cyclone tracks for NWMR

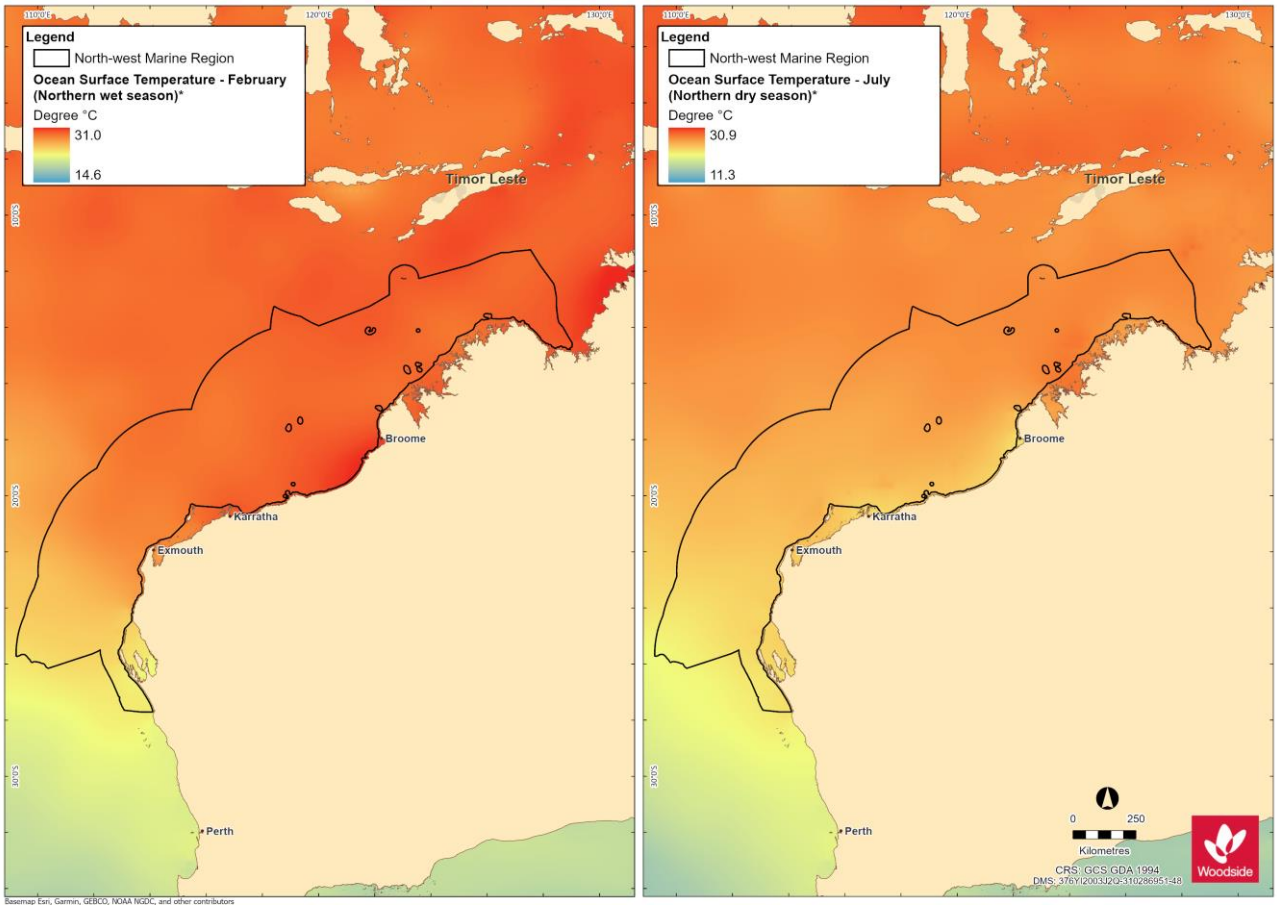

Figure 2-5. Ocean surface temperature for NWMR: (a) summer (February, northern wet season) and (b) winter (July, northern dry season)

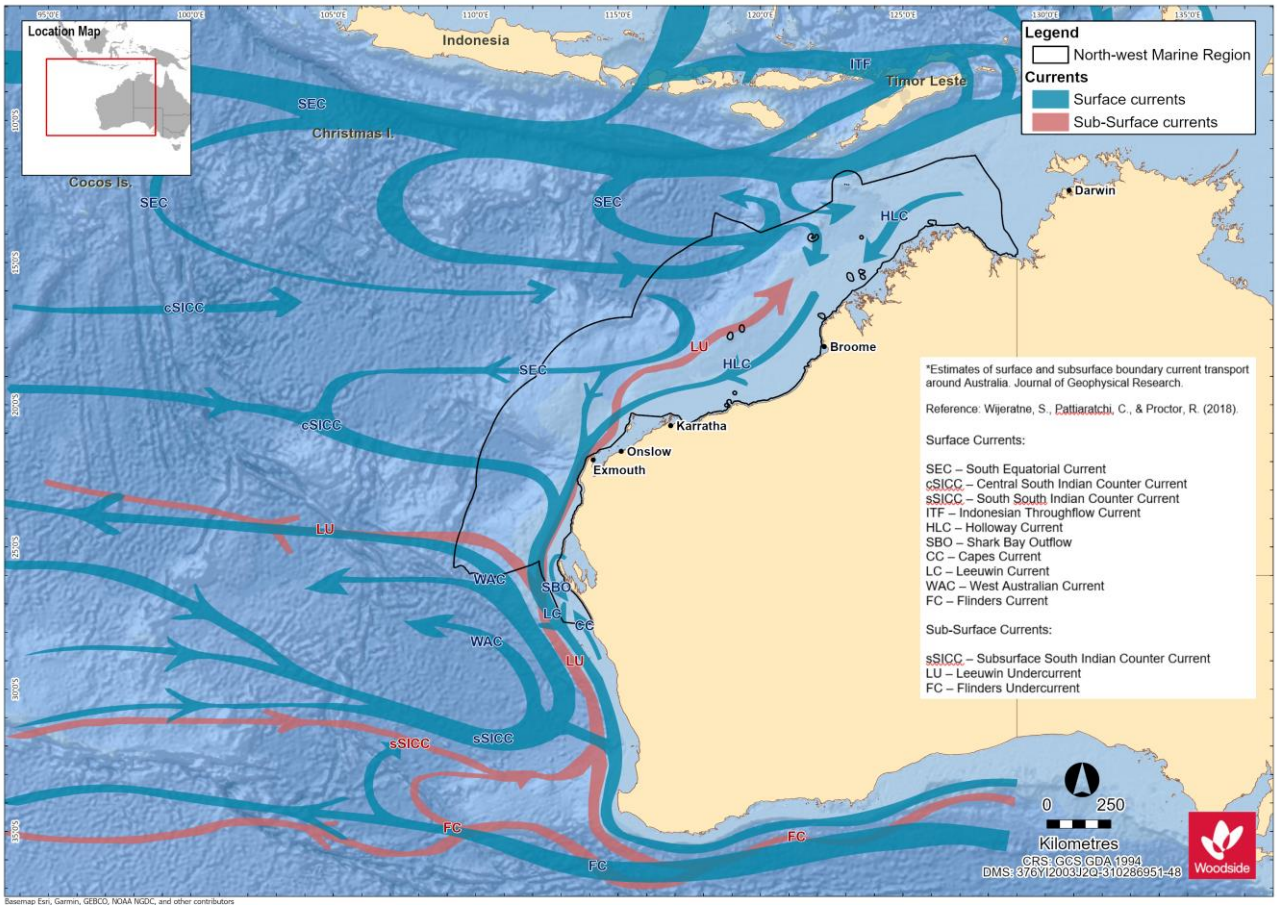

Figure 2-6. Ocean surface and sub-surface currents of the NWMR and wider region

2.3.1 Browse

Table 2-4 Summary meteorology and oceanography for Browse (refer to Appendix B for supporting metocean figures)

Receptor	Description
Meteorology	
Seasonal patterns	The Browse area overlapping the Kimberley marine system experiences tropical monsoon climate with two distinct seasons: the wet season from December to March and dry season from April to November.
Air temperature	The mean annual air temperature recorded at Troughton Island between 2010 and 2020 ranged from 30.1ºC in 2011 to 32.6ºC in 2016 and highest mean monthly air temperatures were recorded for the months of November and December (BOM, 2021b).
Rainfall	Rainfall recorded from Troughton Island in the Browse basin ranged from barely detectable (<1 mm) mean monthly level to >100 mm in December to March, with the highest rainfall recorded for January. Reflecting the wet monsoon season of the Kimberley marine system (BOM, 2021c).
Wind	The dry season experiences high pressure systems that bring east to south-easterly winds with average wind speeds during the season of approximately 16.6 km/hr and maximum wind gusts of 65 km/hr. In contrast the wet season brings predominately westerly winds with average wind speeds approximately 17 km/hr and maximum gusts exceeding 100 km/hr (generally associated with tropical cyclones (MetOcean Engineers, 2005).
Oceanography	
Currents	Surface currents exhibit seasonal directionality, with flow to the south-west during March to June and more variable outside this period (Woodside, 2019). This is consistent with the stronger Leeuwin Current flow during winter months, with more variable currents driven by local wind stress during periods of weaker Leeuwin Current flow.

2.3.2 North West Shelf / Scarborough

Table 2-5 Summary meteorology and oceanography for the North West Shelf and Scarborough (refer to Appendix B for supporting metocean figures)

Receptor	Description
Meteorology	
Seasonal patterns	The NWS and Scarborough areas experience the monsoonal climate of the wider NWMR with a distinct wet and dry seasonal regime and transitions periods between seasons.
Air temperature	Air temperatures as measured at the North Rankin A platform on NWS ranged from a maximum average of 39.5ºC in summer to a minimum average temperature of 15.6ºC in winter (Woodside, 2012).
Rainfall	Rainfall patterns annually reveal the wet season with highest rainfalls during the late summer, often associated with the passage of tropical low-pressure systems and cyclones. Rainfall in the dry season is typically extremely low. (Pearce *et al.* 2003).
Wind	Winds are typically from the southwest during the wet season (summer) and tending from the south-east during the dry season (winter). The summer south-westerly winds are driven by high pressure cells that pass from west to east over the Australian continent. During the winter period, the relative position of the high-pressure cells shifts further north, leading to prevailing south-easterly winds from the mainland (Pearce *et al.* 2003).
Oceanography	
Currents	The large-scale ocean currents of the NWMR, primarily the Indonesian Throughflow and Leeuwin Current (and Holloway Current), are the primary influence on the NWS and Scarborough areas. The ITF and Leeuwin Current are strongest during the late summer and winter and flow reversals to the north-east, typically short-lived and weak, when there are strong south-westerly winds can generate localised upwelling on the shelf edge (Holloway and Nye, 1985; James *et al.* 2004 and Condie *et al.* 2006).

2.3.3 North-west Cape

Table 2-6 Summary meteorology and oceanography for the North-west Cape (refer to Appendix B for supporting metocean figures)

Receptor	Description
Meteorology	
Seasonal patterns	The climate of the NWMR is dry tropical exhibiting a hot summer season and a mild winter season. There are often distinct transition periods between the summer and winter regimes, characterised by periods of relatively low winds.
Air temperature	Air temperatures in the North-west Cape area range from high summer temperatures (maximum average of 37.5ºC) and mild winter temperatures (minimum average of 12.2ºC).
Rainfall	Rainfall typically occurs during the summer, with highest rainfall during later summer and autumn, often associated with the passage of tropical low-pressure systems and cyclones. Rainfall is typically low in winter.
Wind	Winds vary seasonally, generally from the south-west quadrant during summer months and the south, south-east quadrant during the autumn and winter months. The summer south-westerly winds are driven by high pressure cells that pass from west to east over the Australian continent. Winds typically weaken and are more variable during the transitional period between the summer and winter seasons, generally between April to August.
Oceanography	
Currents	Surface currents exhibit seasonal directionality, with flow to the south-west during March to June and more variable outside this period (Woodside, 2016). This is consistent with the stronger Leeuwin Current flow during winter months, with more variable currents driven by local wind stress during periods of weaker Leeuwin Current flow.

2.4 Physical Environment of NWMR

Based on the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) Version 4.0, there are eight provincial bioregions that occur within the NWMR, which are based on patterns of demersal fish diversity, benthic habitat and oceanographic data (Commonwealth of Australia, 2006), **Figure 2-7**. Of the eight provincial bioregions that occur within the NWMR, these include four offshore (~65% of total NWMR area) and four shelf (~35% of total NWMR area) bioregions (Baker *et al.,* 2008).

The NWMR is a tropical carbonate margin that comprises an extensive area of shelf, slope and abyssal plain/deep ocean floor, as well as complex areas of bathymetry such as plateau, terraces and major canyons (Harris *et al.*, 2005). A series of reefs are located on the outer shelf/slope of the NWMR, including Ashmore, Cartier, Scott and Seringapatam reefs (Baker *et al*., 2008). The distribution of seafloor geomorphic features has been systematically mapped over much of the Australian margin and adjacent seafloor. The mapped area can be divided into 10 geomorphic regions, of which the NWMR overlays two; the Western Margin and Northern Margin (Harris *et al.*, 2005). Most of the region consists of either continental slope (61%) or continental shelf (28%) (DEWHA, 2007a) with more than 40% of the NWMR having a water depth less than 200 m. The shallow shelf is contrasted by features such as the Cuvier and Argo abyssal plains, which reach depths more than five kilometres. A unique feature of the region is the significant narrowing of the continental shelf around North-west Cape (approximately 7 km wide) from the broad continental shelf in the north of the region (approximately 400 km wide at Joseph Bonaparte Gulf) (DEWHA, 2007a), **Figure 2-8.**

The geological history of the region, as well as its geomorphology and oceanography, has influenced the composition and distribution of sediments (DEWHA, 2007a). The sedimentology of the NWMR is dominated by marine carbonates, which show a broad zoning and fining with water depth. Main trends of the NWMR sediments include a tropical carbonate shelf that is dominated by sand and gravel, an outer shelf/slope zone that is dominated by mud and a relatively homogenous rise and abyssal plain/deep ocean floor that is dominated by non-carbonate mud (Baker *et al.,* 2008), **Figure 2-9**.

The distribution and resuspension of sediments on the inner shelf is strongly influenced by the strength of tides across the continental shelf as well as episodic events such as cyclones. Further offshore, on the mid to outer shelf and on the slope itself, sediment movement is primarily influenced by ocean currents and internal tides (DEWHA, 2007a).

This variation in bathymetry and interactions with oceanographic processes provides a diversity of habitats to marine fauna and flora within the NWMR.

2.5 Air quality

The ambient air quality of all three marine regions is largely unpolluted due to the extent of the open ocean area, the activities currently carried out in each and the relative remoteness of each region.

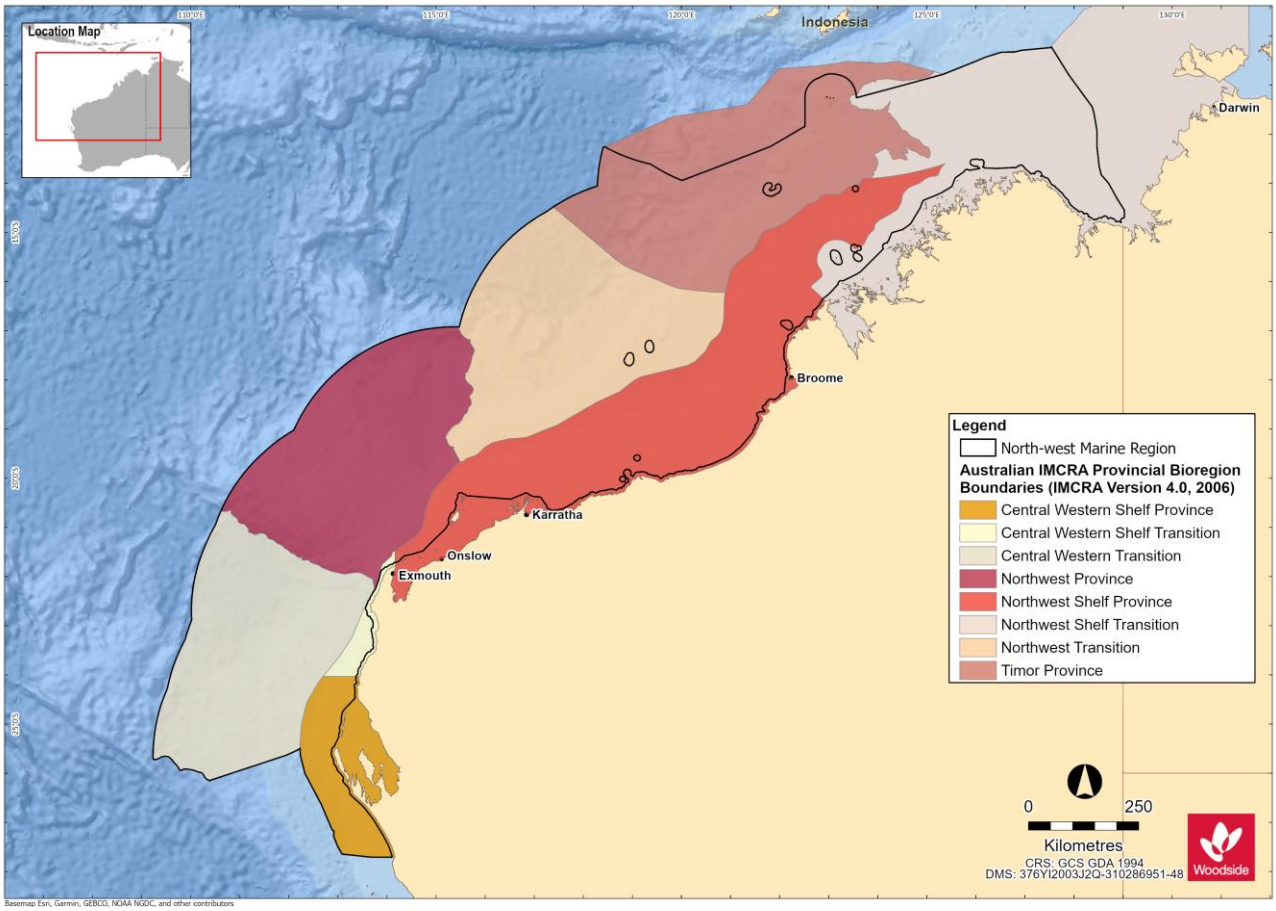

Figure 2-7. The eight provincial bioregions of the NWMR (Commonwealth of Australia, 2006)

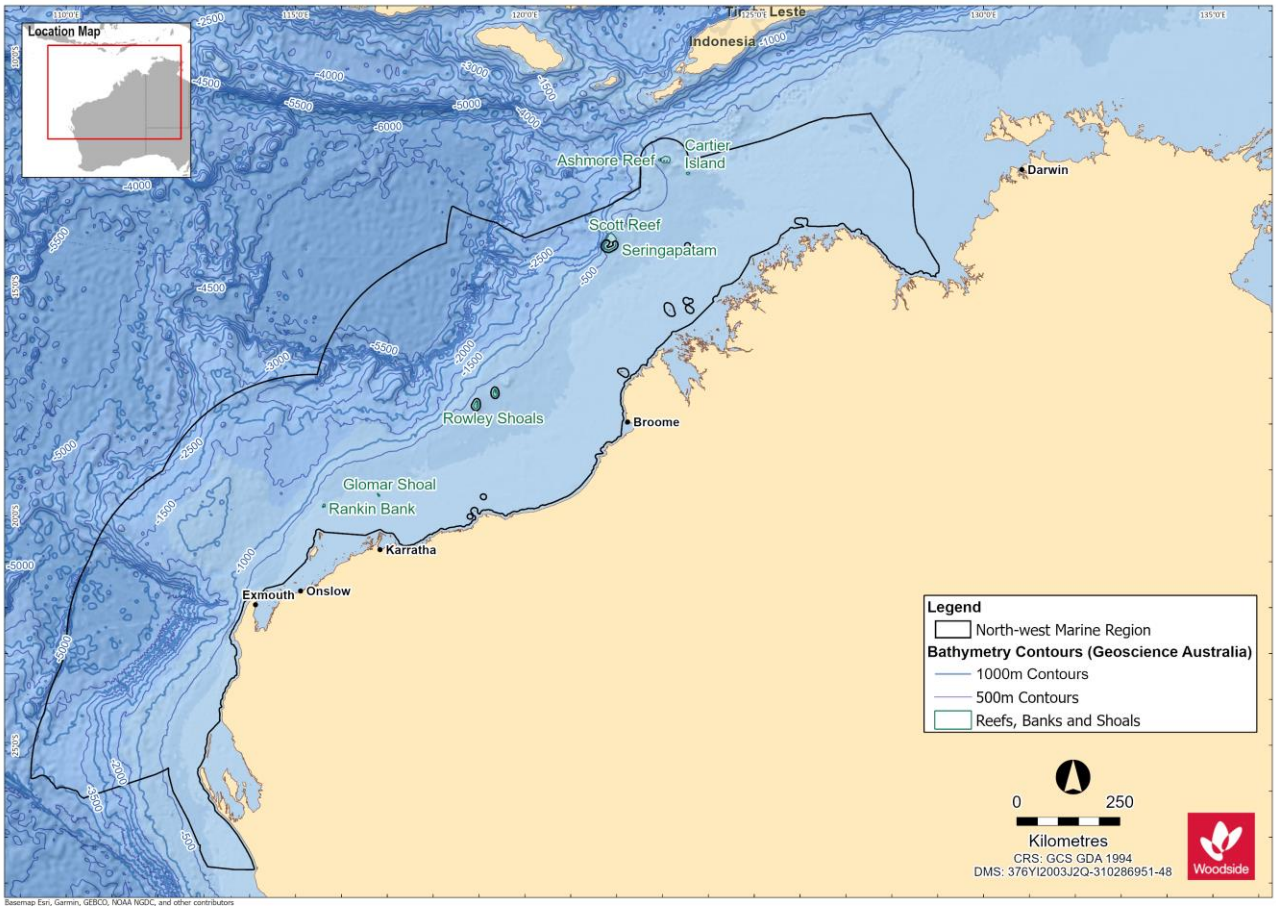

Figure 2-8. Bathymetry of the NWMR

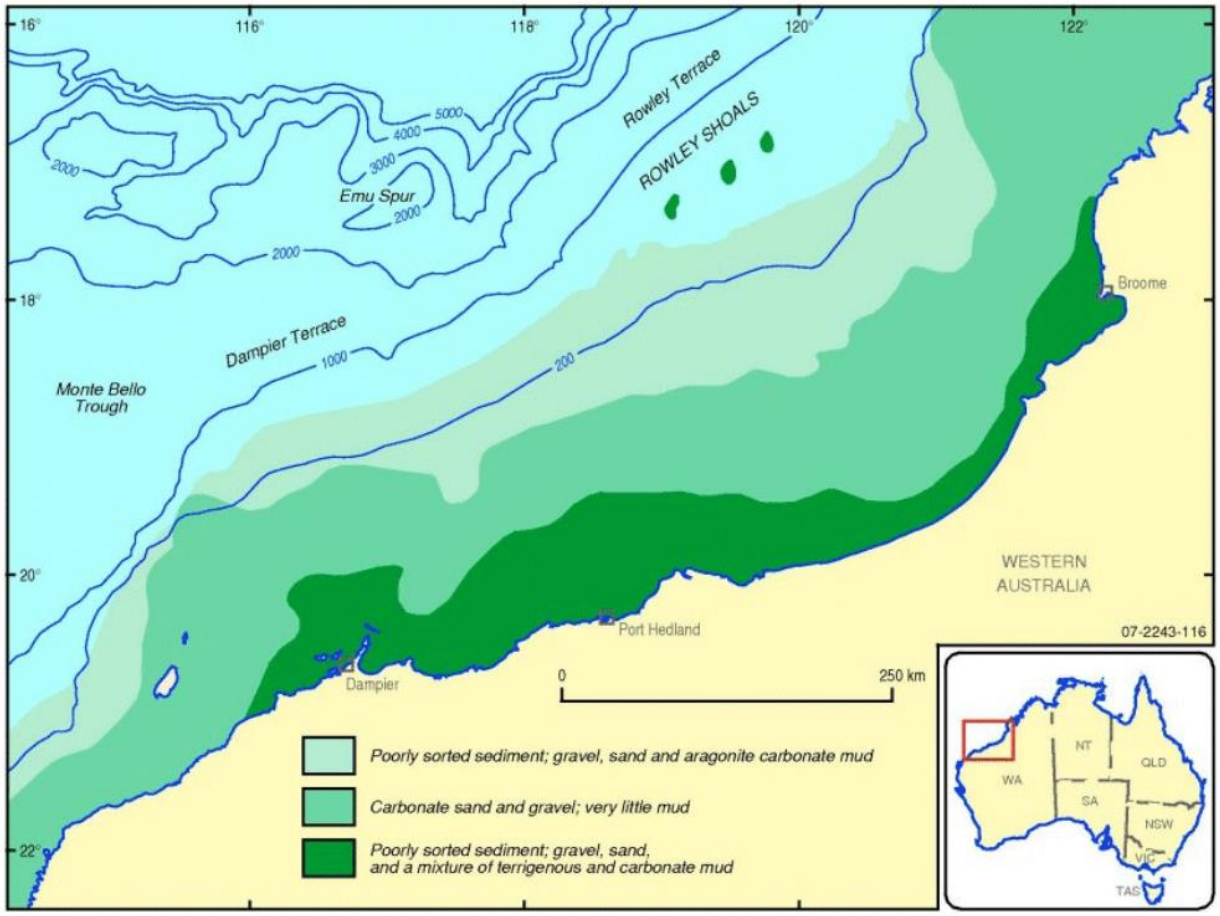

Figure 2-9. Overview of the seabed sediments of the NWMR (Baker *et al*., 2008)

3. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE (EPBC ACT)

3.1 Summary of Matters of National Environmental Significance (MNES)

This section summarises the matters of national environmental significance (MNES) reported for the three bioregions; NWMR **(Table 3-1),** SWMR (**Table 3-2**) and NMR (**Table 3-3**), based on the Protected Matters search reports (**Appendix A**).

Additional information on these MNES are provided in subsequent sections (referenced below).

Table 3-1 Summary of MNES identified by the EPBC Act Protected Matters Search Tool (PMST) as potentially occurring within the NWMR

MNES	Number	Description	Section of this Document
World Heritage Properties	2	Shark Bay The Ningaloo Coast	**Section 10**
National Heritage Places	5	Shark Bay The Ningaloo Coast The West Kimberley The Dampier Archipelago (including Burrup Peninsula) Dirk Hartog Landing Site 1616	**Section 10**
Wetlands of International Importance (Ramsar)	3	Ashmore Reef National Nature Reserve Eighty Mile Beach Roebuck Bay[1]	**Section 10**
Commonwealth Marine Area	2	EEZ and Territorial Sea Key Ecological Features (KEFs) Australian Marine Parks (AMPs) Australian Whale Sanctuary Extended Continental Shelf	**Section 9** **Section 10**
Listed Threatened Ecological Communities	1	Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula	Terrestrial community and not considered further
Listed Threatened Species	70	Refer NWMR PMST report (**Appendix A**)	**Section 5 – Section 8**
Listed Migratory Species	84	Refer NWMR PMST report (**Appendix A**)	**Section 5 – Section 8**

[1] *Roebuck Bay is a designated Wetland of International Importance (Ramsar site), which was not included in the PMST Report (**Appendix A**).*

Table 3-2 Summary of MNES identified by the EPBC Act Protected Matters Search Tool (PMST) as potentially occurring within the SWMR

MNES	Number	Description	Section of this Document
World Heritage Properties	0	N/A	N/A
National Heritage Places	3	Cheetup Rock Shelter Batavia Shipwreck Site and Survivor Camps Area 1629 – Houtman Abrolhos HMAS Sydney II and HSK Kormoran Shipwreck Sites	**Section 10**
Wetlands of International Importance (Ramsar)	4	Becher Point Wetlands Forrestdale and Thomsons Lakes Peel-Yalgorup System Vasse-Wonnerup System	**Section 10**
Commonwealth Marine Area	2	EEZ and Territorial Sea KEFs AMPs Australian Whale Sanctuary Extended Continental Shelf	**Section 9** **Section 10**
Listed Threatened Ecological Communities	3	Banksia Woodlands of the Swan Coastal Plain ecological community Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community	Terrestrial communities and not considered further
Listed Threatened Species	65	Refer SWMR PMST report (**Appendix A**)	N/A
Listed Migratory Species	67	Refer SWMR PMST report (**Appendix A**)	N/A

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

MNES	Number	Description	Section of this Document
World Heritage Properties	0	N/A	N/A
National Heritage Places	0	N/A	N/A
Wetlands of International Importance (Ramsar)	0	N/A	N/A
Commonwealth Marine Area	2	EEZ and Territorial Sea KEFs AMPs Australian Whale Sanctuary Extended Continental Shelf	**Section 9** **Section 10**
Listed Threatened Ecological Communities	0	N/A	N/A
Listed Threatened Species	33	Refer NMR PMST report (**Appendix A**)	N/A
Listed Migratory Species	70	Refer NMR PMST report (**Appendix A**)	N/A

3.2 Part 13 Statutory Instruments for EPBC Act Listed Threatened and Migratory Species in the NWMR, SWMR and NMR

A screening process was conducted to identify which EPBC Act listed threatened and migratory species, and associated Part 13 statutory instruments, are relevant in the context of the assessment of impacts and risks associated with petroleum activities in each of the Woodside activity areas, using the following criteria:

- overlap between the Woodside activity areas with habitat critical for the survival of marine turtles, and with BIAs (overlapping the marine environment) for any listed threatened species as reported in the PMST searches;
- published literature, unpublished reports and/or credible anecdotal information (e.g. feedback from stakeholders) indicating species presence/occurrence within the Woodside activity areas;
- temporal overlap between the likely timing of petroleum activities and peak periods for key behaviours (e.g. breeding, nesting, calving, resting, foraging, migration); and
- environmental aspects associated with petroleum activities have been identified as a key threat to a species in a Part 13 statutory instrument (e.g. anthropogenic noise, light emissions, marine debris).

Relevant EPBC Act threatened and migratory species and their Part 13 statutory instruments are listed in **Table 3-4**. For the full list of EPBCA Act listed species for each marine bioregion refer to the PMST reports (**Appendix A**).

Table 3-4 Summary of MNES identified by the EPBC Act Protected Matters Search Tool (PMST) to be considered for impact or risk evaluation for Woodside operations

Species	EPBC Act Part 13 Statutory Instrument
All vertebrate marine fauna	Threat Abatement Plan for the impacts of marine debris on vertebrate marine life (Commonwealth of Australia, 2018)
Marine Mammals	
Blue whale	Conservation Management Plan for the Blue Whale: A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999* 2015–2025 (Commonwealth of Australia, 2015a)
Southern right whale	Conservation Management Plan for the Southern Right Whale: A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999* 2011–2021 (DSEWPAC, 2012d)
Sei whale	Conservation Advice *Balaenoptera borealis* sei whale (Threatened Species Scientific Committee, 2015a)
Humpback whale	Conservation Advice *Megaptera novaeangliae* humpback whale (Threatened Species Scientific Committee, 2015b)
Fin whale	Conservation Advice *Balaenoptera physalus* fin whale (Threatened Species Scientific Committee, 2015c)
Australian sea lion	Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) 2013 (DSEWPAC, 2013a) (due to expire in October 2023) Conservation Advice *Neophoca cinerea* Australian Sea Lion (Threatened Species Scientific Committee, 2020a) (in effect under the EPBC Act from 23-Dec-2020)
Marine Reptiles	
All marine turtle species (loggerhead, green, leatherback, hawksbill, flatback, olive ridley)	Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth of Australia, 2017)
Short-nosed sea snake	Approved Conservation Advice for *Aipysurus apraefrontalis* (Short-nosed Sea Snake) (DSEWPAC, 2011a)
Leaf-scaled sea snake	Approved Conservation Advice for *Aipysurus foliosquama* (Leaf-scaled Sea Snake) (DSEWPAC, 2011b)
Fishes, Sharks, Rays and Sawfishes	
Grey nurse shark (west coast population)	Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014 (DOE, 2014)
White shark	Recovery Plan for the White Shark (*Carcharodon carcharias*) 2013 (DSEWPAC, 2013b)
Whale shark	Conservation Advice *Rhincodon typus* whale shark (Threatened Species Scientific Committee, 2015d)
All sawfishes (largetooth, green, dwarf, speartooth, narrow)	Sawfish and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015b)

Species	EPBC Act Part 13 Statutory Instrument
Seabirds	
Migratory seabird species	Draft Wildlife Conservation Plan for Migratory Seabirds (Commonwealth of Australia, 2019)
Southern giant petrel	National recovery plan for threatened albatrosses and giant petrels 2011–2016 (DSEWPAC, 2011c)
Indian yellow-nosed albatross	National recovery plan for threatened albatrosses and giant petrels 2011–2016 (DSEWPAC, 2011c)
Abbott's booby	Conservation Advice for the Abbott's booby - *Papasula abbotti* (Threatened Species Scientific Committee, 2020b)
Australian fairy tern	Approved Conservation Advice for *Sterna nereis nereis* (Fairy Tern) (DSEWPAC, 2011d)
Australian lesser noddy	Conservation Advice *Anous tenuirostris melanops* Australian lesser noddy (Threatened Species Scientific Committee, 2015e)
Soft-plumaged petrel	Conservation Advice *Pterodroma mollis* soft-plumaged petrel (Threatened Species Scientific Committee, 2015f)
Shorebirds	
Migratory shorebird species	Wildlife Conservation Plan for Migratory Shorebirds (Commonwealth of Australia, 2015c)
Eastern curlew, far eastern curlew	Conservation Advice *Numenius madagascariensis* eastern curlew (DOE, 2015a)
Curlew sandpiper	Conservation Advice *Calidris ferruginea* curlew sandpiper (DOE, 2015b)
Great knot	Conservation Advice *Calidris tenuirostris* Great knot (Threatened Species Scientific Committee, 2016a)
Red knot, knot	Conservation Advice *Calidris canutus* Red knot (Threatened Species Scientific Committee, 2016b)
Bar-tailed godwit (*menzbieri*)	Conservation Advice *Limosa lapponica menzbieri* Bar-tailed godwit (northern Siberia) (Threatened Species Scientific Committee, 2016c)
Greater sand plover	Conservation Advice *Charadrius leschenaultii* Greater sand plover (Threatened Species Scientific Committee, 2016d)
Lesser sand plover	Conservation Advice *Charadrius mongolus* Lesser sand plover (Threatened Species Scientific Committee, 2016e)

4. HABITAT AND BIOLOGICAL COMMUNITIES

4.1 Regional context

The NWMR habitats range from nearshore benthic primary producer habitats such as seagrass beds, coral communities and mangrove forests, to offshore soft sediment seabed habitats and submerged and emergent reef systems. These habitats support biological communities that range from low density sessile and mobile benthos, such as sponges, molluscs and echinoids (with noted areas of sponge hotspot diversity) in offshore soft sediment habitat (DSEWPAC, 2012a) to complex, diverse, remote coral reef systems.

Benthic primary producer habitats, such as seagrass beds, coral communities and mangrove forests within the SWMR, are described as a mixture of tropical and temperate species, due to the seasonal influences of the tropical waters carried south by the Leeuwin Current and the temperate waters carried north by the Capes Current (DSEWPAC, 2012b).

The NMR shares similar habitat types to the NWMR. The predominant habitat of the region includes soft muddy sediments on relatively flat terrain. Other habitat types include seagrasses, reefs, shoals and coastal habitats such as mangroves and coastal wetlands (Rochester *et al.*, 2007).

The summary of key habitats and biological communities provided in the following sub-sections is focused on the primary features of relevance to the activity areas within the NWMR – primarily the offshore habitats of the continental shelf and slope, submerged shoals and banks, and remote oceanic reef systems of recognised conservation value.

4.2 Biological Productivity of NWMR

Primary productivity of the NWMR is generally low and appears to be largely driven by offshore influences (Brewer *et al.*, 2007), with periodic upwelling events and cyclonic influences driving coastal productivity with nutrient recycling and advection. Seasonal weather patterns also influence the delivery of nutrients from deep-water to shallow water. Cyclones and north-westerly winds during the North-west monsoon (approximately November–March) and the strong offshore winds of the South-east monsoon (approximately April–September) facilitate the upwelling and mixing of nutrients from deep-water to shallow water environments (Brewer *et al.*, 2007).

The Indonesian Throughflow (ITF) has an important effect on productivity in the northern areas of the Region. Generally, its deep, warm and low nutrient waters suppress upwelling of deeper comparatively nutrient-rich waters, thereby forcing the highest rates of primary productivity to occur at depths associated with the thermocline. When the ITF is weaker, the thermocline lifts bringing deeper, more nutrient-rich waters into the photic zone and hence resulting in conditions favourable to increased productivity (DEWHA, 2007a). Similarly, the Leeuwin Current has a significant role in determining primary productivity in the southern areas of the NWMR. As with the ITF, the overlying warm oligotrophic waters of the Leeuwin Current suppress upwelling. A subsurface chlorophyll maximum is therefore formed at a depth in the water column where nutrients and light are sufficient for photosynthesis to proceed. Seasonal changes in the strength of the Leeuwin Current influence primary productivity levels and seasonal interactions between the Leeuwin and Ningaloo currents in the south of the NWMR are believed to be particularly important (DEWHA, 2007a).

Internal tides (defined as internal waves generated by the barotropic tide) are a striking characteristic of many parts of the NWMR and are associated with highly stratified water columns. Internal waves (solitons), which can raise cooler, generally more nutrient rich water higher in the water column, are generated between water depths of 400 m and 1000 m where bottom topography results in a significant change in water depth over a relatively short distance. Cyclones are episodic events in the NWMR that contribute to spikes in productivity through enrichment of surface water layers due to enhanced vertical mixing of the water column. Temporary increases in primary productivity as a result of cyclones generally last between one and two weeks, and it is believed that the impacts of

cyclones are generally limited to waters less than 100 m deep and affect benthic communities more substantially than pelagic systems (DEWHA, 2007a).

Water depth also has a significant overriding influence over productivity in the marine environment, due to its influence on light availability. This is reflected by distinct onshore and offshore assemblages of major pelagic groups of phytoplankton, microzooplankton, mesoplankton and ichthyoplankton. Productivity booms are thought to be triggered by seasonal changes to physical drivers or episodic events, as detailed above, which result in rapid increases in primary production over short periods, followed by extended periods of lower primary production. The trophic systems in the NWMR are able to take advantage of blooms in primary production, enabling nutrients generated to be used by different groups of consumers over long periods (DEWHA, 2007a).

Little detailed information is available about the trophic systems in the NWMR. The utilisation of available nutrients is thought to differ between pelagic and benthic environments, influenced by water depth and vertical migration of some species groups in the water column. In the pelagic system, it is thought that approximately half of the nutrients available are utilised by microzooplankton (e.g. protozoa) with the remainder going to macro/meso-zooplankton (e.g. copepods). As primary and secondary consumers, gelatinous zooplankton (e.g. salps, coelenterates) and jellyfish are thought to play an important role in the food web, contributing a significant proportion of biomass in the marine system during and for periods after booms in primary productivity. Salps are semi-transparent, barrel-shaped marine animals that can reproduce quickly in response to bursts in primary productivity and provide a food source for many pelagic fish species (DEWHA, 2007a).

4.3 Planktonic Communities in the NWMR

The NWMR has two distinct phytoplankton assemblages; a tropical oceanic community in offshore waters and a tropical shelf community confined to the NWS (Hallegraeff, 1995). MODIS (Moderate Resolution Imaging Spectrometer) satellite datasets from the NWMR indicates that chlorophyll (and thus phytoplankton) levels are low in summer months (December to March) and higher in the winter months (Schroeder *et al.*, 2009). Low chlorophyll levels during summer months may be a result of lower plankton productivity during the wet season or lower nutrient inputs from warm surface waters dominant during summer. However, it is likely that much of the primary production is taking place below the surface, where the MODIS imagery does not penetrate (Schroeder *et al.*, 2009). The winter months are relatively cloud free and surface chlorophyll is high throughout most of the region.

Zooplankton and may include organisms that complete their lifecycle as plankton (e.g. copepods, euphausiids) as well as larval stages of other taxa such as fishes, corals and molluscs. Peaks in zooplankton such as mass coral spawning events (typically in March and April) (Rosser and Gilmour, 2008) and fish larvae abundance (CALM, 2005a) can occur throughout the year. Spatial and temporal patterns in the distribution and abundance of macro-zooplankton on the North-west Shelf are influenced by sporadic climatic and oceanographic events, with large inter-annual changes in assemblages (Wilson *et al.*, 2003). Amphipods, euphausiids, copepods, mysids and cumaceans are among the most common components of the zooplankton in the region (Wilson *et al.*, 2003).

4.3.1 Browse

Phytoplankton within the Browse activity area is expected to reflect the conditions of the NWMR. There is a tendency for offshore phytoplankton communities in the NWMR to be characterised by smaller taxa (e.g. bacteria), whereas shelf waters are dominated by larger taxa such as diatoms (Hanson *et al.*, 2007).

Zooplankton within the activity area may include organisms that complete their lifecycle as plankton (e.g. copepods, euphausiids) as well as larval stages of other taxa such as fishes, corals and molluscs. Peaks in zooplankton such as mass coral spawning events (typically in March and April) (Rosser and Gilmour, 2008; Simpson *et al.*, 1993) and fish larvae abundance (CALM, 2005a) can occur throughout the year.

The influence of the Indonesian Throughflow restricts upwelling across the Kimberley System (approximately equates to the Browse activity area). However, small-scale topographically associated current movements and upwellings are thought to occur, which inject nutrients into specific locations within the system and result in 'productivity hot-spots'. Similarly, internal waves, generated at the shelf break (e.g. west of Browse Island and around submerged cliffs) play a role in making nutrients available in the photic zone. Productivity within shallow nearshore waters is driven primarily by tidal movement and terrestrial runoff whereby nutrients are mixed by tidal action and new inputs of organic matter come from the land.

4.3.2 North-west Shelf / Scarborough

Plankton communities within the NWS / Scarborough activity area are expected to reflect conditions of the NWMR. Within the Pilbara system of the NWMR (approximately equates to the NWS / Scarborough activity area). Internal tides along the NWS and Exmouth Plateau result in the drawing of deeper cooler waters into the photic zone, stirring up nutrients and triggering primary productivity. Broadly the greatest productivity within this sub-system is found around the 200 m isobath associated with the shelf break.

4.3.3 North-west Cape

Waters of the North-west Cape experience a relatively high diversity of phytoplankton groups including diatoms, coccolithophorids and dinoflagellates. During the warmer months blooms of *Trichodesmium* occur in the region, these have been observed particularly on the frontal systems around Point Murat (Heyward *et al*., 2000).

Average Leeuwin Current phytoplankton biomass is characteristic of low productivity oceanic waters like the Indian, Pacific and Atlantic Oceans (Hanson *et al.*, 2005). However, the Canyons linking the Cuvier Abyssal Plain and Cape Range Peninsula KEF are connected to the Commonwealth waters adjacent to Ningaloo Reef, and may also have connections to Exmouth Plateau. The canyons are thought to interact with the Leeuwin Current to produce eddies inside the heads of the canyons, resulting in waters from the Antarctic intermediate water mass being drawn into shallower depths and onto the shelf (Brewer *et al.* 2007). These waters are cooler and richer in nutrients and strong internal tides may also aid upwelling at the canyon heads (Brewer *et al.* 2007). The narrow shelf width (about 10 kilometres) near the canyons facilitates nutrient upwelling and relatively high productivity. This high primary productivity leads to high densities of primary consumers, such as micro and macro-zooplankton, such as amphipods, copepods, mysids, cumaceans, euphausiids (Brewer *et al.*, 2007).

4.4 Habitats and Biological Communities in the NWMR

4.4.1 Offshore Habitats and Biological communities

The NWMR has a large area of continental shelf and continental slope, with a range of bathymetric features such as canyons, plateaus, terraces, ridges, reefs, banks and shoals. The marine environment in this region is typified by tropical to sub-tropical marine ecosystems with diverse habitats from soft sediments, canyons, remote coral reefs and limestone pavement.

The key habitats and biological communities representative of the broader NWMR are summarised in **Table 4-1**.

The key habitats and biological communities representative of the broader SWMR and NMR are summarised in **Table 4-2** and **Table 4-3**.

4.4.2 Shoreline habitats and biological communities

The NWMR encompasses offshore and coastal waters, islands and mainland shoreline habitats typified by mangroves, tidal flats, saltmarshes, sandy beaches, and smaller areas of rocky shores. Each of these shoreline types has the potential to support different flora and fauna assemblages due to the different physical factors (e.g. waves, tides, light, etc.) influencing the habitat.

The key shoreline habitats representative of the broader NWMR are summarised in **Table 4-1**.

The key shoreline habitats representative of the broader SWMR and NMR are summarised in **Table 4-2** and **Table 4-3**.

Table 4-1 Habitats and biological communities within the NWMR

Habitat/Community	Browse	NWS / Scarborough	North-west Cape	Reference
Offshore habitats and biological communities				
Soft sediment with infauna	The offshore environment of the NWMR comprises predominately of seabed habitats dominated by soft sediments (sandy and muddy substrata with occasional patches of coarser sediments) and sparse benthic biota. The benthic communities inhabiting the predominantly soft, fine sediments of the offshore habitats are characterised by infauna such as polychaetes, and sessile and mobile epifauna such as crustacea (shrimp, crabs and squat lobsters) and echinoderms (starfish, cucumbers).The density of benthic fauna is typically lower in deep-sea sediment habitats (greater than 200 m) than in shallower coastal sediment habitats, but the diversity of communities may be similar.			
Soft sediment with hard substrate outcropping	A unique seafloor feature combining both soft sediment and hard substrates, including outcrops, terraces, continental slope, and escarpments. This habitat is found in offshore areas of the NWMR, often associated with key ecological features such as the Ancient coastline at 125 m depth contour KEF.			**Section 9**
	Ancient Coastline at 125 m Depth Contour KEF Continental Slope Demersal Fish Communities KEF	Ancient Coastline at 125 m Depth Contour KEF Continental Slope Demersal Fish Communities KEF	Ancient Coastline at 125 m Depth Contour KEF Continental Slope Demersal Fish Communities KEF	**Section 9**
Coral Reef	Coral reef habitats within the NWMR have a high species diversity that includes corals, and associated reef species such as fishes, crustaceans, invertebrates, and algae. Coral reef habitats of the offshore environment of the NWMR include remote oceanic reef systems, large platform reefs, submerged banks and shoals.			
	Browse Island Scott Reef Seringapatam Reef Ashmore Reef Cartier Island Hibernia Reef	Rowley Shoals (including Mermaid Reef, Clerke Reef, Imperieuse Reef) Glomar Shoal Rankin Bank	-	**Section 10**
Seagrass and Macroalgae communities	Seagrass beds and benthic macroalgae reefs are a main food source for many marine species and also provide key habitats and nursery grounds (Heck Jr. *et al.*, 2003; Wilson *et al.*, 2010). In the northern half of Western Australia, these habitats are restricted to sheltered and shallow waters, including around offshore reef systems, due to large tidal movement, high turbidity, large seasonal freshwater run-off and cyclones.			
	Scott Reef Seringapatam Reef Ashmore Reef	Rowley Shoals (including; Mermaid Reef, Clerke Reef, Imperieuse Reef)		**Section 10**
Filter Feeders/ heterotrophic	Filter feeder epifauna such as sponges, ascidians, soft corals and gorgonians are animals that feed by actively filtering suspended matter and food particles from water, by passing the water over specialised filtration structures (DEWHA, 2008). Filter feeders generally live in areas that have strong currents and hard substratum, often associated with deeper environments of the shoals and banks in the offshore NWMR.			
	Lower outer reef slopes of the oceanic reef	Glomar Shoal Rankin Bank	Cape Range canyon system	**Section 10**

Habitat/Community	Browse	NWS / Scarborough	North-west Cape	Reference
	systems such as Scott Reef	Ancient coastline at 125 m depth contour KEF		
Sandy Beaches	Sandy beaches are dynamic environments, naturally fluctuating in response to external forcing factors (e.g. waves, currents, etc). Sandy beaches vary in length, width and gradient, and in sediment type, composition, and grain size throughout the NWMR, being found around islands and reefs in the offshore areas of the region.			
	Browse Island Scott Reef (Sandy Islet) Ashmore Reef Cartier Island	Montebello Islands Lowendal Islands Barrow Island	Muiron Islands	**Section 10**
Nearshore/coastal habitats and biological communities				
Coral Reef	Coral reef habitats typically found in nearshore regions of the NWMR include the fringing reefs around coastal islands and the mainland shore.			
	Kimberley East Holothuria and Long reefs Bonaparte and Buccaneer Archipelagos Montgomery Reef Adele complex (Beagle, Mavis, Albert, Churchill reefs, Adele Island)	Dampier Archipelago Montebello, Lowendal and Barrow Island Groups	Ningaloo Reef Exmouth Gulf Shark Bay	**Section 10**
Seagrass and Macroalgae communities	Seagrass beds and benthic macroalgae reefs are a main food source for many marine species and also provide key habitats and nursery grounds (Heck Jr. *et al.*, 2003; Wilson *et al.*, 2010). In the nearshore areas of the NWMR, these habitats are restricted to sheltered and shallow waters due to large tidal movement, high turbidity, large seasonal freshwater run-off and cyclones. These areas include in bays and sounds and around reef and island groups.			
	King Sound	Roebuck Bay Dampier Archipelago Montebello, Lowendal and Barrow Island Groups	Ningaloo Reef Exmouth Gulf Shark Bay	**Section 10**
Filter Feeders/ heterotrophic	Filter feeder epifauna such as sponges, ascidians, soft corals and gorgonians are animals that feed by actively filtering suspended matter and food particles from water, by passing the water over specialised filtration structures (DEWHA, 2007a). Filter feeders generally live in areas that have strong currents and hard substratum. Conversely, higher diversity infauna are mainly associated with soft unconsolidated sediment and infauna communities are considered widespread and well represented along the continental shelf and upper slopes of the NWMR. In nearshore areas of the NWMR, these species are generally found around reef systems.			
	-	Deeper habitats of Rankin Bank and Glomar Shoal	Deeper habitats of Ningaloo Reef and the protected sponge zone in the south	

Habitat/Community	Browse	NWS / Scarborough	North-west Cape	Reference
Mangroves	Mangroves grow in intertidal mud and sand, with specially adapted aerial roots (pneumatophores) that provide for gas exchange during low tide (McClatchie *et al.*, 2006). Mangrove forests can help stabilise coastal sediments, provide a nursery ground for many species of fish and crustacean, and provide shelter or nesting areas for seabirds (McClatchie *et al.*, 2006). Mangroves are confined to shoreline habitats, in nearshore areas of the NWMR.			
	Dampier Peninsula (including Carnot Bay, Beagle Bay and Pender Bay)	Pilbara Coastline (including; Ashburton River Delta, Coolgra Point, Robe River Delta, Yardie Landing, Yammadery Island and the Mangrove Islands) Montebello, Lowendal and Barrow Island Groups Roebuck Bay	Shark Bay Mangrove Bay, Cape Range Peninsula Exmouth Gulf	
Saltmarshes	Saltmarshes communities are confined to shoreline habitats and are typically dominated by dense stands of halophytic plants such as herbs, grasses, and low shrubs. The diversity of saltmarsh plant species increases with increasing latitude (in contrast to mangroves). The vegetation in these environments is essential to the stability of the saltmarsh, as they trap and bind sediments. The sediments are generally sandy silts and clays and can often have high organic material content.			
	-	Eighty Mile Beach Roebuck Bay	Shark Bay	
Sandy Beaches	Sandy beaches are dynamic environments, naturally fluctuating in response to external forcing factors (e.g. waves, currents, etc). Sandy beaches vary in length, width and gradient, and in sediment type, composition, and grain size throughout the NWMR. Sandy beaches are important for both resident and migratory seabirds and shorebirds and can also provide an important habitat for turtle nesting and breeding. They are located along many coastlines of the nearshore environments of the NWMR.			
	Cape Domett Lacrosse Island	Eighty Mile Beach Eco Beach Dampier Archipelago Inshore Pilbara Islands (Northern, Middle, and Southern)	Ningaloo coast Muiron Islands Exmouth Gulf	

Table 4-2 Habitats within the SWMR

Habitat/Community	Location
Offshore	
Soft sediment with infauna	Most of the SWMR seafloor is composed of soft unconsolidated sediments, but due to large variations in bathymetry there are marked differences in sedimentary composition and benthic assemblage structure across the region. Despite the prevalence of these habitats in the SWMR, very little is known about the composition or distribution of the region's sedimentary infauna (DEWHA, 2008b)
Soft sediment with hard substrate outcropping	A unique seafloor feature combining both soft sediment and hard substrates, including outcrops, terraces, continental slope, and escarpments.
	Perth Canyon Marine Park Ancient coastline at 90-120 m depth contour KEF Diamantina Fracture Zone Naturaliste Plateau
Coral Reef	To date, studies and understanding of the corals within the SWMR have concentrated on the shallow water areas in State Waters. Within the deeper Commonwealth waters of the SWMR little is known of the distribution of corals.
Filter Feeders/ heterotrophic	Filter feeder epifauna such as sponges, ascidians, soft corals and gorgonians are animals that feed by actively filtering suspended matter and food particles from water, by passing the water over specialised filtration structures (DEWR, 2007). Filter feeders generally inhabit deeper habitat (below the photic zone) that have strong currents and hard substratum
	Ancient coastline at 90-120 m depth Diamantina Fracture Zone Naturaliste Plateau Perth Canyon Marine Park South-west Corner Marine Park
Nearshore	
Coral Reef	The northern extent of the SWMR coincides loosely with the disappearance of abundant and diverse coral from coastal habitats. To the south of Shark Bay, abundant corals occur predominantly around offshore islands, with corals at inshore sites occurring in very isolated patches of non-reef coral communities, usually of reduced species richness.
	Houtman Abrolhos Islands Rottnest Island
Seagrass and Macroalgae communities	Within the SWMR, macroalgae and seagrass communities are noted for their extent, species richness and endemism. The clear waters of the region allow light to reach greater depths, with some species found at much greater depths than usual (down to 120 m) (DEWR, 2007). Of the known species there are more than 1000 species of macro-algae and 22 species of seagrass consisting of tropical and temperate species. Seagrass and macro-algae occur in areas with sheltered bays and in the inter-reef lagoons along exposed sections of the coast.
	Houtman Abrolhos Islands Jurien Marine Park Shoalwater Islands Marine Park Geographe Marine Park Cockburn Sound Rottnest Island

Habitat/Community	Location
	Commonwealth marine environment within and adjacent to the west-coast inshore lagoons KEF Commonwealth marine environment within and adjacent to Geographe Bay KEF Commonwealth marine environment surrounding the Recherche Archipelago KEF
Filter Feeders/ heterotrophic	Filter feeder epifauna such as sponges, ascidians, soft corals and gorgonians are animals that feed by actively filtering suspended matter and food particles from water, by passing the water over specialised filtration structures (DEWR, 2007). Filter feeders generally live in areas that have strong currents and hard substratum.
	Houtman Abrolhos Islands Recherche Archipelago
Mangroves	Mangroves grow in intertidal mud and sand, with specially adapted aerial roots (pneumatophores) that provide for gas exchange during low tide (McClatchie *et al.*, 2006). Mangrove forests can help stabilise coastal sediments, provide a nursery ground for many species of fish and crustacean, and provide shelter or nesting areas for seabirds (McClatchie *et al.*, 2006). Mangroves are confined to shoreline habitats, in nearshore areas of the SWMR.
	Houtman Abrolhos Islands
Sandy Beaches	Sandy beaches within the SWMR are important for both resident and migratory seabirds and shorebirds and can also host breeding populations of the Australian sea lion. They are found along many coastlines of the nearshore environments of the SWMR. In addition to this, beaches in the SWMR provide a variety of socio-economic values including tourism, commercial and recreational fishing, and support other recreational activities.
	Houtman Abrolhos Islands Marmion Marine Park Ngari Capes Marine Park Walpole and Nornalup Inlets Marine Park

Table 4-3 Habitats and Biological Communities within the NMR

Habitat/Community	Location
Offshore habitats and biological communities	
Soft sediment with infauna	Most of the offshore environment of the NMR is characterised by relatively flat expanses of soft sediment seabed. The soft sediments of the region are characterised by moderately abundant and diverse communities of infauna and mobile epifauna dominated by polychaetes, crustaceans, molluscs, and echinoderms.
Soft sediment with hard substrate outcropping	A unique seafloor feature combining both soft sediment and hard substrates, including outcrops, terraces, continental slope, and escarpments. The variability in substrate composition may contribute to the presence of unique ecosystems. Species present include sponges, soft corals and other sessile filter feeders associated with hard substrate sediments.
	Carbonate bank and terrace system of the Van Diemen Rise KEF Pinnacles of the Bonaparte Basin KEF
Coral Reef	Offshore coral reefs within the NMR is generally associated with a series of submerged shoals and banks. The shoals/banks in the region support tropical marine biota consistent with that found on emergent reef systems of the Indo West Pacific region such as Ashmore Reef, Cartier Island, Seringapatam Reef and Scott Reef (Heyward *et al.,* 1997)
	Pinnacles of the Bonaparte Basin KEF Evans Shoal Tassie Shoal Blackwood Shoal
Filter Feeders/ heterotrophic	Filter feeder epifauna such as sponges, ascidians, soft corals and gorgonians are animals that feed by actively filtering suspended matter and food particles from water, by passing the water over specialised filtration structures (DEWHA, 2007b). Filter feeders generally live in areas that have strong currents and hard substratum and typically associated with the deeper habitats of the submerged shoals and banks, and canyon features.
	Carbonate bank and terrace system of the Van Diemen Rise KEF Pinnacles of the Bonaparte Basin KEF Tributary Canyons of the Arafura Depression KEF Evans Shoal Tassie Shoal Goodrich Bank
Nearshore	
Coral Reef	Within the NMR corals occur both as reefs and in non-reef coral communities. Nearshore reefs include patch reefs and fringing reefs sparsely distributed within the region. Coral reefs within the NMR provides breeding and aggregation areas for many fish species including mackerel and snapper and offer refuges for sea snakes and apex predators such as sharks.
	Submerged coral reefs of the Gulf of Carpentaria KEF Darwin Harbour
Seagrass and Macroalgae communities	Seagrasses provide key habitats in the NMR. They stabilise coastal sediments and trap and recycle nutrients. They provide nursery grounds for commercially harvested fish and prawns and provide feeding grounds for dugongs and green turtles. Seagrass distribution in the region is largely associated with sheltered small bays and inlets including shallow waters surrounding inshore islands.
	Field Island The mainland coastline adjacent to Kakadu National Park

Habitat/Community	Location
Filter Feeders/ heterotrophic	Filter feeder epifauna such as sponges, ascidians, soft corals, and gorgonians are animals that feed by actively filtering suspended matter and food particles from water, by passing the water over specialised filtration structures (DEWHA, 2007b). Filter feeders generally live in areas that have strong currents and hard substratum.
	Cape Helveticus
Mangroves	Mangroves grow in intertidal mud and sand, with specially adapted aerial roots (pneumatophores) that provide for gas exchange during low tide (McClatchie *et al.*, 2006). Mangroves provide habitat for waterbirds and support many commercially and recreationally important fish and crustacean species for parts of their life cycles. They buffer the coast from large tidal movements, storm surges and flooding.
	Tiwi Islands Darwin Harbour The mainland coastline adjacent to the Daly River
Sandy Beaches	Sandy beaches vary in length, width and gradient, and in sediment type, composition, and grain size throughout the NMR and are important for both resident and migratory seabirds and shorebirds. Sandy beaches can also provide an important habitat for turtle nesting. They are located along many coastlines of the nearshore environments of the islands and mainland shores of the NMR.
	Tiwi Islands Cobourg Peninsula Joseph Bonaparte Gulf

5. FISHES, SHARKS AND RAYS

5.1 Regional Context

Western Australian waters provide important habitat for listed fishes, sharks, and rays including areas that support key life stages such as breeding, foraging, and migration routes for fish species. Pelagic and demersal fishes occupy a range of habitats throughout each of the regions, from coral reefs to open offshore waters, and are an extremely important component of ecosystems, providing a link between primary production and higher predators, with many species being of conservation value and important for commercial and recreational fishing.

The fish fauna in the NWMR is diverse. Of the approximately 500 shark species found worldwide, 94 are found in the region (DEWHA, 2008). Approximately 54 species of syngnathids (seahorses, seadragons, pipehorses and pipefishes) and one species of solenostomids (ghostpipefishes) are also known to occur in the NWMR or adjacent State waters (DSEWPAC, 2012a).

The fish fauna of the SWMR includes more than 900 species occupying a large variety of habitats. However, only three species of bony fishes known to occur in the region are listed under the EPBC Act as threatened or marine species, and seven listed species of shark (DSEWPAC, 2012b).

The NMR is considered an important area for the sawfish and river shark species group, with five species of sawfishes and river sharks listed under the EPBC Act known to occur in the region (DSEWPAC, 2012c). Approximately 28 species of syngnathids and two species of solenostomids are listed marine and known to occur in the NMR, however there is a paucity of knowledge on the distribution, relative abundance and habitats of these species in the region (DEWHA, 2008).

The following sections focus on the fish species (including sharks and rays) listed as threatened or migratory that are known to occur within the NWMR. In addition, listed, conservation dependent fish and shark species for the NWMR are described. A detailed account of commercial and recreational fisheries that operate in the region is provided in **Section 11**.

Table 5-1 outlines the threatened and migratory fish species that may occur within the NWMR, with their conservation status and relevant recovery plans and/or conservation advice. **Table 5-2** provides information for species of fish that are listed as conservation dependent that may occur within the NWMR, NMR and SWMR. Note that currently there are no approved Conservation Advices in place for any of these five species.

Table 5-1 Fish species (including sharks and rays) identified by the EPBC Act PMST for the NWMR

Species Name	Common Name	*Environment Protection and Biodiversity Conservation Act 1999*			WA *Biodiversity Conservation Act 2016*	EPBC Act Part 13 Statutory Instrument
		Threatened Status	Migratory Status	Listed	Conservation Status	
Rhincodon typus	Whale shark	Vulnerable	Migratory	Marine	Other specially protected fauna	Conservation Advice *Rhincodon typus* whale shark. (Threatened Species Scientific Committee, 2015d)
Carcharias taurus	Grey nurse shark (west coast population)	Vulnerable	N/A	Marine	Vulnerable	Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (DOE, 2014a)
Carcharodon carcharias	White shark	Vulnerable	Migratory	Marine	Vulnerable	Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPAC, 2013b)
Isurus oxyrinchus	Shortfin mako	N/A	Migratory	Marine	N/A	N/A
Isurus paucus	Longfin mako	N/A	Migratory	Marine	N/A	N/A
Lamna nasus	Porbeagle shark Mackerel shark	N/A	Migratory	Marine	N/A	N/A
Carcharhinus longimanus	Oceanic whitetip shark	N/A	Migratory	Marine	N/A	N/A
Anoxypristis cuspidata	Narrow sawfish	N/A	Migratory	Marine	N/A	N/A
Pristis clavata	Dwarf sawfish	Vulnerable	Migratory	Marine	Priority	Sawfish and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015b)
Pristis pristis	Largetooth (Freshwater) sawfish	Vulnerable	Migratory	Marine	Priority	
Pristis zijsron	Green sawfish	Vulnerable	Migratory	Marine	Vulnerable	
Glyphis garricki	Northern river shark	Endangered	N/A	Marine	Priority	
Manta alfredi	Reef manta ray	N/A	Migratory	Marine	N/A	N/A
Manta birostris	Giant manta ray	N/A	Migratory	Marine	N/A	N/A

Table 5-2 EPBC Act listed Conservation Dependent species of fishes and sharks that may occur in the NWMR, NMR and SWMR

Species Name	Common Name	Likely Occurrence / Distribution	Listing Advice
Hoplostethus atlanticus	Orange roughy, Deep-sea perch, Red roughy	SWMR	No conservation listing advice for this species. Refer to the Marine bioregional plan for the SWMR (DSEWPAC, 2012b) for further information
Thunnus maccoyii	Southern bluefin tuna	NWMR and SWMR	Threatened Species Scientific Committee (2010)
Sphyrna lewini	Scalloped hammerhead	NWMR, NMR and SWMR	Threatened Species Scientific Committee (2018)
Centrophorus zeehaani	Southern dogfish, Endeavour dogfish, Little gulper shark	SWMR	Threatened Species Scientific Committee (2013)
Galeorhinus galeus	School shark, Eastern school shark, Snapper shark, Tope, Soupfin shark	SWMR	Threatened Species Scientific Committee (2009)

5.2 Protected Sharks, Sawfishes and Rays in the NWMR

The EPBC Act Protected Matters search (**Appendix A**) identified seven species of shark and five species of river shark or sawfish listed as threatened and/or migratory within the NWMR. In addition, two species of ray (the reef manta ray and giant manta ray) are listed as migratory within the region (refer **Table 5-2**).

5.2.1 Sharks and Sawfishes

The shark species known to occur within the NWMR include: the whale shark, grey nurse shark, white shark, shortfin mako, and longfin mako (**Table 5-2**).

Five species of river shark or sawfish known to occur in the NWMR and include: the narrow sawfish, northern river shark, freshwater sawfish, green sawfish and dwarf sawfish (**Table 5-2**).

There are identified BIAs within the NWMR for the whale shark, freshwater sawfish, green sawfish, and dwarf sawfish (refer **Section 5.3.2**).

Table 5-2 Information on the threatened shark and sawfish species within the NWMR

Species	Preferred Habitat and Diet	Habitat Location
Whale shark	Preferred habitat: They have a widespread distribution in tropical and warm temperate seas, both oceanic and coastal (Last and Stevens, 2009). The species is widely distributed in Australian waters. Diet: Whale sharks are planktivorous sharks and feed on a variety of planktonic organisms including krill, jellyfish, and crab larvae (Last and Stevens, 2009).	Ningaloo Reef is the main known aggregation site for whale sharks in Australian waters and has the largest density of whale sharks per kilometre in the world (Martin, 2007). Refer **Table 5-3** for the BIA summary for the whale shark.
Grey nurse shark (west coast population)	Preferred habitat: Most commonly found in temperate waters on, or close to, the bottom of the continental shelf, from close inshore to depths of about 200 m (McAuley, 2004). Diet: A variety of teleost and elasmobranch fishes and some cephalopods (Gelsleichter *et al.*, 1999; Smale, 2005).	Details of movement patterns of the western sub-population are unclear (McAuley, 2004) and key aggregation sites have not been formally identified within the NWMR (Chidlow *et al.*, 2006). The NWMR represents the northern limit of the west coast population.

Species	Preferred Habitat and Diet	Habitat Location
White shark	Preferred habitat: The species typically occurs in temperate coastal waters between the shore and the 100 m depth contour; however, adults and juveniles have been recorded diving to depths of 1000 m (Bruce *et al.*, 2006; Bruce, 2008). Diet: Smaller white sharks (less than 3 m in length) feed primarily on teleost and elasmobranch fishes, broadening their diet as larger sharks to include marine mammals (Last and Stevens, 2009).	There are no known aggregation sites for white sharks in the NWMR, and this species is most often found south of North-west Cape, in low densities (DSEWPAC, 2012a). Given the migratory nature of the species, most likely has a broad distribution within the NWMR. No BIAs identified for NWMR.
Shortfin mako	Preferred habitat: The shortfin mako shark is a pelagic species with a circumglobal, wide-ranging oceanic distribution in tropical and temperate seas (Mollet *et al.*, 2000). Tagging studies indicate shortfin makos spend most of their time in water less than 50 m deep but with occasional dives up to 880 m (Abascal *et al.*, 2011; Stevens *et al.*, 2010). Diet: Feeds on a variety of prey, such as teleost fishes, other sharks, marine mammals, and marine turtles (Campana *et al.*, 2005).	Given the migratory nature of the species, most likely has a broad distribution within the NWMR. No BIAs identified for NWMR.
Longfin mako	Preferred habitat: A pelagic species with a wide-ranging oceanic distribution in tropical and temperate seas (Mollet *et al.*, 2000). Diet: Primarily teleost fishes and cephalopods (primarily squid) (Last and Stevens, 2009).	Records on longfin mako sharks are sporadic and their complete geographic range is not well known (Reardon *et al.*, 2006). Given the migratory nature of the species, most likely has a broad distribution within the NWMR. No BIAs identified for NWMR.
Mackerel/Porbeagle shark	Preferred habitat: The porbeagle shark primarily inhabits offshore waters around the edge of the continental shelf. They occasionally move into coastal waters, but these movements are temporary (Campana and Joyce, 2004; Francis *et al.*, 2002). The porbeagle shark is known to dive to depths exceeding 1300 m (Campana *et al.*, 2010; Saunders *et al.*, 2011). Diet: Primarily teleost fish, elasmobranchs, and cephalopods (primarily squid) (Joyce *et al.*, 2002; Last and Stevens, 2009).	In Australia, the species occurs in waters from southern Queensland to south-west Australia (Last and Stevens, 2009). Distribution within the NWMR is unknown, but there are several records for this species on the NWS in the Atlas of Living Australia (ALA).
Oceanic whitetip shark	Preferred habitat: The oceanic whitetip shark is globally distributed in warm-temperate and tropical oceans (Andrzejaczek *et al.*, 2018). The species may occur in tropical and sub-tropical offshore and coastal waters around Australia. They primarily occupy pelagic waters in the upper 200 m of the water column; however, they have been observed diving to depths of around 1000 m, potentially associated with foraging behaviour (Howey-Jordan *et al.*, 2013; D'Alberto *et al.*, 2017). The species is highly migratory, travelling large distances between shallow reef habitats in coastal waters and oceanic waters (Howey-Jordan *et al.*, 2013). The species does exhibit a strong preference for warm and shallow waters above 120 m. Diet: Opportunistic feeders and generally target a variety of finfishes and pelagic squid, depending on habitat. Target pelagics such as tuna in open ocean as noted by the large bycatch numbers in the long line fisheries.	Given the migratory nature of the species, most likely has a broad distribution within the NWMR. No BIAs identified for NWMR.

Species	Preferred Habitat and Diet	Habitat Location
Narrow sawfish	Preferred habitat[1]: Shallow coastal, estuarine, and riverine habitats, however it may occur in waters up to 40 m deep (D'Anastasi *et al.*, 2013). Diet: Shoaling fishes, such as mullet, as well as molluscs and small crustaceans (Cliff and Wilson, 1994).	Shallow coastal waters of the Pilbara and Kimberly coasts (Last and Stevens, 2009).
Northern river shark	Preferred habitat[1]: Rivers, tidal sections of large tropical estuarine systems and macrotidal embayments, as well as inshore and offshore marine habitats (Pillans *et al.*, 2009; Thorburn and Morgan, 2004). Adults have been recorded only in marine environments. Juveniles and sub-adults have been recorded in freshwater, estuarine and marine environments (Pillans *et al.*, 2009). Diet: Variety of fish and crustaceans (Stevens *et al.*, 2005)	Within the NWMR records have come from both the west and east Kimberley, including King Sound, the Ord and King rivers, West Arm of Cambridge Gulf and also from Joseph Bonaparte Gulf (Thorburn and Morgan, 2004; Stevens *et al.*, 2005; Thorburn, 2006; Field *et al.*, 2008; Pillans *et al.*, 2008, Whitty *et al.*, 2008; Wynen *et al.*, 2008).
Largetooth (Freshwater) sawfish	Preferred habitat: Sandy or muddy bottoms of shallow coastal waters, estuaries, river mouths and freshwater rivers, and isolated water holes. Diet: Shoaling fishes, such as mullet, as well as molluscs and small crustaceans (Cliff and Wilson, 1994).	Refer **Table 5-3** for the BIA summary for the freshwater sawfish.
Green sawfish	Preferred habitat[1]: Inshore coastal environments including estuaries, river mouths, embayments, and along sandy and muddy beaches, as well as offshore marine habitat (Stevens *et al.*, 2005; Thorburn *et al.*, 2003). Diet: Schools of baitfish and prawns (Poganoski *et al.*, 2002), molluscs and small crustaceans (Cliff and Wilson, 1994).	Refer **Table 5-3** for the BIA summary for the green sawfish.
Dwarf sawfish	Preferred habitat[1]: Shallow (2 to 3 m) silty coastal waters and estuarine habitats, occupying relatively restricted areas and moving only small distances (Stevens *et al.*, 2008) Diet: Shoaling fish such as mullet, molluscs, and small crustaceans (Cliff and Wilson, 1994).	Refer **Table 5-3** for the BIA summary for the dwarf sawfish.

1 Preferred habitat as described within the Sawfish and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015b).

5.2.2 Rays

Rays are commonly found in the NWMR. Two listed and migratory species of ray known to occur within the NWMR: the reef manta ray and giant manta ray.

No BIAs for either the reef or giant manta ray species have been identified in the NWMR.

Table 5-3 Information on migratory ray species within the NWMR

Species	Preferred Habitat and Diet	Habitat Location
Reef manta ray	Preferred habitat: The reef manta ray is commonly sighted within productive nearshore environments, such as island groups, atolls or continental coastlines. However, the species has also been recorded at offshore coral reefs, rocky reefs, and seamounts (Marshall *et al.*, 2009). Diet: Feed on planktonic organisms including krill and crab larvae.	A resident population of reef manta rays has been recorded at Ningaloo Reef. No BIAs identified for NWMR.
Giant manta ray	Preferred habitat: The species primarily inhabits near-shore environments along productive coastlines with regular upwelling, but they appear	The Ningaloo Coast is an important area for giant manta rays from March to August (Preen *et al.*, 1997).

Species	Preferred Habitat and Diet	Habitat Location
	to be seasonal visitors to coastal or offshore sites including offshore island groups, offshore pinnacles and seamounts (Marshall *et al.*, 2011). Diet: Feed on planktonic organisms including krill and crab larvae.	No BIAs identified for NWMR.

5.3 Fish, Shark and Sawfish Biological Important Areas in the NWMR

A review of the National Conservation Values Atlas identified Biologically Important Areas (BIAs) for four species of shark and sawfish (whale shark, freshwater sawfish, green sawfish and dwarf sawfish) within the NWMR. The BIAs for the whale shark and the sawfish species include foraging, nursing and pupping areas. These are described in **Table 5-4**.

Table 5-4 Fish, whale shark and sawfish BIAs within the NWMR

Species	Woodside Activity Area			BIAs		
	Browse	NWS/S	NWC	Pupping	Nursing	Foraging
Whale shark	✓	✓	✓	No pupping BIA identified within the NWMR	No nursing BIA identified within the NWMR	Foraging (high density) in Ningaloo Marine Park and adjacent Commonwealth waters (March–July) Foraging northward from Ningaloo along the 200 m isobath (July – Nov).
Green sawfish	✓	✓	-	Pupping in Cape Keraudren (pupping occurs in summer in a narrow area adjacent to shoreline) Pupping in Willie Creek Pupping in Roebuck Bay Pupping in Cape Leveque Pupping in waters adjacent to Eighty Mile Beach Pupping (likely) in Camden Sound.	Nursing in Cape Keraudren Nursing in waters adjacent to Eighty Mile Beach	Foraging in Cape Keraudren Foraging in Roebuck Bay Foraging in Cape Leveque Foraging in Camden Sound
Largetooth (freshwater) sawfish	✓	✓	-	Pupping in the mouth of the Fitzroy River (January to May) Roebuck Bay (Jan – May) Pupping likely in waters adjacent to Eighty Mile Beach	Nursing (likely) in King Sound Roebuck Bay (Jan – May)	Foraging in the mouth of the Fitzroy River (January to May) Foraging in King Sound Roebuck Bay (Jan – May) Foraging in waters adjacent to Eighty Mile Beach
Dwarf sawfish	✓	✓	-	Pupping in King Sound Pupping in waters adjacent to Eighty Mile Beach	Nursing in King Sound Nursing waters adjacent to Eighty Mile Beach	Foraging in King Sound Foraging in Camden Sound Foraging in waters adjacent to Eighty Mile Beach

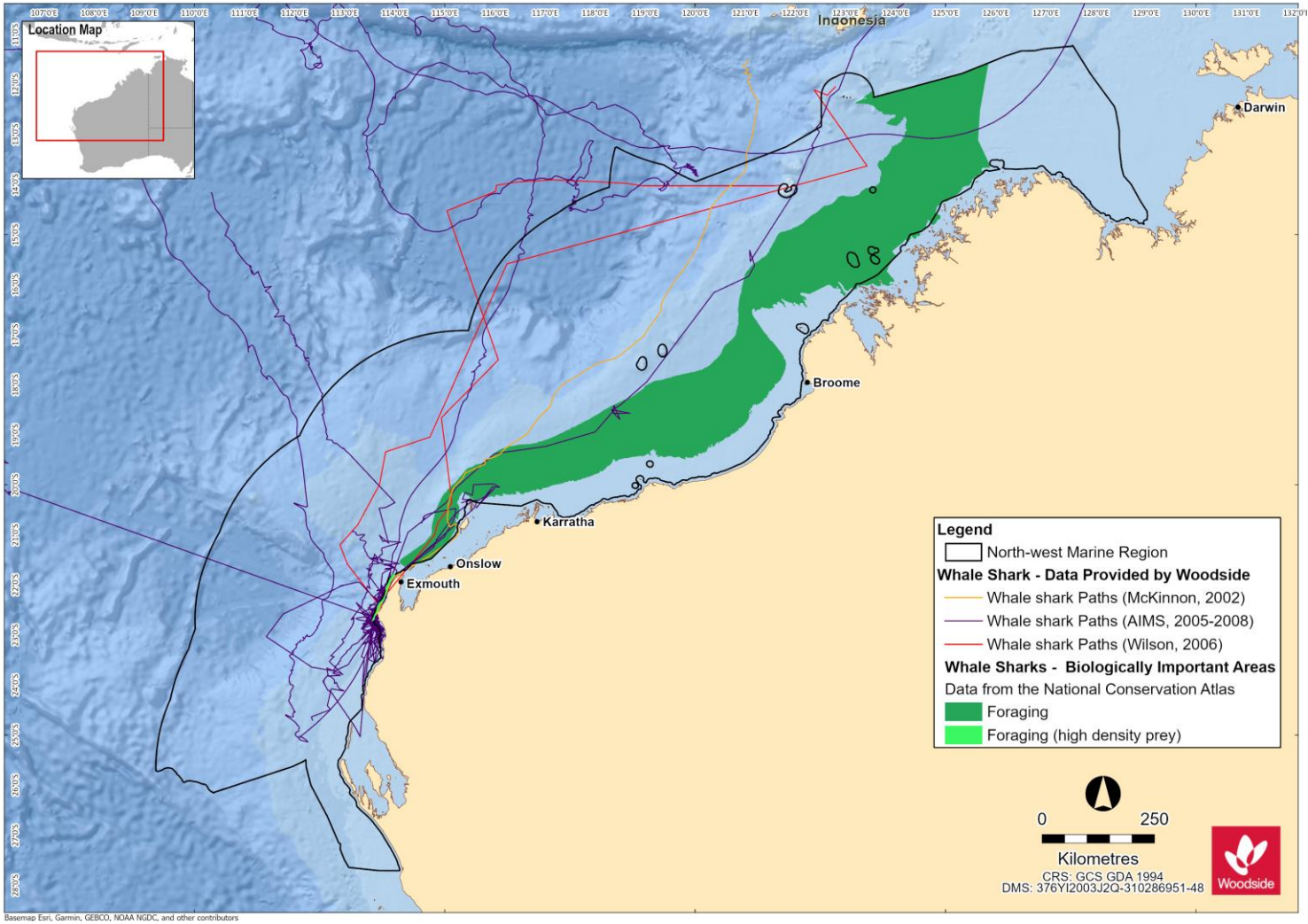

Figure 5-1 Whale shark BIAs for the NWMR and tagged whale shark tracks

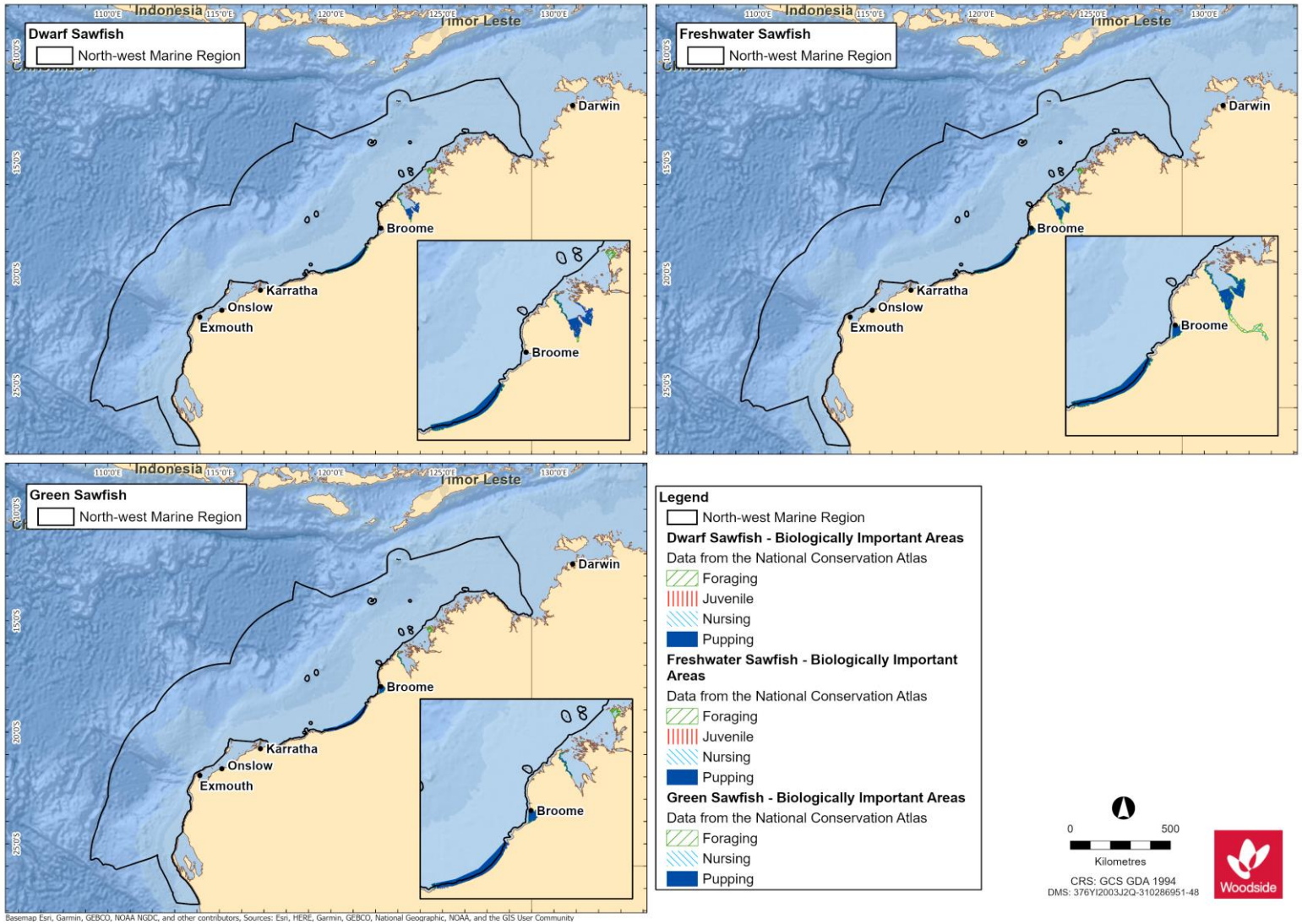

Figure 5-2 Sawfish BIAs for the NWMR

5.4 Fish Assemblages of the NWMR

5.4.1 Regional Context for Fish Assemblages of NWMR

The NWMR contains a diverse range of fishes of tropical Indo-west Pacific affinity (Allen *et al.*, 1988). The region is characterised by the highest level of endemism and species diversity compared with other areas of the Australian continental slope. Last *et al.* (2005) recorded 1431 species from the three bioregions encompassing the continental slope, whilst also acknowledging some information gaps.

The NWMR is known for its demersal slope fish assemblages; the continental slope of the Timor Province and the North-west Transition supports more than 418 and 505 species of demersal fishes respectively, of which 64 are considered to be endemic. This is the second richest area for demersal fish species across the entire Australian continental slope. Conversely, the broad Southern Province, which covers most of southern Australia, supports 463 species, only 26 possibly being endemic. The continental slope demersal fish assemblages of the NWMR have been identified as a KEF (DEWHA, 2008), as described in **Section 9**.

The NWMR also features a diversity of pelagic fishes (those living in the pelagic zone) and bentho-pelagic fishes, including tuna, billfish, bramids, lutjanids, serranids and some sharks (DEWHA, 2007a). These species feed on salps and jellyfish, and more often on secondary consumers such as squid and bait fish. Water depth provides an indication of the level of interaction between pelagic and benthic communities within the NWMR; in waters deeper than 1000 m, for instance, the trophic system is pelagically-driven and benthic communities rely on particulates that fall to the seafloor (DEWHA, 2007a).

Pelagic fishes play an important ecological role within the NWMR; small pelagic fishes, such as lantern fish, inhabit a range of marine environments, including inshore and continental shelf waters and form a vital link in and between many of the region's trophic systems, feeding on pelagic phytoplankton and zooplankton and providing a food source for a wide variety of predators including large pelagic fishes, sharks, seabirds and marine mammals (Bulman, 2006; Mackie *et al.*, 2007). Large pelagic fishes, such as tuna, mackerel, swordfish, sailfish and marlin, are found mainly in oceanic waters and occasionally on the continental shelf (Brewer *et al.*, 2007). Both juvenile and adult phases of the large pelagic species are highly mobile and have a wide geographic distribution, although the juveniles more frequently inhabit warmer or coastal waters (DEWHA, 2008).

5.4.2 Listed Fish Species in the NWMR

The family Syngnathidae is a group of bony fishes that includes seahorses, pipefishes, pipehorses and seadragons. Along with syngnathids, members of the related Solenostomidae family (ghost pipefishes) are also found in the NWMR (DSEWPAC, 2012a).

There are 44 solenostomid and syngnathid species that are listed marine species that may occur within the NWMR, although no species is currently listed as threatened or migratory, according to the PMST report (**Appendix A**).

Syngnathids live in nearshore and inner shelf habitats, usually in shallow coastal waters, among seagrasses, mangroves, coral reefs, macroalgae dominated reefs, and sand or rubble habitats (Dawson, 1985; Lourie *et al.*, 1999, Lourie *et al.*, 2004; Vincent, 1996). Two species, the winged seahorse (*Hippocampus alatus*) and western pipehorse (*Solegnathus sp. 2*) have been identified in deeper waters of the NWMR (up to 200 m) (DSEWPAC, 2012a), however, these species were not identified by the Protected Matters search of the NWMR.

Knowledge about the distribution, abundance and ecology of both syngnathids and solenostomids in the NWMR is limited. No BIAs for syngnathids and solenostomids have been identified in the NWMR.

5.4.3 Browse

The proposed Browse activity area includes biologically important habitat for the whale shark and three sawfish species:

- whale shark (foraging northward from Ningaloo along the 200 m isobath (July – Nov),
- freshwater sawfish (pupping, nursing and foraging areas),
- green sawfish (pupping, nursing and foraging areas); and
- dwarf sawfish (pupping, nursing and foraging areas).

BIAs for the shark and sawfish species are outlined in **Table 5-4** and **Figure 5-1**.

The proposed Browse activity area has partial overlap with the Continental slope demersal fish communities KEF.

5.4.4 NWS / Scarborough

The NWS / Scarborough activity area includes biologically important habitat for the whale shark and three sawfish species:

- whale shark (foraging northward from Ningaloo along the 200 m isobath (July – Nov),
- freshwater sawfish (pupping, nursing and foraging areas),
- green sawfish (pupping, nursing and foraging areas); and
- dwarf sawfish (pupping, nursing and foraging areas).

BIAs for the whale shark and sawfish species are outlined in **Table 5-4** and **Figure 5-1**.

The NWS / Scarborough activity area has partial overlap with the Continental slope demersal fish communities KEF. The continental slope between North-west Cape and the Montebello Trough has more than 500 fish species, 76 of which are endemic, which makes it the most diverse slope bioregion in Australia (Last *et al.*, 2005).

5.4.5 North-west Cape

The North-west Cape activity area includes biologically important foraging habitat for the whale shark:

- whale shark, including:
  - Foraging (high density) in Ningaloo Marine Park and adjacent Commonwealth waters (March–July); and
  - Foraging northward from Ningaloo along the 200 m isobath (July – Nov).

BIAs for the whale shark are outlined in **Table 5-4** and **Figure 5-1**.

The North-west Cape activity area coincides with part of the Continental slope demersal fish communities KEF.

6. MARINE REPTILES

6.1 Regional Context for Marine Reptiles

The NWMR contains important habitat for listed marine reptiles, including areas that support key life stages such as nesting, internesting, migration and foraging for marine turtle species, and habitats supporting resident sea snake and crocodile populations.

Six of the seven marine turtle species occur in Australian waters, and all six (the green turtle, hawksbill turtle, loggerhead turtle, flatback turtle, leatherback turtle and olive ridley turtle) occur in the NWMR and NMR.

There are 25 listed species of sea snake reported within or adjacent to the NWMR (Guinea, 2007a; Udyawer *et al*., 2016), of which four are endemic to reef habitats in the remote parts of the region. Nineteen (19) listed sea snake species are known to occur in the NMR, as reported in the Protected Matters search (**Appendix A**).

There are significantly fewer marine reptile species that frequently occur within the SWMR and presently include three species of listed marine turtle and one sea snake species. Other species of sea snake may occur because of the southward-flowing Leeuwin Current, as vagrants in the region (DSEWPAC, 2012b).

The following sections focus on the listed marine reptile species known to occur within the NWMR.

Table 6-1 outlines the threatened and migratory marine reptile species that occur within the NWMR, with their conservation status and relevant recovery plans and/or conservation advice.

Table 6-1 Marine reptile species identified by the EPBC Act PMST as potentially occurring within or utilising habitats in the NWMR for key life cycle stages

Species Name	Common Name	*Environment Protection and Biodiversity Conservation Act 1999*			WA *Biodiversity Conservation Act 2016*	EPBC Act Part 13 Statutory Instrument
		Threatened Status	Migratory Status	Listed	Conservation Status	
Caretta caretta	Loggerhead turtle	Endangered	Migratory	Marine	Endangered	Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth of Australia, 2017)
Chelonia mydas	Green turtle	Vulnerable	Migratory	Marine	Vulnerable	
Dermochelys coriacea	Leatherback turtle	Endangered	Migratory	Marine	Vulnerable	
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	Migratory	Marine	Vulnerable	
Natator depressus	Flatback turtle	Vulnerable	Migratory	Marine	Vulnerable	
Lepidochelys olivacea	Olive ridley turtle	Endangered	Migratory	Marine	Vulnerable	
Aipysurus apraefrontalis	Short-nosed sea snake	Critically endangered	N/A	Marine	Critically endangered	Approved Conservation Advice for *Aipysurus apraefrontalis* (Short-nosed Sea Snake) (DSEWPAC, 2011a)
Aipysurus foliosquama	Leaf-scaled sea snake	Critically endangered	N/A	Marine	Critically endangered	Approved Conservation Advice for *Aipysurus foliosquama* (Leaf-scaled Sea Snake) (DSEWPAC, 2011b)
Crocodylus porosus	Salt-water crocodile	N/A	Migratory	Marine	Other protected fauna	N/A

6.2 Marine Turtles in the NWMR

According to the Protected Matters search (**Appendix A**) six species of marine turtle known to occur within the NWMR are listed as threatened and migratory (three Vulnerable and three Endangered) under the EPBC Act—the green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), flatback (*Natator depressus*), loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*) and olive ridley (*Lepidochelys olivacea*) turtle (DSEWPAC, 2012a) (refer **Table 6-1**).

The NWMR supports globally significant breeding populations of four marine turtle species: the green, hawksbill, flatback and loggerhead turtle. Olive ridley turtles are known to forage within the NWMR, but there are only occasional records of the species nesting in the region. Leatherback turtles regularly forage over Australian continental shelf waters within the NWMR but there are also no records of the species nesting in the region (DSEWPAC, 2012a).

The six marine turtle species reported for the NWMR also occur within the NMR.

Three marine turtle species; the green, loggerhead, and leatherback turtle, have presumed feeding areas within the SWMR; however, no known nesting areas exist within the region (DSEWPAC, 2012b).

Discrete genetic stocks have evolved within each marine turtle species. This is the result of marine turtles returning to the location where they hatched. These genetically distinct stocks are defined by the presence of regional breeding aggregations. Stocks are composed of multiple rookeries in a region and are delineated by where there is little or no migration of individuals between nesting areas. Turtles from different stocks typically overlap at feeding grounds (Commonwealth of Australia, 2017). There are 17 genetic stocks across both the NWMR and NMR (nine in the NWMR, six in the NMR, and two overlapping both regions). Of these 17 genetic stocks, nine are known to occur within Woodside's three areas of activity (**Table 6-2**).

6.2.1 Life Cycle Stages

Marine turtles are highly migratory during non-reproductive life phases and have high site fidelity during breeding and nesting life phases. Majority of their lives are spent in the ocean, but the adult female marine turtles will come ashore to lay eggs in the sand above the high water mark on natal beaches (Commonwealth of Australia, 2017). **Figure 6-1** summarises the generalised life cycle of marine turtles. Species-specific life cycle information is outlined within the Recovery Plan for Marine Turtles of Australia (Commonwealth of Australia, 2017).

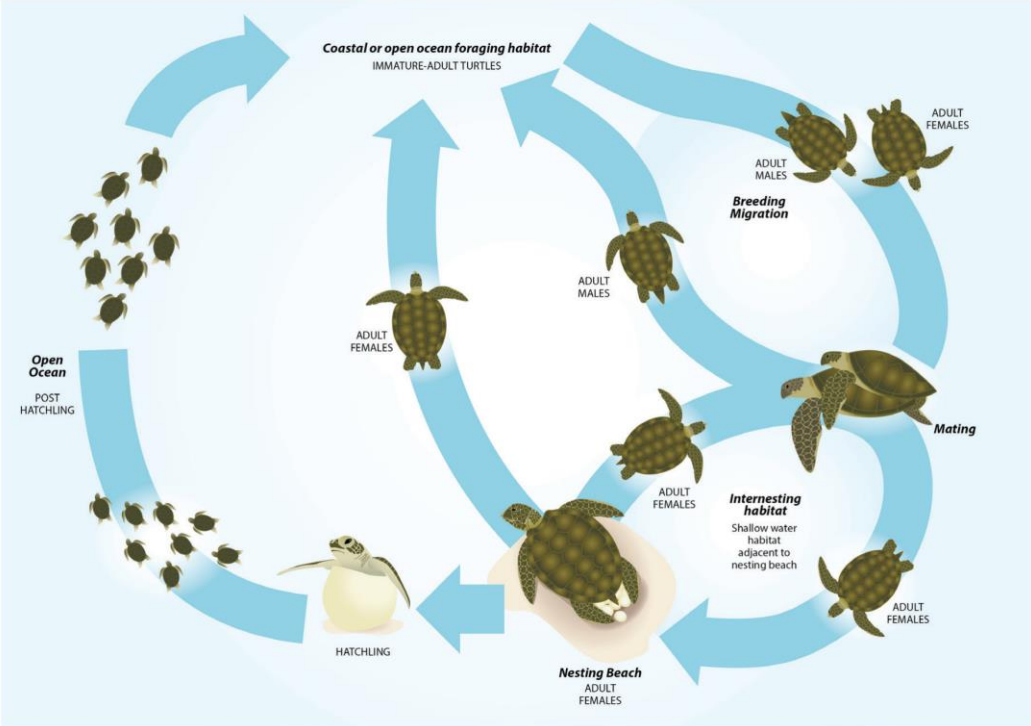

Figure 6-1 Generalised life cycle of marine turtles (Commonwealth of Australia, 2017)

6.2.2 Habitat Critical to Survival for Marine Turtles in the NWMR

The Recovery Plan for Marine Turtles of Australia (Commonwealth of Australia, 2017) identifies habitat critical to the survival of a species for marine turtle stocks under the EPBC Act. Habitat critical to survival is defined by the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* as areas necessary:

- for activities such as foraging, breeding or dispersal;
- for the long-term maintenance of the species (including the maintenance of species essential to the survival of the species);
- to maintain genetic diversity and long term evolutionary development; and
- for the reintroduction of populations or recovery of the species.

The Recovery Plan for Marine Turtles of Australia (Commonwealth of Australia, 2017) has identified nesting locations and associated internesting areas as habitat critical to survival for four marine turtle species within the NWMR and these are identified, described and mapped in **Table 6-2** and **Figure 6-2**. No habitat critical to survival has been identified within the NWMR for olive ridley or leatherback turtles.

Table 6-2 outlines the relevant genetic stock, habitat critical to survival and key life cycle stage seasonality of the four species of marine turtles within the NWMR.

Table 6-2 Genetic stock, habitat critical to survival and key life cycle stage seasonality of the four species of marine turtles within the NWMR

Species	Woodside Activity Area			Habitat Critical to Survival			
	Browse	NWS/S	NWC	Nesting (* Major Rookery[1])	Internesting Buffer	Seasonality-Nesting	Preferred Habitat[2]
Green Turtle							
NWS Stock (G-NWS)	✓	✓	✓	Adele Island Maret Island Cassini Island Lacepede Islands* Barrow Island* Montebello Islands (all with sandy beaches)* Serrurier Island Dampier Archipelago Thevenard Island Northwest Cape* Ningaloo coast	20 km radius	Nov-Mar	Nearshore reef habitats in the photic zone.
Ashmore Reef Stock (G-AR)	✓	-	-	Ashmore Reef* Cartier Reef*		All year (peak: Dec-Jan)	
Scott Reef-Browse Island Stock (G-ScBr)	✓	-	-	Scott Reef (Sandy Islet)* Browse Island*		Nov-Mar	
Hawksbill Turtle							
Western Australia Stock (H-WA)	-	✓	-	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	20 km radius	Oct-Feb	Nearshore and offshore reef habitats.

Species	Woodside Activity Area			Habitat Critical to Survival			
	Browse	NWS/S	NWC	Nesting (* Major Rookery[1])	Internesting Buffer	Seasonality-Nesting	Preferred Habitat[2]
Flatback Turtle							
Cape Domett Stock (F-CD)	✓	-	-	Cape Domett* Lacrosse Island	60 km radius	All year (peak: Jul-Sep)	Nearshore and offshore sub-tidal and soft bottomed habitats of offshore islands.
South-west Kimberley Stock (F-swKim)	-	✓	-	Eighty Mile Beach* Eco Beach* Lacepede Islands		Oct-Mar	
Pilbara Stock (F-Pil)	-	✓	-	Montebello Islands Mundabullangana Beach* Barrow Island* Cemetery Beach Dampier Archipelago (including Delambre Island* and Huay Island) Coastal islands from Cape Preston to Locker Island		Oct-Mar	
Unknown genetic stock Kimberley, Western Australia	✓	✓	-	Maret Islands Montilivet Islands Cassini Island Coronation Islands (includes Lamarck Island) Napier-Broome Bay Islands (West Governor Island, Sir Graham Moore Island – near Kalumbaru) Champagny, Darcy and Augustus Islands (Camden Sound)		May-July	

Species	Woodside Activity Area			Habitat Critical to Survival			
	Browse	NWS/S	NWC	Nesting (* Major Rookery[1])	Internesting Buffer	Seasonality-Nesting	Preferred Habitat[2]
Loggerhead Turtle							
Western Australia Stock (LH-WA)	-	-	✓	Dirk Hartog Island* Muiron Islands* Gnaraloo Bay* Ningaloo coast	20 km radius	Nov-May	Nearshore and island coral reefs, bays and estuaries in tropical and warm temperate latitudes.

[1] *Major rookeries as outlined in the Recovery Plan (Commonwealth of Australia, 2017)*

[2] *Preferred habitat as outlined in the Recovery Plan (Commonwealth of Australia, 2017)*

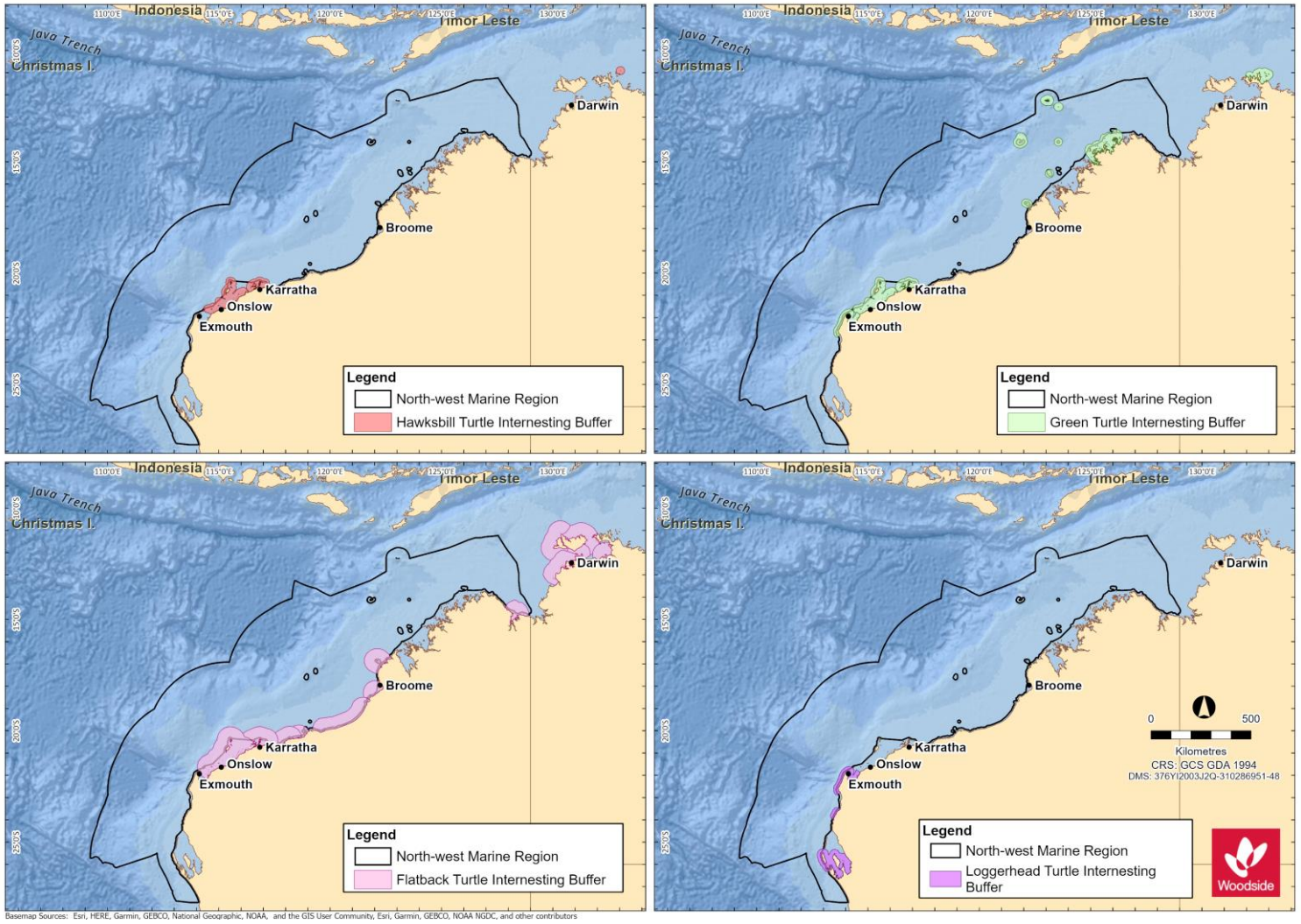

Figure 6-2 Marine turtle species habitat critical to survival (nesting beaches and internesting buffers) for the NWMR

6.3 Marine Turtle Biological Important Areas in the NWMR

A review of the National Conservation Values Atlas (DAWE, 2020[2]) identified BIAs for the four marine turtle species that occur within the NWMR. These are described in **Table 6-3**. Note that nesting and internesting BIAs are not listed in **Table 6-3** as they are defined as in the Recovery Plan as habitat critical to survival for marine turtles nesting beaches and internesting areas (refer **Table 6-2**).

[2] http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf

Table 6-3 Marine turtle BIAs within the NWMR

Species	Woodside Activity Area			BIAs		
	Browse	NWS/S	NWC	Mating	Foraging	Migration[3]
Green turtle	✓	✓	✓	No mating BIA identified within the NWMR.	Foraging inshore areas of Barrow Island Foraging at Montgomery Reef Foraging at Montebello Islands Foraging at Dixon Island Foraging around Ashmore Reef Foraging at Seringapatam Reef and Scott Reef Foraging in the De Grey River area to Bedout Island Foraging around the Islands between Cape Preston and Onslow and inshore of Barrow Island Foraging around Dampier Archipelago (islands to the west of the Burrup Peninsula) Foraging at Legendre Island and Huay Island Foraging around Delambre Island Foraging in the Joseph Bonaparte Gulf Foraging in waters adjacent to James Price Point	Green turtles can migrate more than 2600 km between their feeding and nesting grounds. Individual turtles foraging in the same area do not necessarily take the same migration route (Limpus *et al.*, 1992). Ferreira et al. (2021) broadly identified two migratory corridors, one used by the NWS stock-Pilbara and another used by the NWS stock-Kimberley and the Scott-Browse stock with some overlap at the northern and southern extents respectively. This study showed that the foraging distribution of green turtles from two stocks in WA expands throughout north-west and northern Australian coastal waters, including the NT and Queensland.
Hawksbill turtle	✓	✓	✓	No mating BIA identified within the NWMR.	Foraging around the Lowendal Island group Foraging at Delambre Island Foraging around Dixon Island Foraging in the De Grey River area to Bedout Island Foraging around the islands between Cape Preston and	Individuals may migrate up to 2400 km between their nesting and foraging grounds (DSEWPAC, 2012a).

[3] Migration BIA does not exist for Marine Turtles – general information provided.

Species	Woodside Activity Area			BIAs		
	Browse	NWS/S	NWC	Mating	Foraging	Migration[3]
					Onslow and inshore of Barrow Island Foraging around the islands of the Dampier Archipelago (to the west of the Burrup Peninsula) Foraging at Ashmore Reef	
Flatback turtle	✓	✓	-	Lacepede Islands Mating at Montebello Islands Mating at Dampier Archipelago (islands to the west of the Burrup Peninsula) Mating at Barrow Island A year-round internesting buffer biologically important area (BIA) of 80 km is located north and north-west of the Montebello Islands, extending 20 km further than the habitat critical to survival. However, use level for this BIA has been defined as very low (Commonwealth of Australia, 2017) and the habitat critical to survival internesting buffer is the legally recognised area of protection under the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* Refer to the Marine Bioregional Plan for the North-west Marine Region (DSEWPAC, 2012a) for locations of seasonal 80 km internesting buffer BIAs for flatback turtles	Foraging at the islands between Cape Preston and Onslow and inshore of Barrow Island. Foraging at Montebello Islands Foraging at Dampier Archipelago (islands to the west of the Burrup Peninsula) Foraging at Legendre Island and Huay Island Foraging at Delambre Island Foraging in the Joseph Bonaparte Depression Foraging in waters adjacent to James Price Point	There is evidence that some flatback turtles undertake long-distance migrations between breeding and feeding grounds (Limpus *et al.*, 1983). However, flatback turtles generally do not have a pelagic phase to their lifecycle. Instead, hatchlings grow to maturity in shallow coastal waters thought to be close to their natal beaches (DSEWPAC, 2012a).

Species	Woodside Activity Area			BIAs		
	Browse	NWS/S	NWC	Mating	Foraging	Migration[3]
Loggerhead turtle	✓	✓	-	No mating BIA identified within the NWMR	Foraging in the De Grey River area to Bedout Island Foraging on the Western Joseph Bonaparte Depression Foraging in the waters adjacent to James Price Point	Adult loggerhead turtles dispersing from Dirk Hartog Island beaches (near Shark Bay) have remained within WA waters from southern WA to the Kimberley. Turtles dispersing from the North-west Cape–Muiron Islands nesting area have ranged north as far as the Java Sea and the north-western Gulf of Carpentaria, and to south-west WA (DSEWPAC, 2012).
Olive ridley turtle	✓	✓	-	No mating BIA identified within the NWMR	Foraging in the Western Joseph Bonaparte Depression and Gulf Foraging in the Dampier Archipelago (islands to the west of the Burrup Peninsula)	Migration routes and distances between nesting beaches and foraging areas are not known for Australian olive ridley turtles.

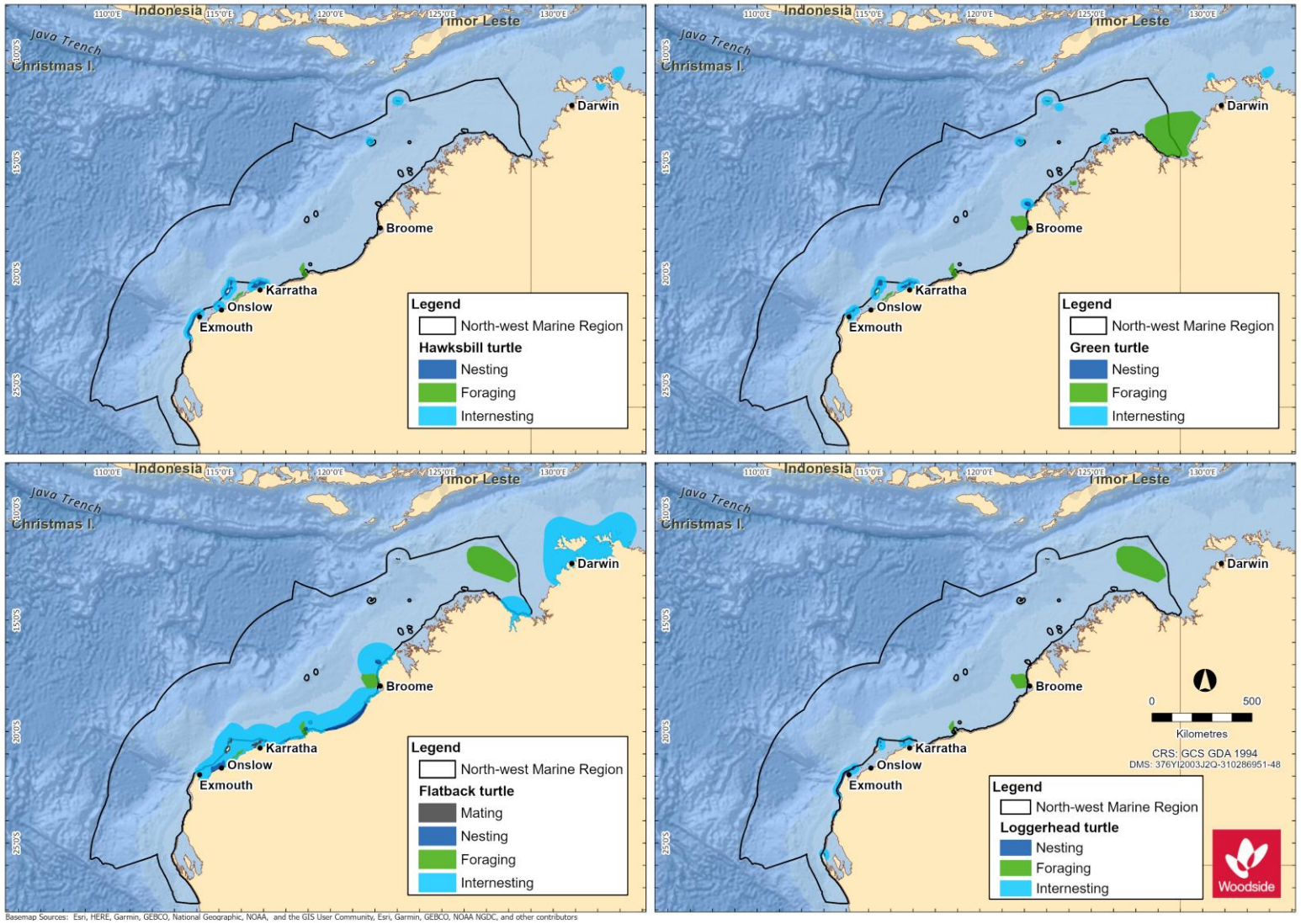

Figure 6-3 Marine turtle species BIAs within the NWMR

6.4 Marine Turtle Summary for NWMR

Six of the seven marine turtle species occur within the Woodside activity areas. Across all three areas, globally significant breeding populations of four marine turtle species; the green, hawksbill, flatback and loggerhead turtle, have been recorded.

However, offshore waters do not represent biologically important habitat for marine turtles in any of the three Woodside activity areas. Isolated records of transient individuals (on post-nesting migration) are expected, but there is no evidence of important habitat or behaviours for marine turtles in offshore, open water environment of the NWS, in general.

6.4.1 Browse

The proposed Browse activity area includes major nesting areas that support globally significant breeding populations of two marine turtle species:

- the green turtle, including two distinct genetic stocks (Ashmore Reef and Scott Reef-Browse Island); and
- the flatback turtle, Cape Domett genetic stock.

Locations of habitat critical for each of the two species are outlined in **Table 6-2** and **Figure 6-2**.

BIAs for the green and flatback turtle are outlined in **Table 6-3** and **Figure 6-3**.

Table 6-4 Marine turtle key information for Browse activity area

Species / Genetic Stock	Key Information
Green Turtle	
Ashmore Reef Stock (G-AR)	The G-AR stock nests in a localised area of the Indian Ocean in the Ashmore Reef and Cartier Island AMP areas. Population estimates are not available for Ashmore Reef, although annual breeding numbers are thought to be in the low hundreds (Whiting, 2000). Designated habitat critical for the G-AR stock are the nesting locations of Ashmore Reef and Cartier Reef, and an internesting buffer of 20 km radius around these rookeries, year-round with peak internesting activity occurring December to January (refer Table 6 of the Recovery Plan). Juvenile and adult turtles forage within the tidal/sub-tidal habitats of offshore islands and coastal waters with coral reef, mangrove, sand, rocky reefs, and mudflats where there are algal turfs or seagrass meadows present (Commonwealth of Australia, 2017).
Scott Reef-Browse Island Stock (G-ScBr)	The G-ScBr stock is a discrete unit known to nest at only two locations within the north-east Indian Ocean—Sandy Islet and Browse Island. There is currently very limited data available for the G-ScBr stock, therefore population numbers are not known. Designated habitat critical for the G-ScBr stock are the nesting locations of Sandy Islet and Browse Island, and an internesting buffer of 20 km radius around these rookeries, for the period November to March (refer Table 6 of the Recovery Plan). Surveys conducted at Scott Reef in 2006, 2008 and 2009 indicate that the summer months from late November to February are the preferred breeding season for green turtles at Sandy Islet (Guinea, 2009). Satellite tagging studies (Pendoley, 2005; Guinea, 2011) have provided an indication of the behaviour and migratory routes of adult green turtles leaving Scott Reef. Most animals appear to swim through South Reef lagoon and disperse toward the Western Australian mainland via two distinct post-nesting migration pathways; travelling east and north toward the Bonaparte Archipelago and then north along the coast to foraging areas in NT waters, or travelling south to Cape Leveque and then south along the coast to the Turtle Islands off the mouth of the De Grey River in the Pilbara region (Ferreira *et al*., 2021).

Species / Genetic Stock	Key Information
Flatback Turtle	
Cape Domett Stock (F-CD)	Cape Domett is an important high density nesting area. Combined with a smaller site at Lacrosse Island, the F-CD stock is one of the largest flatback turtle stocks in Australia. Average nesting abundance at Cape Domett is estimated at 3250 females per year (Whiting *et al.*, 2008). Designated habitat critical for the F-CD stock are the nesting locations of Cape Domett and Lacrosse Island, and an internesting buffer of 60 km radius around these rookeries, year-round with peak internesting activity occurring July to September. Extending further than the habitat critical internesting buffer, an internesting buffer BIA of 80 km is located at Cape Domett and Lacrosse Island.

6.4.2 North-west Shelf / Scarborough

The NWS / Scarborough activity area includes major nesting areas that support globally significant breeding populations of three marine turtle species, representing four discreet genetic stocks:

- the green turtle, NWS genetic stock;
- the hawksbill turtle, WA genetic stock; and
- the flatback turtle, South-west Kimberley stock and Pilbara genetic stocks.

Locations of habitat critical for each of the four species are outlined in **Table 6-2** and **Figure 6-2**.

BIAs for the green, hawksbill, and flatback are outlined in **Table 6-3** and **Figure 6-3**.

Table 6-5 Marine turtle key information for NWS / Scarborough activity area

Species / Genetic Stock	Key Information
Green Turtle	
NWS Stock (G-NWS)	The G-NWS stock is one of the largest green turtle stocks in the world and the largest in the Indian Ocean. The G-NWS stock is estimated at approximately 20,000 individuals (DSEWPAC, 2012a) and the trend for the stock is reported as stable (Commonwealth of Australia, 2017). Major rookeries of the G-NWS stock within the NWS / Scarborough activity area are located at Barrow Island and the Montebello Islands. These areas are designated habitat critical for the stock and include an internesting buffer of 20 km radius around these rookeries, November to March.
Hawksbill Turtle	
Western Australia Stock (H-WA)	The H-WA stock is the largest in the Indian Ocean. The majority of the nesting for this stock is located in the Pilbara. The Dampier Archipelago has the largest nesting aggregation recorded. In particular, Rosemary Island supports the most significant hawksbill turtle rookery in the WA region and one of the largest in the Indian Ocean; approximately 500-1000 females nest on the island annually, more than at any other WA rookery (Pendoley, 2005; Pendoley *et al*., 2016). Major rookeries of the H-WA stock within the NWS / Scarborough activity area are located at Rosemary Island, Delambre Island and the Montebello Islands. These areas are designated habitat critical for the stock and include an internesting buffer of 20 km radius around these rookeries, October to February.
Flatback Turtle	
South-west Kimberley Stock (F-swKim)	The genetic relationship between this nesting aggregation and the Cape Domett and Pilbara stocks is currently under review. Population numbers of the F-swKim stock are unknown. Major rookeries of the F-swKim stock are located at Eighty Mile Beach and Eco Beach. These areas are designated habitat critical for the stock and include an internesting buffer of 60 km radius around these rookeries, October to March.

Species / Genetic Stock	Key Information
Pilbara Stock (F-Pil)	The extent of genetic relatedness of flatback turtles along the WA coast is currently under review. Population numbers of the F-Pil stock are unknown. This stock nests on many islands in the Pilbara and southern Kimberley, with major rookeries at Mundabullangana Beach, Delambre Island and Barrow Island. These areas are designated habitat critical for the F-Pil stock and include an internesting buffer of 60 km radius around these rookeries, October to March. Extending further than the habitat critical internesting buffer, a year-round internesting buffer BIA of 80 km is located north and north-west of the Montebello Islands. However, use level for this BIA has been defined as very low (Commonwealth of Australia, 2017) and the habitat critical internesting buffer is the legally recognised area of protection under the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*. Post-nesting satellite tracking indicates foraging occurs along the WA coast in water shallower than 130 m and within 315 km of shore (Commonwealth of Australia, 2017).

6.4.3 North-west Cape

The North-west Cape activity area includes major nesting areas that support globally significant breeding populations of two marine turtle species, representing two discreet genetic stocks:

- the green turtle, NWS genetic stock; and
- the loggerhead turtle, Western Australia genetic stock.

Locations of habitat critical for each of the two species are outlined in **Table 6-2** and **Figure 6-2**.

BIAs for the green and loggerhead turtles are outlined in **Table 6-3** and **Figure 6-3**.

A 2018 survey, including on-beach monitoring of the Muiron Islands and Ningaloo Coast from North-west Cape to Bungelup (Rob *et al.*, 2019), supports the concept that North-west Cape and the Muiron Islands are major important nesting areas for green and loggerhead turtles, as identified in the Recovery Plan (Commonwealth of Australia, 2017).

Table 6-6 Marine turtle key information for North-west Cape activity area

Species / Genetic Stock	Key Information
Green Turtle	
NWS Stock (G-NWS)	The G-NWS stock is one of the largest green turtle stocks in the world and the largest in the Indian Ocean. The G-NWS stock is estimated at approximately 20,000 individuals (DSEWPAC, 2012a) and the trend for the stock is reported as stable (Commonwealth of Australia, 2017). There is one major rookery of the G-NWS stock located within the North-west Cape activity area. Located on the mainland coast of the North-west Cape, this area is designated habitat critical for the stock and includes an internesting buffer of 20 km radius around the rookery, November to March.
Loggerhead Turtle	
Western Australia Stock (LH-WA)	The LH-WA stock is one of the largest in the world (Limpus, 2009). The trend for the stock is reported as stable (Commonwealth of Australia, 2017). Major rookeries of the LH-WA stock are located at Dirk Hartog Island, Muiron Islands and Gnaraloo Bay. These areas are designated habitat critical for the stock and include an internesting buffer of 20 km radius around these rookeries, November to May. Dirk Hartog Island in the Shark Bay Marine Park, with an average of 122 nests per day over 2.1 km (Reinhold and Whiting, 2014), is recognised as the most important loggerhead turtle rookery in WA (Commonwealth of Australia, 2016; as cited in Rob *et al.*, 2019).

6.5 Sea Snakes

Sea snakes are commonly found in the NWMR and NMR, but less so in the SWMR, and occupy three broad habitat types: shallow water coral reef and seagrass habitats, deepwater soft bottom habitats away from reefs, and surface water pelagic habitats (Guinea, 2007a).

There are 25 listed species of sea snake reported within or adjacent to the NWMR (Guinea, 2007a; Udyawer *et al*., 2016), of which four are endemic to reef habitats in the remote parts of the region:

- dusky sea snake (*Aipysurus fuscus*);
- large headed sea snake (*Hydrophis pacificus*);
- short-nosed sea snake (*Aipysurus apraefrontalis*); and
- leaf-scaled sea snake (*Aipysurus foliosquama*).

The short-nosed sea snake and the leaf-scaled sea snake are listed threatened species (Critically Endangered) under the EPBC Act **(Table 6-7**).

There is currently limited knowledge about the ranges and distribution patterns of sea snake species in the NWMR, in addition to a lack of understanding of population status and threats. Recent findings of *A. apraefrontalis* and *A. foliosquama* in locations outside of their previously defined ranges have highlighted the lack of information on species distributions in the NWMR (Udyawer *et al.*, 2016). Udyawer *et al.* (2020) used a correlative modelling approach to understand habitat associations and identify suitable habitats for five sea snake species (*A. apraefrontalis, A. foliosquama, A. fuscus, A. l. pooleorum* and *A. tenuis*). Species-specific habitat suitability was modelled across 804,244 km^2 of coastal waters along the NWS, and the resulting habitat suitability maps enabled the identification of key locations of suitable habitat for these five species (refer **Table 6-6**).

No habitat critical to survival or BIAs for sea snake species have been identified in the NWMR. While the Ashmore Reef and Cartier Island AMPs have been recognised for their high diversity and density of sea snakes (DSEWPAC, 2012a), surveys have revealed a steep decline in sea snake numbers at Ashmore Reef (Guinea, 2007b; Lukoschek *et al.*, 2013). Leaf-scaled and short-nosed sea snakes have been absent from surveys at Ashmore Reef since 2001, despite an increase in survey intensity (Guinea, 2006, 2007b; Guinea and Whiting, 2005; Lukoschek *et al.*, 2013). The reason for the decline is unknown.

Table 6-7 Information on the two threatened sea snake species within the NWMR

Species	Preferred Habitat and Diet	Habitat Location
Short-nosed sea snake	Preferred habitat: Primarily on the reef flats or in shallow waters of the outer reef edges to depths of 10 m (Minton *et al*., 1975). Typically, movement is restricted to within 50 m of reef flat habitat (Guinea and Whiting, 2005). Diet: Primarily fishes and eels.	The short-nosed sea snake has been recorded from Exmouth Gulf to the reefs of the Sahul Shelf, although most records come from Ashmore and Hibernia reefs (Guinea and Whiting, 2005). Key locations of suitable habitat: Ashmore Reef, Exmouth Gulf, Muiron Islands, Montebello Islands (Udyawer *et al.*, 2020).
Leaf-scaled sea snake	Preferred habitat: The leaf-scaled sea snake occurs in shallow protected areas of reef flats, typically in water depth less than 10 m. Diet: Primarily shallow water coral-associated wrasse, gudgeons, clinids and eels (McCosker, 1975; Voris, 1972; Voris and Voris, 1983)	The leaf-scaled sea snake has only been recorded at Ashmore and Hibernia reefs (Guinea and Whiting, 2005), indicating it has a very limited distribution. Key locations of suitable habitat: Ashmore Reef, Shark Bay, Exmouth Gulf, Barrow Island and Montebello Islands (Udyawer *et al.*, 2020).

6.6 Crocodiles

The salt-water crocodile (*Crocodylus porosus*) is a listed migratory species under the EPBC Act known to occur within the NWMR. The species is found in most major river systems of the Kimberley, including the Ord, Patrick, Forrest, Durack, King, Pentecost, Prince Regent, Lawley, Mitchell, Hunter, Roe and Glenelg rivers. The largest populations occur in the rivers draining into the Cambridge Gulf and the Prince Regent River and Roe River systems. There have also been isolated records in rivers of the Pilbara region, around Derby near Broome and as far south as Carnarvon on the mid-west coast.

No BIAs for salt-water crocodile have been identified in the NWMR.

7. MARINE MAMMALS

7.1 Regional Context

The offshore waters of WA include important habitat for marine mammals, including areas that support key life stages such as breeding, foraging, and migration. Of the 45 species of cetacean occurring in Australian waters, 27 species occur regularly in the waters of the NWMR, nine species in the waters of the NMR and 33 species in the SWMR. The waters of the NWMR and the NMR also support significant populations of dugong (DSEWPAC, 2012a, c).

The NWMR is an important migratory pathway between feeding grounds in the Southern Ocean and breeding grounds in tropical waters of the NWMR for several cetacean species (DSEWPAC, 2012a). Numerous large mysticetes (baleen whale) species, in particular the humpback whale, are known to utilise the region for migration and calving, and the pygmy blue whale for foraging and as a migration pathway between southern feeding and northern breeding/feeding areas, north of the equator.

The SWMR is an important area for numerous marine mammal species including pinniped species, large, migratory whale species and resident coastal whale and dolphin species (DSEWPAC, 2012b).

The NMR and adjacent areas are important for several species of cetacean, particularly inshore dolphin species. These species, and other marine mammals, rely on the waters of the NMR and adjacent coastal areas for breeding and foraging. However, there is little knowledge of the seasonal movements, migrations and breeding seasonality for many of the marine mammal species in the NMR due to lack of extensive surveys (DSEWPAC, 2012c).

Table 7-1 outlines the threatened and migratory marine mammal species that may occur within the NWMR, with their conservation status and relevant recovery plans and/or conservation advice.

Table 7-1 Marine mammal species identified by the EPBC Act PMST as occurring within the NWMR

Species Name	Common Name	*Environment Protection and Biodiversity Conservation Act 1999*			WA *Biodiversity Conservation Act 2016*	EPBC Act Part 13 Statutory Instrument
		Threatened Status	Migratory Status	Listed	Conservation Status	
Cetaceans - Mysticeti						
Balaenoptera musculus	Blue whale	Endangered	Migratory	Cetacean	Endangered	Conservation Management Plan for the Blue Whale - A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999* 2015-2025 (Commonwealth of Australia, 2015a)
Eubalaena australis	Southern right whale	Endangered	Migratory	Cetacean	Vulnerable	Conservation Management Plan for the Southern Right Whale: A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999* 2011-2021 (DSEWPAC, 2012d)
Balaenoptera borealis	Sei whale	Vulnerable	Migratory	Cetacean	Endangered	Conservation Advice *Balaenoptera borealis* sei whale (Threatened Species Scientific Committee, 2015a)
Megaptera novaeangliae	Humpback whale	Vulnerable	Migratory	Cetacean	Conservation dependent	Conservation Advice *Megaptera novaeangliae* humpback whale (Threatened Species Scientific Committee, 2015b)
Balaenoptera physalus	Fin whale	Vulnerable	Migratory	Cetacean	Endangered	Conservation Advice *Balaenoptera physalus* fin whale (Threatened Species Scientific Committee, 2015c)
Balaenoptera edeni	Bryde's whale	N/A	Migratory	Cetacean	N/A	N/A
Balaenoptera bonaerensis	Antarctic minke whale	N/A	Migratory	Cetacean	N/A	N/A
Cetaceans - Odontoceti						
Physeter macrocephalus	Sperm whale	N/A	Migratory	Cetacean	Vulnerable	N/A
Orcinus orca	Killer whale	N/A	Migratory	Cetacean	N/A	N/A
Orcaella heinsohni	Australian snubfin dolphin	N/A	Migratory	Cetacean	Priority	N/A
Sousa chinensis	Indo-Pacific humpback dolphin	N/A	Migratory	Cetacean	Priority	N/A

Species Name	Common Name	*Environment Protection and Biodiversity Conservation Act 1999*			WA *Biodiversity Conservation Act 2016*	EPBC Act Part 13 Statutory Instrument
		Threatened Status	Migratory Status	Listed	Conservation Status	
Tursiops aduncus	Spotted bottlenose dolphin (Arafura/Timor Sea populations)	N/A	Migratory	Cetacean	N/A	N/A
Sirenians and Pinnipeds						
Dugong dugon	Dugong	N/A	Migratory	Marine	Other protected fauna	N/A
Neophoca cinerea	Australian sea lion	Endangered	N/A	Marine	Vulnerable	Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) 2013 (DSEWPAC, 2013a) Conservation Advice *Neophoca cinerea* Australian Sea Lion (Threatened Species Scientific Committee, 2020a) (in effect under the EPBC Act from 23-Dec-2020)

7.2 Cetaceans in the NWMR

Cetaceans are generally widely distributed and highly mobile. In general, distribution patterns reflect seasonal feeding areas, characterised by high productivity, and migration routes associated with reproductive patterns. The NWMR is thought to be an important migratory pathway between feeding grounds in the Southern Ocean and breeding grounds in tropical waters for several cetacean species (DSEWPAC, 2012a).

From the Protected Matters search, 34 EPBC Act listed species were recorded as potentially occurring or having habitat within the NWMR (**Appendix A**). Of those, 12 cetacean species are listed as threatened and/or migratory, including baleen whales, toothed whales and dolphins that occur within the NWMR (**Table 7-2**).

7.3 Dugongs in the NWMR

The dugong is listed as migratory under the EPBC Act. Dugongs inhabit seagrass meadows in coastal waters, estuarine creeks and streams, and reef systems (DSEWPAC, 2012a).

Some of the coastal waters adjacent to the NWMR support significant populations of dugongs, including Shark Bay, Exmouth Gulf, in and adjacent to Ningaloo Reef, in coastal waters along the Kimberley coast, and on the edge of the continental shelf at Ashmore Reef (DEWHA, 2008).

Although the patterns of dugong movement in WA are not well understood, it is thought that dugongs move in response to availability of seagrass (Marsh *et al.*, 1994; Preen *et al.*, 1997) and water temperature.

There are a number of BIAs for dugong within and adjacent to waters of the NWMR (refer **Section 7.5**).

7.4 Pinnipeds in the NWMR

The Australian sea lion is listed as a species that may occur, or may have habitat within the NWMR (Protected Matters search - **Appendix A**). It is included here as the Australian sea lion is the only pinniped endemic to Australia (Strahan, 1983) and has been recorded within the southern extent of the NWMR at Shark Bay, WA (Kirkwood *et al.*, 1992). The most northern known breeding colony is at the Houtman Abrolhos Islands in the SWMR. The Australian sea lion's breeding range extends from the Houtman Abrolhos Islands, WA to The Pages Island, east of Kangaroo Island, SA. The Australian sea lion was listed as endangered in 2020 (Threatened Species Scientific Committee, 2020a). An assessment of the status and trends in abundance of this endemic, coastal pinniped species (Goldsworthy *et al.* 2021) documented an overall reduction in pup abundance over three generations, providing strong evidence that the species meets IUCN endangered criteria.

There are no BIAs for the Australian sea lion in the NWMR.

Table 7-2 Information on the threatened/migratory marine mammal species within the NWMR

Species	Key Information
Baleen whales (Mysticeti)	
Humpback whale	In Australian waters two genetically distinct populations migrate annually along the west (Group IV) and east coasts (Group V) between May and November. In WA, the migration pathway for the Group IV population (also known as Breeding Stock D) extends from Albany to the Kimberley coastline, passing through the NWMR (Threatened Species Scientific Committee, 2015b). Since the 1982 moratorium on commercial whaling population numbers have recovered significantly; from approximately 2000 to 3000 individuals in 1991, to between 19,200–33,850 individuals in 2008 (Bannister and Hedley, 2001; Bejder *et al.*, 2019; Hedley *et al.*, 2011). Aerial surveys off the WA coast undertaken between 2000 and 2008 produced a population estimate for the Group IV population of 26,100 individuals (CI 20,152–33,272) in 2008 (Salgado Kent *et al.*, 2012). Current population growth for the Group IV population is estimated to be between 9.7 and 13% per annum (Threatened Species Scientific Committee, 2015b). Using the Salago-Kent *et al.* (2012) estimate of 26,100 individuals and an annual population growth rate of ~10%, current population size could be in excess of 75,000 individuals (Woodside, 2019). The Group IV population migrates northward from their Antarctic feeding grounds around May each year, reaching the NWMR around early June. The southward migration subsequently starts in mid-September, around the time of breeding and calving (typically August to September) (Threatened Species Scientific Committee, 2015b). Within the NWMR there are key calving areas between Broome and the northern end of Camden Sound, and resting areas in the southern Kimberley region, Exmouth Gulf and Shark Bay. In particular, high numbers of humpback whales are observed in Camden Sound and Pender Bay from June to September each year (Threatened Species Scientific Committee, 2015b). There are reports of neonates further south, suggesting that the calving areas may be poorly defined. Aerial photogrammetric surveys in 2013 and 2015 recorded large numbers of humpback whale calves along North-west Cape, with estimated minimum relative calf abundance of 463–603 in 2013 and 557–725 in 2015 (Irvine *et al.*, 2018). The majority of calves sighted in both years (85% in 2013; 94% in 2015) were neonates, and these observations indicate that a minimum of approximately 20% of the expected number of calves of this population are born near, or south of, North-west Cape. Thus, the calving grounds for the Group IV population extend south from Camden Sound to at least North-west Cape, 1000 km south-west of the currently recognized calving area (Irvine *et al.*, 2018). There are BIAs for migration and breeding and calving for the humpback whale along the WA coast and within the NWMR (refer **Table 7-3** and **Figure 7-1**).
Blue whale	There are two recognised sub-species of blue whale in the Southern Hemisphere, both of which are recorded in Australian waters. These are the southern (or 'true') blue whale (*Balaenoptera musculus*) and the 'pygmy' blue whale (*Balaenoptera musculus brevicauda*) (Commonwealth of Australia, 2015a). In general, southern blue whales occur in waters south of 60°S and pygmy blue whales occur in waters north of 55°S (i.e. not in the Antarctic). On this basis, nearly all blue whales sighted in the NWMR are likely to be pygmy blue whales. The East Indian Ocean (EIO) pygmy blue whale population is seasonally distributed from Indonesia (a potential breeding ground) to south-west of Australia and east across the Great Australian Bight and Bonney Upwelling to beyond the Bass Strait (Blue Planet Marine, 2020). Migration seems to be variable, with some individuals appearing as resident to areas of high productivity and others undertaking migrations across long distances (Commonwealth of Australia, 2015a). McCauley *et al.* (2018) describe three migratory stages around Australia for the EIO pygmy blue whale population: a 'southbound migratory stage' where whales travel southwards from Indonesian waters offshore from the WA coastline, mostly from October to December but possibly into January of the following year; a protracted 'southern Australian stage' (January to June) where animals spread across southern waters of the Indian Ocean and south of Australia; and a 'northbound migratory stage' (April to August) where animals travel north back to Indonesia again. There are currently insufficient data to accurately estimate population numbers of the pygmy blue whale in Australian waters (Blue Planet Marine, 2020; Commonwealth of Australia, 2015a). There are, however, two estimates of population size of the EIO pygmy blue whale for WA. McCauley and Jenner (2010) calculated the population to be between 662 and 1559 individuals in 2004 based on passive acoustics (whale vocalisations), and Jenner *et al.* (2008) (based on photographic mark and recapture) calculated between 712 and 1754 individuals, but both estimates did not account for animals

Species	Key Information
	travelling further west into the Indian Ocean (McCauley *et al.*, 2018). More recent passive acoustic data estimates a 4.3% growth rate that applies to the proportion of EIO pygmy blue whales seasonally present in offshore water of the south-eastern Australia and may not reflect the full population but does imply an increasing population (McCauley *et al.*, 2018). The pygmy blue whale is typically present in the Perth Canyon from November to June, with an observed peak between March and May (Commonwealth of Australia, 2015a; Blue Planet Marine, 2020). The pygmy blue whale feeds in the Perth Canyon at depths of 200 to 300 m, which overlaps the typical distribution of krill (200–500 m water depth (day) to surface (night) (McCauley *et al.*, 2004; Commonwealth of Australia, 2015a). Other possible feeding grounds off the WA coast include the wider area around the Perth Canyon, and possible foraging areas off the Ningaloo Coast and at Scott Reef (Commonwealth of Australia, 2015a). Refer **Table 7-3** and **Figure 7-2** for the location and type of BIAs for blue whales in the NWMR. There is a migratory BIA for the pygmy blue whale within WA waters, which extends for most of the length of the NWMR within offshore waters.
Bryde's whale	The Bryde's whale is the least migratory of its genus and is restricted geographically from the equator to approximately 40°N and S, or the 20° isotherm (Bannister *et al.*, 1996). The species is known to exhibit inshore and offshore forms in other international locations that vary in morphology and migratory behaviours (Bannister *et al.*, 1996). This appears to also be the case within Australian waters. Bryde's whales have been identified as occurring in both oceanic and inshore waters, with the only key localities recognised in WA being in the Houtman Abrolhos Islands and north of Shark Bay (Bannister *et al.*, 1996). Data suggests offshore whales migrate seasonally, heading towards warmer tropical waters during the winter; however, information about migration within the NWMR is not well known (McCauley and Duncan, 2011). McCauley (2011) detected Bryde's whales using acoustic loggers deployed in and around Scott Reef from 2006 to 2009. Other acoustic logger data of Bryde's whale vocalisations recorded between Ningaloo and north of Darwin showed no apparent trends or seasonality (McCauley, 2011). There are no identified BIAs for this species in the National Conservation Values Atlas.
Southern right whale	The southern right whale occurs primarily in waters between about 20°S and 60°S and moves from high latitude feeding grounds in summer to warmer, low latitude, coastal locations in winter (Bannister *et al.*, 1996). Southern right whales aggregate in calving areas along the south coast of WA outside of the NWMR. However, there have been sightings in waters of the NWMR as far north as Ningaloo (Bannister and Hedley, 2001), and a stranding record exists for the far north Kimberley coast (ALA, 2020). Southern right whale calving grounds are found at mid to lower latitudes and are occupied during the austral winter and early-mid spring. They are regularly present on the southern Australian coast from about mid-May to mid-November, and peak periods for mating are from mid-July through August. Mating occurs within these breeding grounds as evidenced by many observations of intromission and mating behaviours. Southern right whales in south-western Australia appear to be increasing at the maximum biological rate but there is limited evidence of increase in south-eastern Australian waters (DSEWPAC, 2012d). There are no identified BIAs for this species in the NWMR.
Antarctic minke whale	The Antarctic minke whale is distributed worldwide and has been recorded off all Australian states (but not in the NT), feeding in cold waters and migrating to warmer waters to breed. It is thought that the Antarctic minke whale migrates up the WA coast to about 20°S to feed and possibly breed (Bannister *et al.*, 1996); however, detailed information about timing and location of migrations and breeding grounds within the NWMR is not well known. In the high latitudinal winter breeding grounds in other regions, the species appears to be distributed off the continental shelf edge. No population estimates are available for Antarctic minke whales in Australian waters. There are no identified BIAs for this species in the National Conservation Values Atlas.
Sei whale	The sei whale is a baleen whale with a worldwide oceanic distribution and is expected to seasonally migrate between low latitude wintering areas and high latitude summer feeding grounds (Bannister *et al.*, 1996; Prieto *et al.*, 2012). There are no known mating or calving areas in Australian waters. The species has a preference for deep waters, typically occurs in oceanic basins and continental slopes (Prieto *et al.*, 2012), and exhibits a migration pathway influenced by seasonal feeding and breeding patterns. Sei whales have been infrequently recorded in Australian waters (Bannister *et al.*, 1996). Reliable estimates of the sei whale population size in Australian waters are currently not possible due to a lack of dedicated surveys and their elusive characteristics. Similarly, the extent of occurrence and area of occupancy of sei whales in Australian waters cannot be calculated due to the

Species	Key Information
	rarity of sighting records. They will typically travel in small pods of three to five individuals, with some segregation by age, sex and reproductive status. Calving grounds are presumed to exist in low latitudes with mating and calving potentially occurring during winter months (Threatened Species Scientific Committee, 2015a). There are no known mating or calving areas in Australian waters, and there are no identified BIAs for this species in the National Conservation Values Atlas.
Fin whale	The fin whale is a large baleen whale distributed worldwide. Fin whales migrate annually between high latitude summer feeding grounds and lower latitude over-wintering areas (Bannister *et al.*, 1996) and follow oceanic migration paths. The species is uncommonly encountered in coastal or continental shelf waters. Australian Antarctic waters are important feeding grounds for fin whales but there are no known mating or calving areas in Australian waters (Morrice *et al.*, 2004). The species has been observed in groups of six to 10 individuals, as well as in pairs and alone (Threatened Species Scientific Committee, 2015c). Accurate distribution patterns are not known within Australian waters and the majority of data are from stranding events. Fin whales have been recorded vocalising off the Perth Canyon, WA, between January and April 2000 (McCauley *et al.*, 2000). It is currently not possible to accurately estimate the population size of fin whales in Australian waters predominantly due to the species' behaviour and local ecology, as the proportion of time they spend at the surface varies greatly depending on these factors. In addition, natural fluctuations of fin whales in Australian waters are unknown; however, long-range movements do appear to be prey-related. A recent study by Aulich *et al.* (2019) used passive acoustic monitoring as a tool to identify the migratory movements of fin whales in Australian waters. On the west coast, the earliest arrival of these animals occurred at Cape Leeuwin in April, and between May and October they migrated along the WA coastline to the Perth Canyon, which likely acts as a way-station for feeding (Aulich *et al.*, 2019). Some whales were found to continue migrating as far north as Dampier (Aulich *et al.*, 2019). There are no identified BIAs for this species in the National Conservation Values Atlas.
Toothed whales (Odontoceti)	
Sperm whale	Sperm whales are the largest of the toothed whales and are distributed worldwide in deep waters (greater than 200 m) off continental shelves and sometimes near shelf edges (Bannister *et al.*, 1996). The species tends to inhabit offshore areas at depths of 600 m or more and is uncommon in waters less than 300 m deep (Ceccarelli *et al.*, 2011). There is limited information about sperm whale distribution in Australian waters, however, they are usually found in deep offshore waters, with more dense populations close to continental shelves and canyons. In the open ocean, there is a generalised movement of sperm whales southwards in summer, and corresponding movement northwards in winter, particularly for males. Detailed information about the distribution and migration patterns of sperm whales off the WA coast is not available. Females with young may reside within the NWMR all year round, males may migrate through the region and the species may be associated with canyon habitats (Ceccarelli *et al.*, 2011). Sperm whales have been recorded in deep waters off North-west Cape and appear to occasionally venture into shallower waters in other areas. Twenty-three (23) sightings of sperm whales (variable pod sizes, ranging from one to six animals) were recorded by marine mammal observers (MMOs) during the North West Cape MC3D marine seismic survey (December 2016 to April 2017) (Woodside, 2020). These animals were observed in deep, continental slope waters of the Montebello Saddle (maximum distance of approximately 90 km from North-west Cape), and the waters overlying the Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF. The deep waters above the gully/saddle on the inner edge of the plateau (the Montebello Saddle) are thought to be important for sperm whales that may feed in the region (based on 19th Century whaling records; Townsend, 1935). There are no identified BIAs for this species in the NWMR.
Killer whale	The preferred habitat of killer whales includes oceanic, pelagic and neritic (relatively shallow waters over the continental shelf) regions, in both warm and cold waters. Killer whales appear to be more common in cold, deep waters; however, they have been observed along the continental slope and shelf, particularly near seal colonies, as well as in shallow coastal areas of WA (Bannister *et al.*, 1996; Thiele and Gill, 1999). The total number of killer whales in Australian waters is unknown, however, it may be that the total number of mature animals within waters around the continent is less than 10,000. Killer whales are known to make seasonal movements, and probably follow regular migratory routes, but no information is available for the

Species	Key Information
	species in Australian waters. Killer whales are top-level carnivores, and there are reports from around Australia of attacks on dolphins, juvenile humpback whales, blue whales, sperm whales, dugongs and Australian sea lions (Bannister *et al.*, 1996). Killer whales are known to target humpback whales, particularly calves, off Ningaloo Reef during the humpback southern migration season (Pitman *et al.*, 2015). Overall, observations suggest that humpback calves are a predictable, plentiful, and readily taken prey source for killer whales off Ningaloo Reef for at least five months of the year. Additionally, there are records of killer whales attacking dugongs in Shark Bay (Anderson and Prince, 1985). However, there are no recognised key localities or important habitats for killer whales within the NWMR (DSEWPAC, 2012a). There are no identified BIAs for this species in the NWMR.
Australian snubfin dolphin	Stranding and museum specimen records indicate that Australian snubfin dolphins occur only in waters off northern Australia, from approximately Broome on the west coast to the Brisbane River on the east coast (Parra *et al.*, 2002). Aerial and boat-based surveys indicate that Australian snubfin dolphins occur mostly in protected shallow waters close to the coast, and close to river and creek mouths (Parra, 2006; Parra *et al.*, 2006; Parra *et al.*, 2002). Within the NWMR, species has been found in the shallow coastal waters and estuaries along the Kimberley coast. Beagle and Pender bays on the Dampier Peninsula, and tidal creeks around Yampi Sound and between Kuri Bay and Cape Londonderry are important areas for Australian snubfin dolphins (DEWHA, 2008). Roebuck Bay has generally been considered the south-western limit of snubfin dolphin distribution across northern Australia, but the species has been recorded in Port Hedland harbour, the Dampier Archipelago, Montebello Islands, Exmouth Gulf and off North-west Cape (Allen *et al.*, 2012). A first comprehensive catalogue of snubfin dolphin sightings has been compiled for the Kimberley, north-west Western Australia (Bouchet *et al.* 2021) and documented that snubfin dolphins are consistently encountered in shallow water (<21 m depth) close to (<15 km) freshwater inputs with high detection rates in known hotspots such as Roebuck Bay and Cygnet Bay as well as suitable coastal habitat in the wider Kimberley region. Refer **Table 7-3** and **Figure 7-3** for the location and type of BIAs for Australian snubfin dolphins in the NWMR.
Indo-Pacific humpback dolphin (Australian humpback dolphin)	Previously included with *Sousa chinensis*, the Australian humpback dolphin (*S. sahulensis*) was elevated to a species in 2014. *S. chinensis* is now applied for humpback dolphins in the eastern Indian and western Pacific Oceans and *S. sahulensis* for humpback dolphins in the waters of the Sahul Shelf from northern Australia to southern New Guinea (Jefferson and Rosenbaum, 2014). The Australian humpback dolphin is listed as *S. chinensis* under EPBC Act. The Australian humpback dolphin (referred to as 'humpback dolphin' hereafter) inhabits the tropical/subtropical waters of the Sahul Shelf across northern Australia and southern Papua New Guinea (Jefferson and Rosenbaum, 2014). Based on historical stranding data, museum specimens and opportunistic sightings collected during aerial and boat-based surveys for other fauna it has been inferred that humpback dolphins occur from the WA/NT border south-west to Shark Bay (Hanf *et al.*, 2016). Allen *et al.* (2012) suggested that humpback dolphins use a range of inshore habitats, including both clear and turbid coastal waters across northern WA. The waters surrounding North-west Cape are an important area for the species. Boat-based surveys up to 5 km out from the coast (Brown *et al.*, 2012) recorded humpback dolphins from 0.3 to 4.5 km away from shore and in depths ranging from 1.2 to 20 m, with a mean of ~8 m. Other studies around North-west Cape, surveying waters up to 5 km from the coast, recorded humpback dolphins in water depths of up to 40 m (Hanf *et al.*, 2016). Based on density, site fidelity and residence patterns, North-west Cape is clearly an important habitat toward the south-western limit of this species' range (Hunt *et al.*, 2017). Aerial surveys targeting dugongs over the western Pilbara have recorded humpback dolphins more than 60 km from the mainland in shallow shelf waters (i.e. <30 m deep) near Barrow Island and the western Lowendal Islands (Hanf, 2015). The species has also been recorded in fringing coral reef and shallow, sheltered sandy lagoons at the Montebello Islands (Raudino *et al.*, 2018). Over the past ten years a number of studies have focused on populations of humpback dolphins along the Kimberley coast, including Roebuck Bay, the Dampier Peninsula, Cone Bay, Yampi Sound, Prince Regent River and the Cambridge Gulf (Brown *et al.*, 2016). Refer Table **Table 7-3** and **Figure 7-4** for the location and type of BIAs for Indo-Pacific humpback dolphins in the NWMR.
Indo-Pacific bottlenose dolphin (Spotted bottlenose dolphin)	There are four known sub-populations of spotted bottlenose dolphins, of which the Arafura/Timor Sea populations were identified as potentially occurring within the NWMR. The species is restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters including coastal areas around oceanic islands, from Shark Bay to the western edge of the Gulf of Carpentaria. The species

Species	Key Information
	forages in a range of habitats but is generally restricted to water depths of less than 200 m (DSEWPAC, 2012a). Important foraging/breeding areas include the shallow coastal waters and estuaries along the Kimberley coast and Roebuck Bay. Refer **Table 7-3** the location and type of BIAs for spotted bottlenose dolphins in the NWMR.
Sirenians	
Dugong	Dugongs are distributed along the WA coast throughout the Gascoyne, Pilbara and Kimberley. Specific areas supporting dugong populations include: Shark Bay; Ningaloo and Exmouth Gulf; the Pilbara coast (Exmouth Gulf to De Grey River [Marsh *et al.*, 2002]); and Eighty Mile Beach and the Kimberley coast, including Roebuck Bay (Brown *et al.*, 2014). Dugong distribution is correlated with the seagrass habitats upon which it feeds, although water temperature has also been correlated with dugong movements and distribution (Preen *et al.*, 1997; Preen, 2004). Dugongs are known to migrate between seagrass habitats (hundreds of kilometres) (Sheppard *et al.*, 2006), and in Shark Bay they exhibit seasonal movements as a behavioural thermoregulatory response to winter water temperatures (Holley *et al.*, 2006; Marsh *et al.*, 2011). Aerial surveys since the mid-1980s indicate that dugong populations are now stable at a regional scale in Shark Bay and in the Exmouth/Ningaloo Reef. Refer **Table 7-3** and **Figure 7-5** for the location and type of BIAs for dugong in the NWMR.
Pinnipeds	
Australian sea lion	The Australian sea lion is the only endemic pinniped (true seals, fur seals and sea lions) in Australian waters. It is a member of the Otariidae (eared seals) family. The birth interval in Australian sea lions is around 17–18 months. The Australian sea lion is unique among pinnipeds in being the only species that has a non-annual breeding cycle that is also temporally asynchronous across its range (DSEWPAC, 2013a; Threatened Species Scientific Committee, 2020a). This means the breeding period (copulation and birthing) in one colony will occur at different times to breeding in another colony. The Australian sea lion is considered to be a specialised benthic forager—that is, it feeds primarily on the sea floor. Studies have shown that the species will eat a range of prey, including fish, cephalopods (squid, cuttlefish and octopus), sharks, rays, rock lobsters and penguins (DSEWPAC, 2013a; Threatened Species Scientific Committee, 2020a). The Australian sea lion feeds on the continental shelf, most commonly in depths of 20–100 m, and they typically travel up to about 60 km from their colony on each foraging trip, with a maximum distance of around 190 km when over shelf waters. The current breeding distribution of the Australian sea lion extends from the Houtman Abrolhos Islands on the west coast of WA to the Pages Islands in SA. Sites for the 58 breeding colonies occurring in WA and SA are designated as habitat critical to the survival of the species under the Recovery Plan for the Australian sea lion (DSEWPAC, 2013a). Of these, four are located in the SWMR along the west coast of WA: Abrolhos Islands (Easter Group), Beagle Island, North Fisherman Island and Buller Island. There are also a number of foraging BIAs for both males and females along the west coast, extending from the Abrolhos Islands south to Rockingham. There is no designated habitat critical to survival or identified BIAs for this species in the NWMR. **Figure 7-6** shows the foraging BIAs for the Australian sea lion to the south of the NWMR.

7.5 Biological Important Areas in the NWMR

BIAs representing important life cycle stages and behaviours for six species of marine mammal in the NWMR: the humpback whale, the pygmy blue whale, Australian snubfin dolphin, Australian humpback dolphin, spotted bottlenose dolphin and dugong, are presented in **Table 7-3**.

Table 7-3 Marine mammal BIAs within the NWMR

Species	Woodside Activity Area			BIAs				
	Browse	NWS/S	NWC	Resting	Foraging	Breeding	Calving	Migration
Humpback whale[1]	✓	✓	✓	Shark Bay Exmouth Gulf (north migration – early June) (south migration – late Aug to Oct) Southern Kimberley region	No foraging BIA identified within the NWMR	Kimberley coast from the Lacepede Islands to north of Camden Sound (mid Aug – early Sept)	Core calving in waters off the Kimberley coast from the Lacepede Islands to north of Camden Sound (mid Aug – early Sept)	Southern border of the NWMR to north of the Kimberley (arrive June)
Blue whale and Pygmy blue whale [1] [2]	✓	✓	✓	No resting BIA identified within the NWMR	Possible foraging areas off Ningaloo and Scott Reef	No breeding BIA identified within the NWMR	No calving BIA identified within the NWMR	Augusta to Derby. Along the shelf edge at depths of 500 m to 1000 m; appear close to Ningaloo coast Montebello Islands area on southern migration (north: April – Aug) (south: Oct – late Dec)
Australian snubfin dolphin [1]	✓	✓	-	No resting BIA identified within the NWMR	Roebuck Bay Cambridge Gulf Camden Sound area King Sound (south) King Sound (north) Yampi Sound Talbot Bay Maret Islands Bigge Island Admiralty Gulf Parry Harbour Bougainville Peninsula Vansittart Bay Anjo Peninsula Napier	Roebuck Bay Cambridge Gulf Camden Sound area King Sound (south) King Sound (north) Yampi Sound Talbot Bay Maret Islands Bigge Island Admiralty Gulf Parry Harbour Bougainville Peninsula Vansittart Bay, Anjo Peninsula Napier Broome Bay Deep Bay Prince Regent River King George River Cape Londonderry	Roebuck Bay Cambridge Gulf Camden Sound area King Sound (south) King Sound (north) Yampi Sound Talbot Bay Maret Islands Bigge Island Admiralty Gulf Parry Harbour Bougainville Peninsula Vansittart Bay Anjo Peninsula Napier Broome Bay Deep Bay Prince Regent River	No migration BIA identified within the NWMR

Species	Woodside Activity Area			BIAs				
	Browse	NWS/S	NWC	Resting	Foraging	Breeding	Calving	Migration
					Broome Bay Deep Bay Prince Regent River King George River Cape Londonderry Ord River	Ord River	King George River Cape Londonderry Ord River	
Indo-Pacific humpback dolphin	✓	✓	-	No resting BIA identified within the NWMR	Roebuck Bay Willie Creek Prince Regent River King Sound (north) Yampi Sound Talbot Bay Walcott Inlet Doubtful Bay Deception Bay Augustus Island Maret Islands Bigge Island King Sound, southern sector Vansittart Bay, Anjo Peninsula	Roebuck Bay Willie Creek Prince Regent River King Sound (north) Yampi Sound Talbot Bay Walcott Inlet Doubtful Bay Deception Bay Augustus Island	Roebuck Bay Willie Creek Prince Regent River	No migration BIA identified within the NWMR
Spotted bottlenose dolphin	✓	✓	✓	No resting BIA identified within the NWMR	Roebuck Bay Cambridge Gulf Camden Sound area King Sound (south) King Sound (north) Yampi Sound	Roebuck Bay Cambridge Gulf Camden Sound area King Sound (south) King Sound (north) Yampi Sound	No calving BIA identified within the NWMR	No migration BIA identified within the NWMR

Species	Woodside Activity Area			BIAs				
	Browse	NWS/S	NWC	Resting	Foraging	Breeding	Calving	Migration
Dugong[1]	✓	✓	✓	No resting BIA identified within the NWMR	Exmouth Gulf Ningaloo Reef Shark Bay Roebuck Bay Dampier Peninsula	No breeding BIA identified within the NWMR	Exmouth Gulf Ningaloo Reef Shark Bay	Not listed as a migratory species

1. *DSEWPAC (2012a)*

2. *Commonwealth of Australia (2015a)*

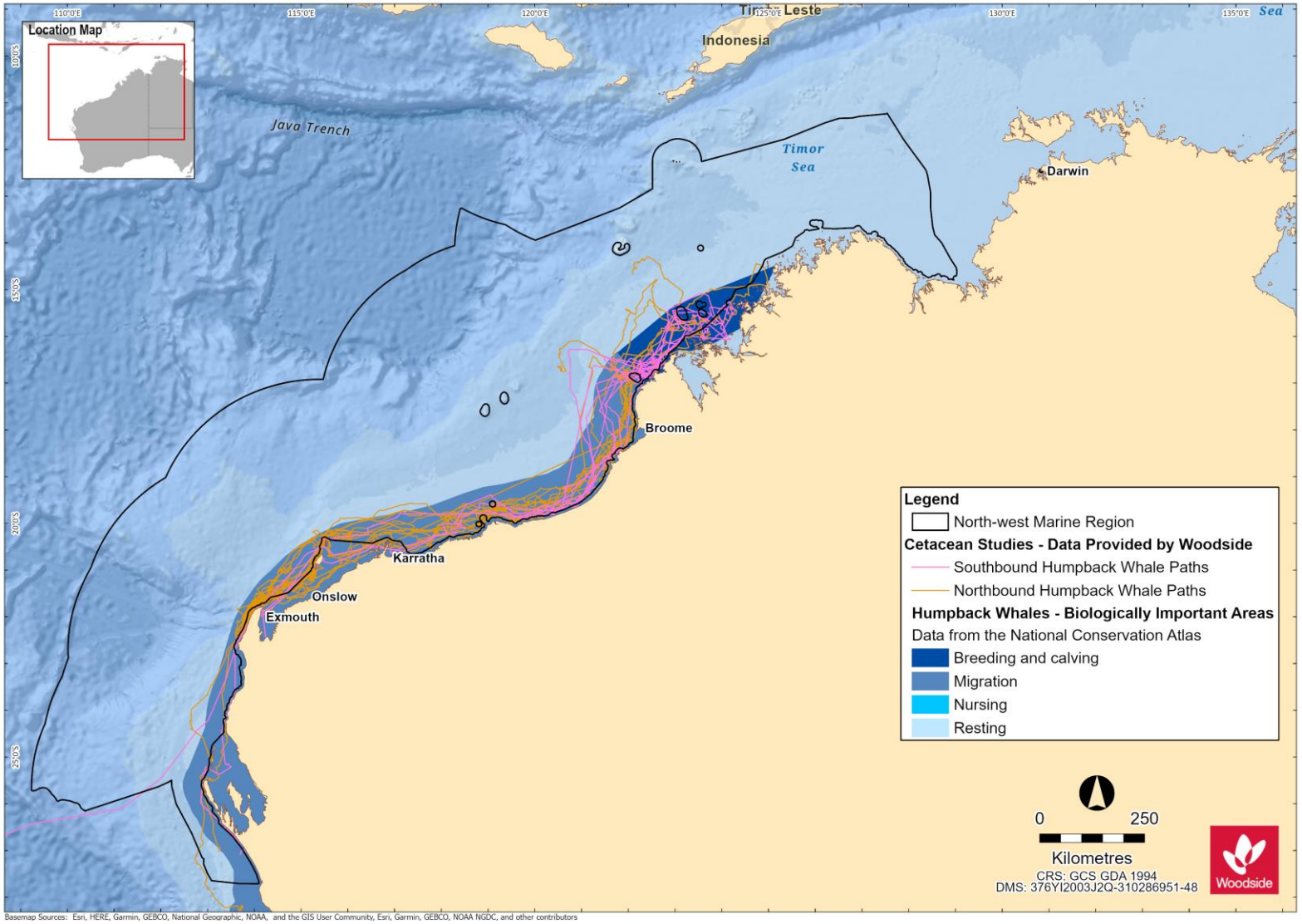

Figure 7-1 Humpback whale BIAs for the NWMR and tagged tracks for north and south bound migrations

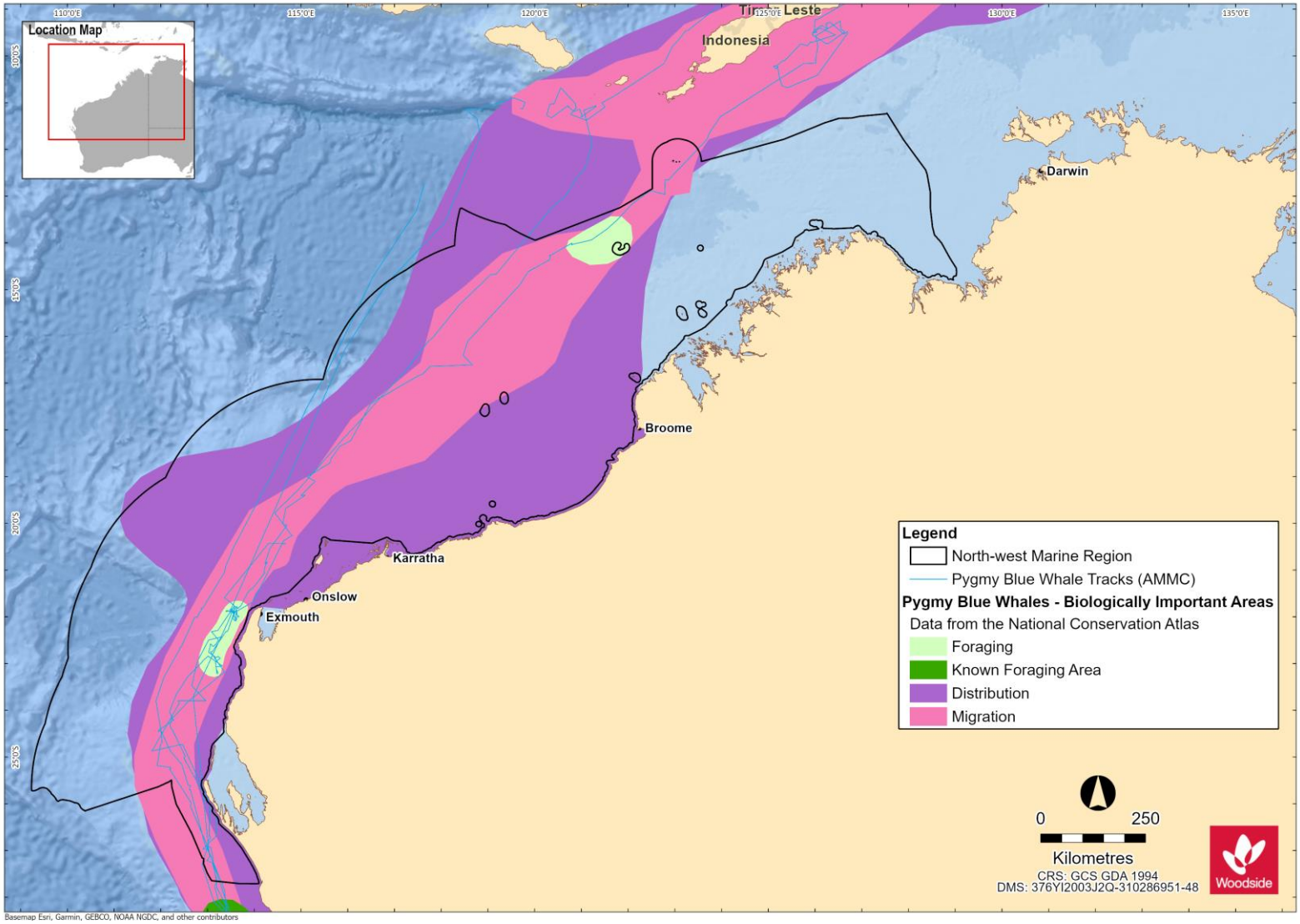

Figure 7-2 Pygmy blue whale BIAs for the NWMR and tagged whale tracks for northbound migration

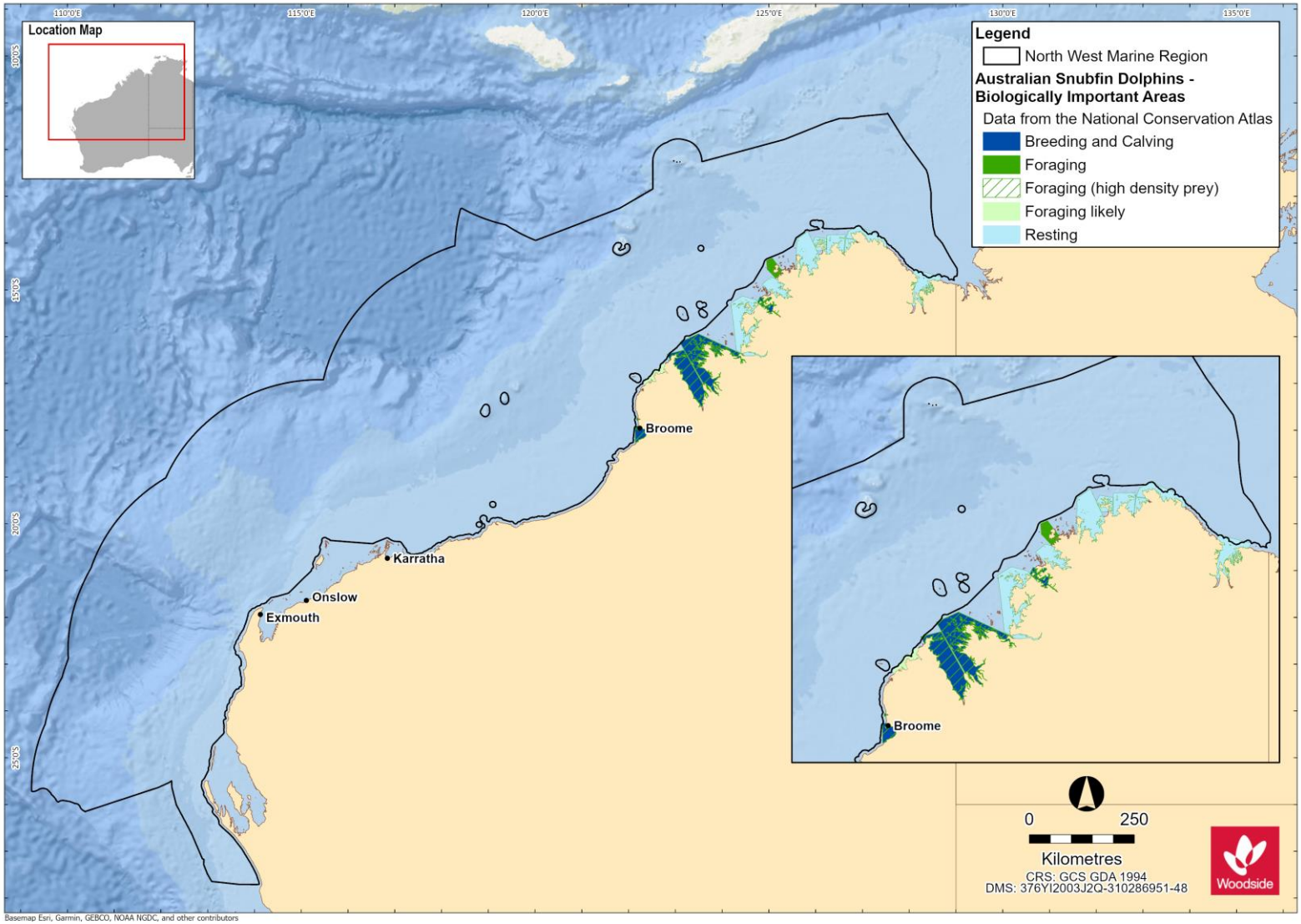

Figure 7-3 Australian snubfin dolphin BIAs for the NWMR

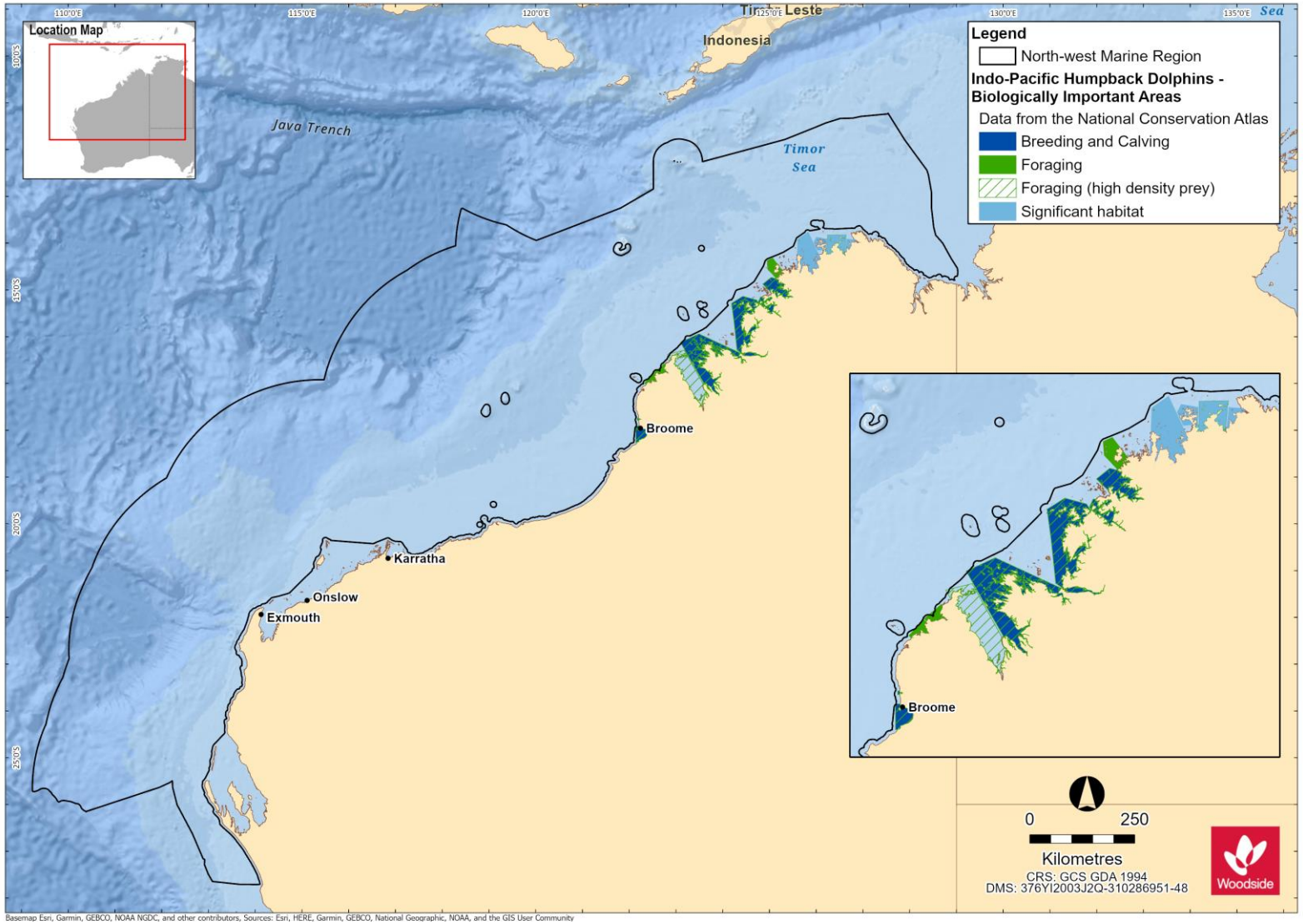

Figure 7-4 Indo-Pacific humpback dolphin BIAs for the NWMR

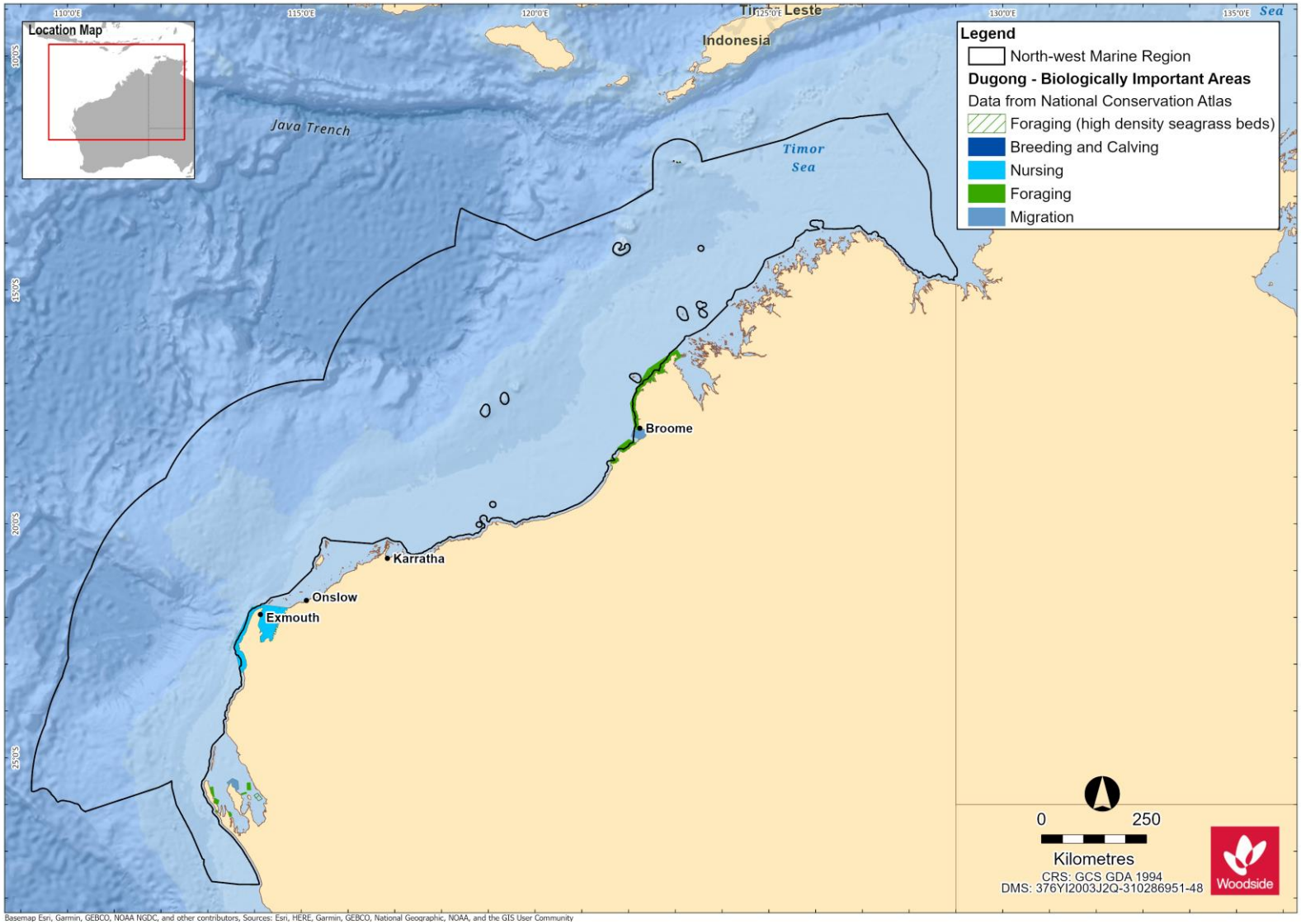

Figure 7-5 Dugong BIAs for the NWMR

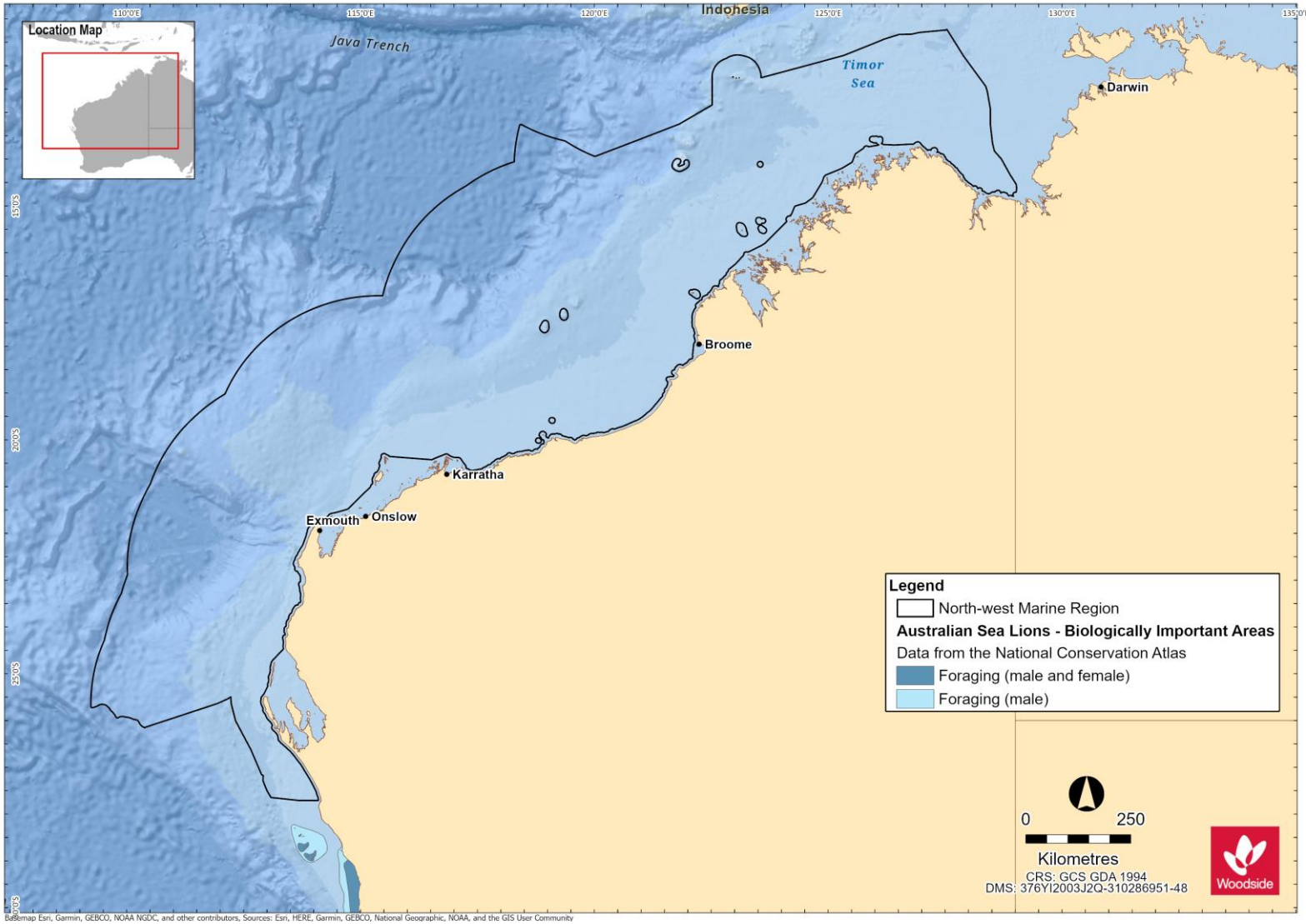

Figure 7-6 Australian sea lion BIAs in the northern extent of the SWMR closest to the NWMR

7.6 Marine Mammal Summary for the NWMR

7.6.1 Browse

The Browse activity area includes biologically important habitat for five threatened and/or migratory marine mammal species:

- blue whale and pygmy blue whale (foraging and migration areas);
- humpback whale (breeding, calving and migration areas);
- Indo-Pacific humpback dolphin (foraging, breeding and calving areas);
- Australian snubfin dolphin (foraging, breeding and calving areas); and
- dugong (foraging).

BIAs for the marine mammal species are outlined in **Table 7-3**.

7.6.2 North-west Shelf / Scarborough

The NWS / Scarborough activity area includes biologically important habitat for five threatened and/or migratory marine mammal species:

- blue whale and pygmy blue whale (foraging and migration areas);
- humpback whale (resting and migration areas);
- Indo-Pacific humpback dolphin (foraging, breeding and calving areas);
- Australian snubfin dolphin (foraging, breeding and calving areas); and
- dugong (foraging and calving areas).

BIAs for the marine mammal species are outlined in **Table 7-3**.

7.6.3 North-west Cape

The North-west Cape activity area includes biologically important habitat for three threatened and/or migratory marine mammal species:

- blue whale and pygmy blue whale (foraging and migration areas);
- humpback whale (resting and migration areas); and
- dugong (foraging and calving areas).

BIAs for the marine mammal species are outlined in **Table 7-3**.

8. SEABIRDS AND MIGRATORY SHOREBIRDS OF THE NWMR

8.1 Regional Context

The NWMR supports high numbers and species diversity of seabirds and migratory shorebirds including many that are EPBC Act listed, threatened and migratory. The NWMR marine bioregional plan reported 34 seabird species (listed as threatened, migratory and/or marine) that are known to occur, and 30 of 37 species of migratory shorebird species that regularly occur in Australia, are recorded at Ashmore Reef in the NWMR (DSEWPAC, 2012e). The NWMR marine bioregional plan also noted that Roebuck Bay and Eighty Mile Beach are internationally significant and recognised migratory shorebird locations.

Many migratory seabirds and shorebirds are protected through bilateral agreements between Australia and Japan (JAMBA), China (CAMBA) and the Republic of Korea (ROKAMBA), recognising the migratory route and important stopover and resting habitats of the East Asian-Australasian Flyway (EAAF). Important migratory bird habitats are also recognised as part of protected wetlands of the internationally significance under the Ramsar Convention. Important Bird Areas (IBAs) for the NWMR, which are also recognised as global Key Biodiversity Areas (KBAs) (BirdLife Australia[4]), include:

- Roebuck Bay KBA (and Ramsar site): Internationally significant migratory shorebird species.
- Mandora Marsh and Anna Plains KBA (adjacent to Eighty Mile Beach, Ramsar site): Internationally significant migratory shorebird species.
- Dampier Saltworks KBA: Internationally significant migratory shorebird species.
- Montebello Islands KBA: Shorebird and seabird species.
- Barrow Island KBA: Shorebird and seabird species.
- Exmouth Gulf Mangroves KBA: Internationally significant migratory shorebird species.

Table 8-1 presents a list of the threatened and migratory seabird and shorebird species that occur within the NWMR, with their conservation status and relevant recovery plans and/or conservation advice.

4 https://www.birdlife.org.au/projects/KBA#:~:text=The%20Key%20Biodiversity%20Areas%20(KBAs,of%20advocacy%20for%20protected%20areas. Accessed April, 2021.

Table 8-1. Bird species (threatened/migratory) identified by the EPBC Act PMST and other sources of information as potentially occurring within the NWMR

Species Name	Common Name	*Environment Protection and Biodiversity Conservation Act 1999*			WA *Biodiversity Conservation Act 2016*	EPBC Act Part 13 Statutory Instrument
		Threatened Status	Migratory Status	Listed	Conservation Status	
Seabirds						
Macronectes giganteus	Southern giant petrel	Endangered	Migratory	Marine	Migratory	National recovery plan for threatened albatrosses and giant petrels 2011-2016 (DSEWPAC, 2011c)
Papasula abbotti	Abbott's booby	Endangered	N/A	Marine	N/A	Conservation Advice for the Abbott's booby - *Papasula abbotti* (Threatened Species Scientific Committee, 2020b)
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	N/A	Marine	N/A	Conservation Advice *Pterodroma mollis* soft-plumaged petrel (Threatened Species Scientific Committee, 2015f)
Sternula nereis nereis	Australian fairy tern	Vulnerable	N/A	N/A	Vulnerable	Conservation Advice for *Sternula nereis nereis* (Fairy Tern) (DSEWPAC, 2011d)
Anous tenuirostris melanops	Australian lesser noddy	Vulnerable	N/A	Marine	Endangered	Conservation Advice *Anous tenuirostris melanops* Australian lesser noddy (Threatened Species Scientific Committee, 2015e)
Thalassarche carteri	Indian yellow-nosed albatross	Vulnerable	Migratory	Marine	Endangered	National recovery plan for threatened albatrosses and giant petrels 2011-2016 (DSEWPAC, 2011c)
Anous stolidus	Common noddy	N/A	Migratory	Marine	Migratory	Draft Wildlife Conservation Plan for Seabirds (Commonwealth of Australia, 2019)
Fregata ariel	Lesser frigatebird	N/A	Migratory	Marine	Migratory	
Fregata minor	Great frigatebird	N/A	Migratory	Marine	Migratory	
Sula leucogaster	Brown booby	N/A	Migratory	Marine	Migratory	
Sula sula	Red-footed booby	N/A	Migratory	Marine	Migratory	

Species Name	Common Name	*Environment Protection and Biodiversity Conservation Act 1999*			WA *Biodiversity Conservation Act 2016*	EPBC Act Part 13 Statutory Instrument
		Threatened Status	Migratory Status	Listed	Conservation Status	
Onychiprion anaethetus (listed as *Sterna anaethetus)*	Bridled tern	N/A	Migratory	Marine	Migratory	
Thalasseus bergii	Greater crested tern	N/A	Migratory	Marine	Migratory	
Sternula albifrons	Little tern	N/A	Migratory	Marine	Migratory	
Sterna dougallii	Roseate tern	N/A	Migratory	Marine	Migratory	
Onychoprion fuscata	Sooty tern	N/A	N/A	Marine	N/A	
Hydroprogne caspia	Caspian tern	N/A	Migratory	Marine	Migratory	
Ardenna pacifica	Wedge-tailed shearwater	N/A	Migratory	Marine	Migratory	
Puffinus assimillis	Little shearwater	N/A	N/A	Marine	N/A	
Ardenna carneipes	Flesh-footed shearwater	N/A	Migratory	Marine	Vulnerable	
Calonectris leucomelas	Streaked shearwater	N/A	Migratory	Marine	Migratory	
Phaethon lepturus	White-tailed tropicbird	N/A	Migratory	Marine	Migratory	
Chroicocephalus novaehollandiase	Silver gull	N/A	N/A	Marine	N/A	
Migratory shorebirds						
Numenius madagascariensis	Eastern curlew, Far Eastern curlew	Critically endangered	Migratory	Marine	Critically endangered	Conservation Advice *Numenius madagascariensis* eastern curlew (DOE, 2015a)
Calidris ferruginea	Curlew sandpiper	Critically endangered	Migratory	Marine	Critically endangered	Conservation Advice *Calidris ferruginea* curlew sandpiper (DOE, 2015b)
Calidris tenuirostris	Great knot	Critically endangered	Migratory	Marine	Critically endangered	Conservation Advice *Calidris tenuirostris* Great knot (Threatened Species Scientific Committee, 2016a)
Limosa lapponica menzbieri	Bar-tailed godwit (*menzbieri*)	Critically endangered	Migratory	Marine	Critically endangered	Conservation Advice *Limosa lapponica menzbieri* Bar-tailed godwit (northern Siberia). (Threatened Species Scientific Committee, 2016c)

Species Name	Common Name	*Environment Protection and Biodiversity Conservation Act 1999*			WA *Biodiversity Conservation Act 2016*	EPBC Act Part 13 Statutory Instrument
		Threatened Status	Migratory Status	Listed	Conservation Status	
Calidris canutus	Red knot	Endangered	Migratory	Marine	Endangered	Conservation Advice *Calidris canutus* Red knot (Threatened Species Scientific Committee, 2016b)
Charadrius mongolus	Lesser sand plover	Endangered	Migratory	Marine	Endangered	Conservation Advice *Charadrius mongolus* Lesser sand plover (Threatened Species Scientific Committee, 2016e)
Charadrius leschenaultii	Greater sand plover	Vulnerable	Migratory	Marine	Vulnerable	Conservation Advice *Charadrius leschenaultia* Greater sand plover (Threatened Species Scientific Committee, 2016d)
All migratory shorebird species	Wildlife Conservation Plan for Migratory Shorebirds (Commonwealth of Australia, 2015c).					

8.2 Seabirds in the NWMR

Seabirds are birds that are adapted to life within the marine environment (oceanic and coastal) and are generally long-lived, have delayed breeding and have fewer young than other bird species (Commonwealth of Australia, 2019). At least 34 seabird species listed as threatened, migratory and/or marine under the EPBC Act are known to occur regularly in the NWMR and include a variety of species of terns, noddies, petrels, shearwaters, frigatebirds, and boobies. Many of these species spend most of their lives at sea (predominately pelagic species), ranging over large distances to forage. These pelagic species only come onshore to breed and raise chicks at natal or high-fidelity breeding colonies on remote, offshore island locations in and adjacent to the NWMR. Many species are ecologically significant to the NWMR, as they are endemic to the region, can be present in large numbers in breeding seasons and non-breeding seasons, and many exhibit extensive annual migrations that include marine areas outside the Australian EEZ (DSEWPAC, 2012e).

The presence of seabirds within the NWMR is influenced by seabird species that migrate and forage in the area during the non-breeding season and this includes many seabird species that breed on the Houtman Abrolhos in the SWMR. Pelagic seabirds have been documented foraging at current boundaries and seasonal upwellings within the NWMR (refer to Sutton *et al*., 2019). The Houtman Abrolhos Islands National Park located in the SWMR, is one of the most significant seabird breeding locations in the eastern Indian Ocean. Sixteen (16) species of seabirds breed there. Eighty percent of common (brown) noddies, 40% of sooty terns and all the lesser noddies found in Australia nest at the Houtman Abrolhos (Surman, 2019). Important seabird areas in the NWMR are as identified by the KBAs (refer to **Section 8.1**) and the information on a select number of seabird species documented for the NWMR (based on the screening criteria presented in **Section 3**), as presented in **Table 8-2**.

Table 8-2 Information on threatened/migratory seabird species of the NWMR

Species	Key Information
Seabirds	
Southern giant petrel	This species is included in the National recovery plan for threatened albatrosses and giant petrels. Habitat critical to survival is defined for breeding and foraging. There are six known breeding localities under Australian jurisdiction (for all species giant petrels) and all are located in the Southern Ocean including islands off Tasmania and within the Australian Antarctic Territory (DSEWPAC, 2011c). Habitat critical to survival identified for foraging is defined as waters south of 25 degrees latitude. The giant petrel species distribution is mainly within the Southern Ocean but this species does migrate into subtropical waters during the winter and its distribution includes the southern extent of the NWMR. No BIAs for this species are located in the NWMR.
Abbott's booby	The Abbott's booby is a large, long-lived seabird known to nest only at Christmas Island. The recovery of this species is strongly dependent on the protection of breeding habitat defined habitat critical to the survival of this species on Christmas Island (Threatened Species Scientific Committee, 2020b). This species spends much of its time at sea and known to forage over large distances offshore when nesting and its range includes off the coast of Java, near the Chagos and in the Banda Sea, and may possibly extend into the north-western extent of the NWMR. No BIAs for this species are located in the NWMR.
Soft-plumaged petrel	This petrel species breeds only at two locations in Australian waters within the Southern Ocean (one off Tasmania and Macquarie Island) (Threatened Species Scientific Committee, 2015f). As a mainly sub-Antarctic species they are usually distributed in cooler seas but distribution extents into subtropical waters and its known distribution includes the southern extent of the NWMR. No BIAs for this species are located in the NWMR.
Australian fairy tern	The Australian fairy tern is listed as Vulnerable for the sub-species only recorded for WA. It has a coastal distribution from Sydney, south to Tasmania and around southern WA up to the Dampier Archipelago and out on the offshore island groups of Barrow, Montebello and the Lowendals (DSEWPAC, 2011d). The Australian fairy tern feeds on small baitfish and roosts and nests on sandy beaches below vegetation. These behaviours, generally, occur in inshore waters of island archipelagos and on the Australian mainland shores and adjacent wetlands. Fairy terns breed from August to February. The Australian fairy tern is unlikely to be present

Species	Key Information
	within the offshore environment of the NWMR. The largest breeding colony in Western Australia for this species is in the Houtman Abrolhos Islands, SWMR (Surman, 2019). For the description and location of BIAs in the NWMR, refer to **Table 8-3** and **Figure 8-2**.
Australian lesser noddy	The Houtman Abrolhos, WA is an important breeding habitat for the Australian lesser noddy in the eastern Indian Ocean. This species exhibits nesting habitat specialisation (white mangrove stands) and has a limited foraging range during the breeding season. Furthermore, the lesser noddy forages over shelf waters and appears not to disperse over their non-breeding period as they remain largely in the general vicinity or slightly to the south of the colony in the non-breeding season (February to September; Surman *et al*., 2018). No BIAs for this species are located in the NWMR.
Indian yellow-nosed albatross	This species is included in the National recovery plan for threatened albatrosses and giant petrels. Habitat critical to survival is defined for breeding and foraging. There are six known breeding localities under Australian jurisdiction (for all species of albatrosses) and all are located in the Southern Ocean including islands off Tasmania and within the Australian Antarctic Territory (DSEWPAC, 2011c). Habitat critical to survival identified for foraging is defined as waters south of 25 degrees latitude. All albatross species distribution (including the Indian yellow-nose albatross) is mainly within the Southern Ocean but this species does migrate into subtropical waters during the winter and its distribution includes the southern extent of the NWMR. No BIAs for this species are located in the NWMR.
Common noddy	This species is listed as migratory and marine. The common (or brown) noddy is the largest species of noddy found in Australian waters. The species is widespread in tropical and subtropical areas beyond Australia. This seabird species is gregarious and normally occurs in flocks, up to hundreds of individuals, when feeding or roosting. The Houtman Abrolhos, WA is the primary breeding habitat for the common noddy in the Eastern Indian Ocean. This species spends their non-breeding season (March to August) in the NWS area, around 950 km north from the breeding colony (Surman *et al*. 2018). The species occurs within NWMR waters, particularly around offshore islands such as the Montebello Island group. This species is recorded on unmanned oil and gas platforms within the NWS. No BIAs for this species are located in the NWMR.
Lesser frigatebird **Great frigatebird**	Both species of frigatebird are listed as migratory and marine. Within the NWMR, the lesser frigatebird is known to breed on Adele, Bedout and West Lacepede islands, Ashmore Reef and Cartier Island (Commonwealth of Australia, 2019). The lesser frigatebird feeds mostly on fish and sometimes cephalopods, and all food is taken while the bird is in flight. Lesser frigatebirds generally forage close to breeding colonies. Breeding/foraging BIAs for the lesser frigatebird are located in the NWMR; refer to **Table 8-3**.
Brown booby	The brown booby is the most common booby, occurring throughout all tropical oceans bounded by latitudes 30º N and 30º S. There are large colonies on offshore islands within the NWMR such as the Lacepede Islands (one of the largest colonies in the world), Ashmore Reef, and other offshore Kimberley islands. This seabird species is a specialised plunge diver, mostly eating fish and some cephalopods (Commonwealth of Australia, 2019). Breeding/foraging BIAs for the brown booby are located in the NWMR; refer to **Table 8-3** and **Figure 8-3**.
Red-footed booby	Within the NWMR, its known breeding sites for this species include Ashmore Reef and Cartier Island. It is a pelagic species and generally occurs away from land. It mainly eats flying fish and squid. Prey abundance is reliant on the high productivity in slope areas off remote islands where the birds breed (Commonwealth of Australia, 2019). Breeding/foraging BIAs for the red-footed booby are located in the NWMR; refer to **Table 8-3** and **Figure 8-3**.
Greater crested tern	The greater crested tern has a widespread distribution recorded on islands and coastlines of tropical and subtropical areas, ranging from the Atlantic coast of South Africa, Indian Ocean and through south-east Asia and Australia. Outside the breeding season it can be found at sea throughout its range, with the exception of the central Indian Ocean (Commonwealth of Australia, 2019). The largest breeding colony in WA for this species is the Houtman Abrolhos Islands, SWMR (Surman, 2019). No BIAs for this species are located in the NWMR.
Little tern	There are three sub-populations of this species in Australia and two of these occur in the NWMR: northern Australian breeding sub-population occurring around Broome and extending across in to the NMR, and an east Asian breeding sub-population, with the terns present from Shark Bay to south-eastern Queensland during the austral summer. Little terns

Species	Key Information
	usually forage close to breeding colonies in the shallow water of estuaries (Commonwealth of Australia, 2019). For the description and location of BIAs in the NWMR, refer to **Table 8-3** and **Figure 8-2**.
Roseate tern	This species is generally tropical in distribution and there are many breeding populations in the NWMR, including Ashmore Reef, Napier Broome Bay, Bonaparte Archipelago, Lacepede Islands, Dampier Archipelago and the Lowendal Islands. A large number of non-breeding roseate terns have been observed at several remote locations in the Kimberley and there are high numbers also recorded for Eighty Mile Beach Ramsar site. The Kimberley colonies are likely to be another sub-species that breeds in east Asia. Roseate terns predominately eat small pelagic fish (Commonwealth of Australia, 2019). The largest breeding colony in Western Australia for this species is in the Houtman Abrolhos Islands, SWMR (Surman, 2019). For the description and location of BIAs in the NWMR, refer to **Table 8-3** and **Figure 8-2**.
Wedge-tailed shearwater	The wedge-tailed shearwater is a pelagic, marine seabird known from tropical and subtropical waters. Its distribution is widespread across the Indian and Pacific oceans. It is known to breed on the east and west coasts (and offshore islands) of Australia. This species is known to consume fish, cephalopods, and other biota primarily via contact-dipping. Wedge-tailed shearwaters are now understood to undertake extensive foraging trips (over thousands of kilometres over periods of days when chicking and provisioning young) and much longer and extensive pelagic travels over the north-west Indian Ocean during the non-breeding season, targeting current boundaries and upwellings. The species breeds throughout its range, mainly on vegetated islands, atolls and cays and excavates burrows in the ground where chicks are raised (Commonwealth of Australia, 2019). Large breeding colonies of the wedge-tailed shearwater are located on the Houtman Abrolhos islands (SWMR) (Surman *et al*., 2018) and several locations in the NWMR including: Muiron Islands (North-west Cape), Varanus Island and the Dampier Archipelago in the Pilbara where burrow numbers were estimated to several hundred thousand to half a million such as on the Muiron Islands, though it is not known if all burrows are utilised on an annual basis (Birdlife Australia, 2018; Surman *et al.*, 2018). Cannell *et al* (2019) satellite tracked adult wedge-tailed shearwaters during egg incubation and chick rearing on the Muiron Islands in January 2018. For the incubation trips, there was a strong consistency for the birds to travel towards seamounts, typically located north-west of the Muiron Islands, between Australia and Indonesia. One bird however remained south-west of the islands, in the Cape Range Canyon. A similar pattern to utilise areas associated with sea mounts was also observed for the long foraging trips during chick rearing, though some of the foraging was concentrated in deeper waters. A bimodal foraging strategy during chick-rearing was observed, with adults undertaking long foraging trips after a series of shorter foraging trips within the NWMR. Surman *et al*. (2018) reported most wedge-tailed shearwaters from the breeding colonies on the Houtman Abrolhos undertook extensive non-breeding migrations. This seabird species occupied waters adjacent or to the north of their nesting sites or migrated 4200 km north-west into the equatorial central Indian Ocean near the Ninety East Ridge during the non-breeding season (later April to mid-November). For the description and location of BIAs in the NWMR, refer to **Table 8-3** and **Figure 8-1**.
Flesh-footed shearwater	The species mainly occurs in the subtropics, over continental shelves and slopes and occasionally inshore waters, with individual birds pass through the tropics and over deeper waters during migration to the North Pacific and Indian oceans (Commonwealth of Australia, 2019). They are a common visitor to the waters off southern Australia, from south-western WA to south-eastern Queensland. The fleshy-footed shearwater is a trans-equatorial migrant, breeding from late September to May off south-western Australia, and migrating north by early May, across the southern Indian and possibly Indonesia to the northern Pacific Ocean. No BIAs for the flesh-footed shearwater are located in the NWMR.
Streaked shearwater	The streaked shearwater has a broad distribution in the western Pacific Ocean, breeding on the coast and offshore islands of Japan, Russia, China and the Korean Peninsula. During winter months (non-breeding season), the species undertakes trans-equatorial migration to the coasts of Vietnam, New Guinea, the Philippines, Australia, southern India and Sri Lanka. The streaked shearwater feeds mainly on fish and squid that it catches by surface-seizing and shallow plunges (Commonwealth of Australia, 2019). No BIAs for the streaked shearwater are located in the NWMR.
White-tailed tropicbird	Tropicbirds are predominately pelagic species and the white-tailed tropicbird forages in warm waters and over long distances (pan-tropical). The species is most common off north-west Australia. In the NWMR, this species is considered a sub-species and are limited in number and distribution. Nesting sites are known for Clerke Reef (Rowley Shoals) and Ashmore

Species	Key Information
	Reef. Christmas Island is also a known nesting site and the species can disperse several thousand kilometres during foraging trips. This species feeds mainly on fish and cephalopods, captured by deep plunge diving (Commonwealth of Australia, 2019). There are breeding BIAs at the Rowley Shoals and Ashmore Reef within the NWMR for the white-tailed tropicbird; refer to **Table 8-3**.
Silver gull	The silver gull is typically described as an inshore and coastal foraging seabird and has an Australian-wide distribution including locations within the NWMR. It is noted as it has been recorded on unmanned oil and gas platforms located within the NWS.

8.2.1 Biologically Important Areas in the NWMR

BIAs representing important life cycle stages and behaviours for eight species of seabird in the NWMR are presented in **Table 8-3**.

Table 8-3 Seabird BIAs within the NWMR

Seabird Species	Woodside Activity Area			BIAs			
	Browse	NWS/S	NWC	Breeding/foraging	Foraging	Breeding	Resting
Australia fairy tern	-	✓	✓	-	No foraging BIAs in the NWMR Foraging in high numbers: the BIA is located in the SWMR including the Houtman Abrolhos Islands	Dampier Archipelago, Montebello, Lowendal and Barrow Island Groups, south Ningaloo and barrier island of Shark Bay	-
Wedge-tailed shearwater	✓	✓	✓	Widespread area of the NWMR offshore and inshore waters	Foraging in high numbers: the BIA is located in the SWMR including the Houtman Abrolhos Islands	-	-
Great frigatebird	✓	-	-	Ashmore Reef, Adele Island	-	-	-
Lesser frigatebird	✓	✓	-	Off Eighty Mile Beach, Lacepedes, Adele Island, North Kimberley and Ashmore Reef	-	-	-
Brown booby	✓	✓	-	Off Eighty Mile Beach, Lacepedes, Adele Island, North Kimberley and Ashmore Reef	-	-	-
Red-footed booby	✓	-	-	Adele Island, Ashmore Reef	-	-	-
Little tern	✓	✓	-	Rowley Shoals, Adele Island	-	-	-
Roseate tern	✓	✓	✓	-	No foraging BIAs in the NWMR Foraging (provisioning young) and foraging BIAs located in the SWMR – Houtman Abrolhos Islands the	Dampier Archipelago, Montebello, Lowendal and Barrow Island Groups, south Ningaloo and barrier island of Shark Bay	Eighty Mile Beach

Seabird Species	Woodside Activity Area			BIAs			
	Browse	NWS/S	NWC	Breeding/foraging	Foraging	Breeding	Resting
					nearest BIA to the NWMR		
White-tailed tropicbird	✓	-	-			Rowley Shoals Ashmore Reef	

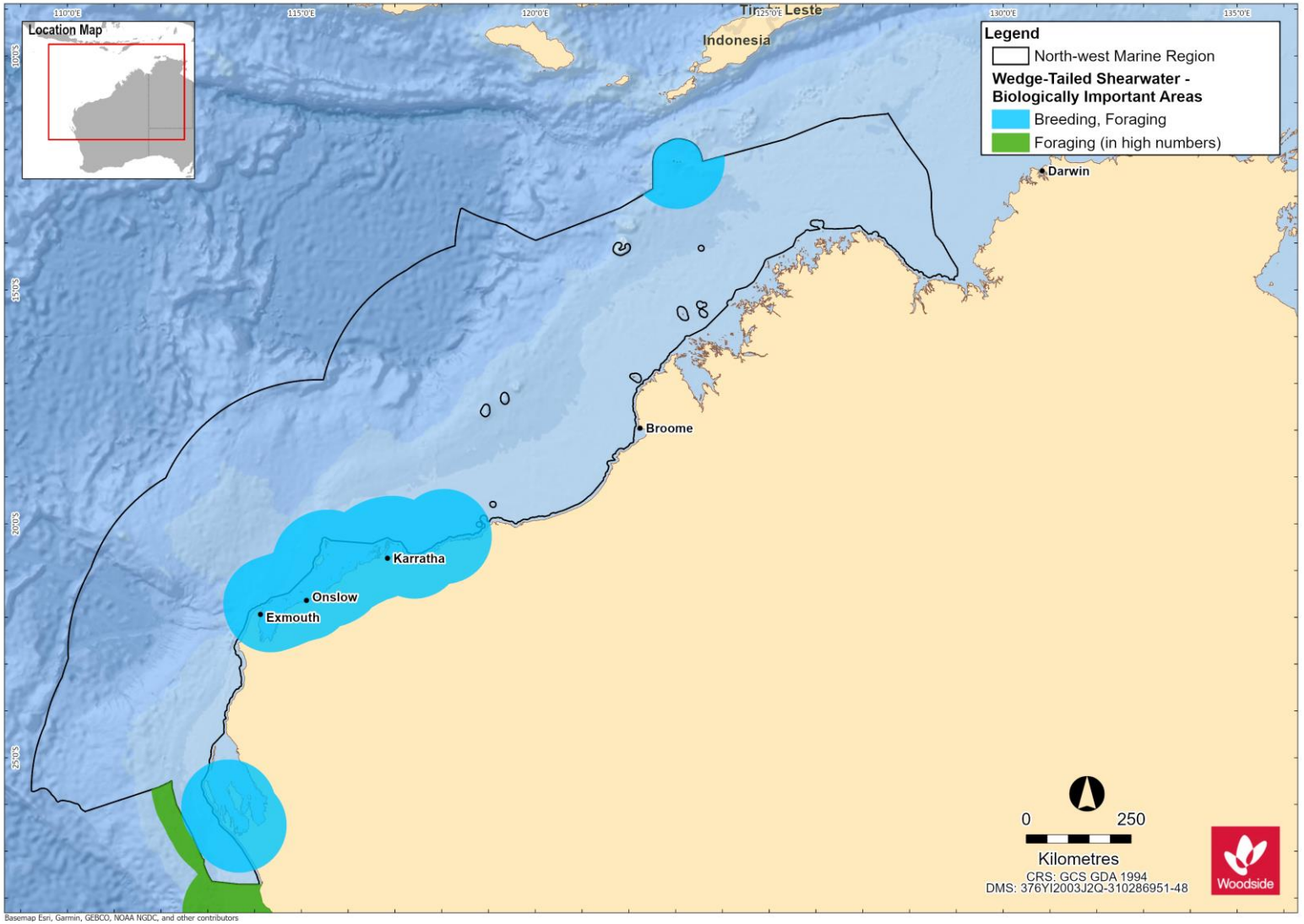

Figure 8-1 Wedge-tailed shearwater BIAs for the NWMR

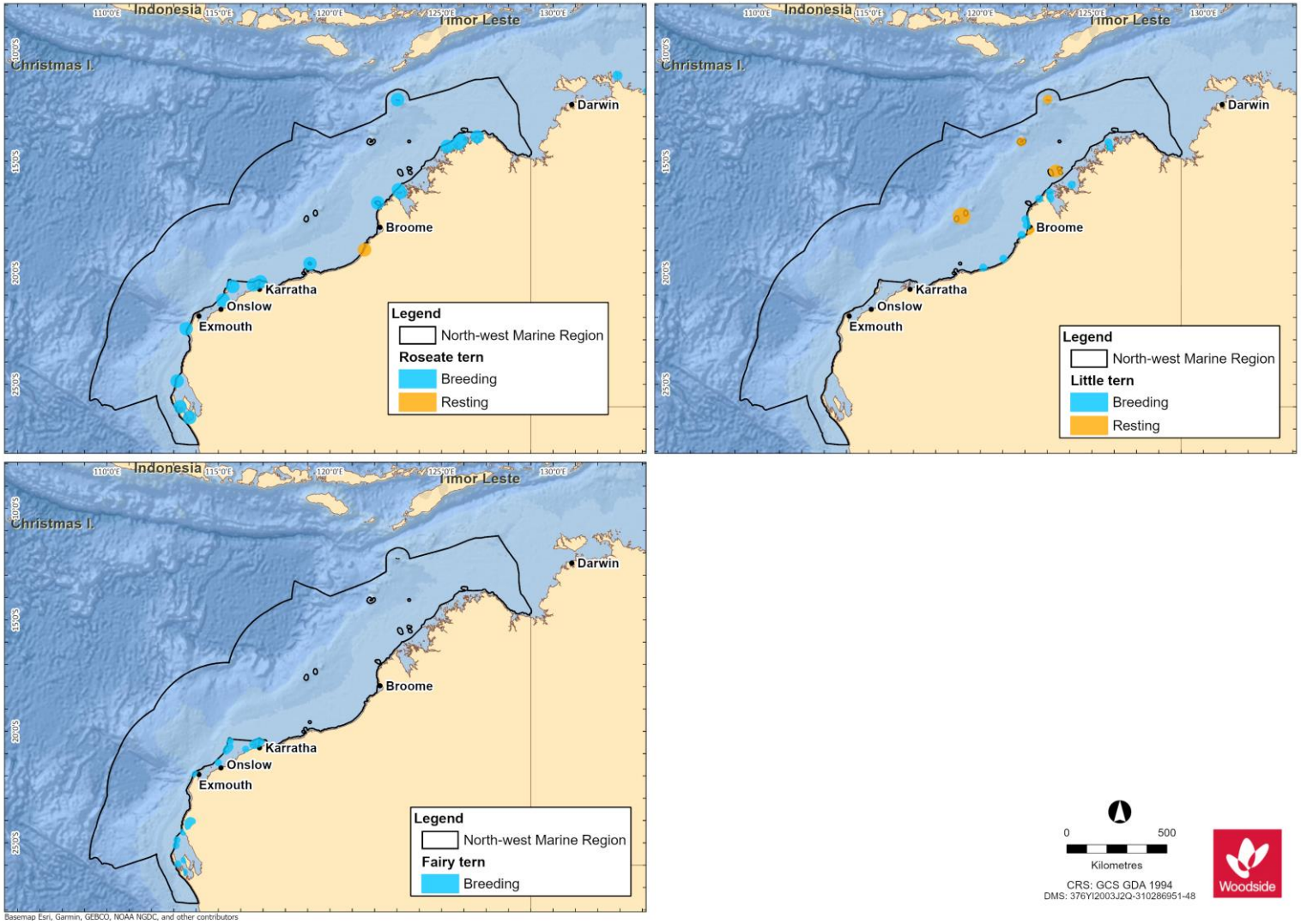

Figure 8-2 Tern species BIAs for the NWMR

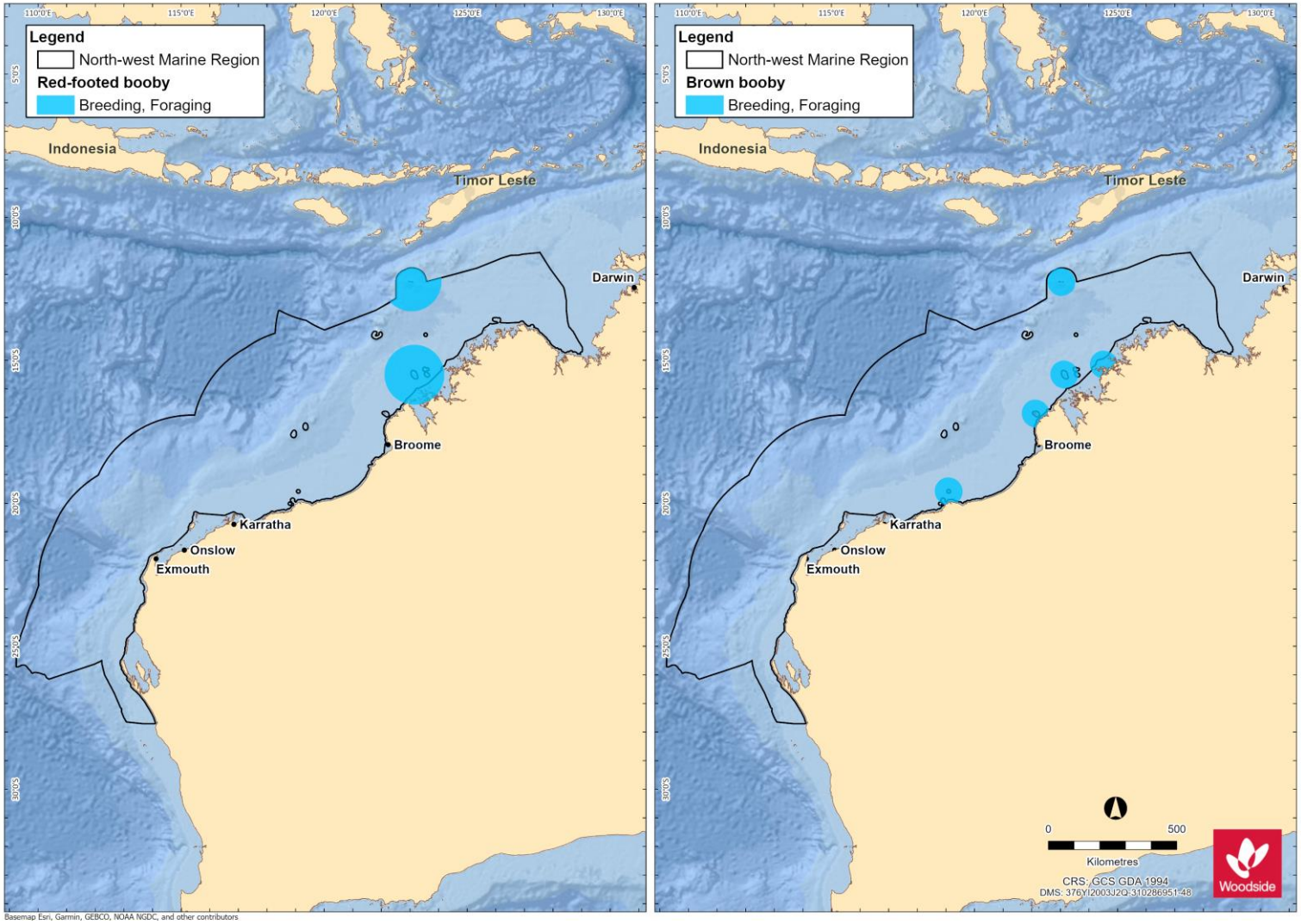

Figure 8-3 Red-footed and brown booby BIAs for the NWMR

8.2.2 Seabird Summary for NWMR

8.2.2.1 Browse

The Browse activity area includes biologically important habitat for seven threatened and/or migratory seabird species:

- wedge-tailed shearwater (breeding/foraging);
- great and lesser frigatebirds (breeding/foraging);
- brown booby (breeding/foraging);
- red-footed booby (breeding/foraging);
- little tern (breeding/foraging);
- roseate tern (breeding and resting); and,
- white-tailed tropicbird (breeding).

BIAs for the seabird species are outlined in **Table 8-3**.

8.2.2.2 NWS / Scarborough

The NWS / Scarborough activity area includes biologically important habitat for five threatened and/or migratory seabird species:

- wedge-tailed shearwater (breeding/foraging);
- lesser frigatebird (breeding/foraging);
- brown booby (breeding/foraging);
- little tern (breeding/foraging); and
- roseate tern (breeding and resting).

BIAs for the seabird species are outlined in **Table 8-3**.

8.2.2.3 North-west Cape

The North-west Cape activity area includes biologically important habitat for five threatened and/or migratory seabird species:

- Australian fairy tern (breeding);
- wedge-tailed shearwater (breeding/foraging); and
- roseate tern (breeding and resting).

BIAs for the seabird species are outlined in **Table 8-3**.

8.3 Shorebirds

Shorebirds (migratory and resident species) are generally associated with wetland or coastal environments, and the NWMR hosts a large number of many shorebird species, particularly in the Austral summer (refer to **Appendix A** for the EPBC Act PMST reports on listed species of shorebirds). Shorebirds may use coastal environments for feeding, nesting or migratory stopovers. In coastal environments, shorebirds generally feed during low tide on exposed intertidal mud and sand flats, and roost in suitable habitat above the high water mark. Many shorebird species undergo annual migrations, typically breeding at high latitudes of the Northern Hemisphere and migrating south for the non-breeding season and Australia is part of the East Asian-Australasian Flyway (EAAF). The EAAF extends from breeding grounds in the Russian tundra, Mongolia and Alaska

southwards through east and south-east Asia, to non-breeding areas of Indonesia, Papua New Guinea, Australia and New Zealand (Weller and Lee, 2017). The EAAF is of most relevance to the NWMR. There are 37 species of shorebird which annually migrate to Australia via the EAAF and 36 of these species spend the austral summer (non-breeding season) foraging and roosting in coastal and wetland habitats (Commonwealth of Australia, 2015c; Weller and Lee, 2017).

Ashmore Reef is documented as a BIA for migratory shorebirds in the NWMR (DSEWPAC, 2012a).

Table 8-4. Information on threatened/migratory shorebird species of the NWMR

Species	Key Information
Shorebirds	
Eastern curlew, Far eastern curlew	This species is the largest, migratory shorebird in the world, with a long neck, long legs and a very long downcurved bill and is a long-haul flyer. The eastern curlew is a coastal species with a continuous distribution north from Barrow Island to the Kimberley region. The species is endemic to the EAAF and is a non-breeding visitor to Australia from August to March, primarily foraging on crabs and molluscs in intertidal mudflats. During the non-breeding season in Australia, this species is most associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (DOE, 2015a).
Curlew sandpiper	The curlew sandpiper breeds in northern Siberia but has a non-breeding range that extends from western Africa to Australia, with small numbers reaching New Zealand (Bamford *et al*., 2008). In Australia, curlew sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states and the NT during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds remain in Australia rather than migrating north along the EAAF. The species preferred habitat for foraging is mudflats and nearby shallow waters in sheltered coastal areas such as estuaries, bay, inlets and lagoons (DOE, 2015b).
Great knot	The great knot breeds in the Northern Hemisphere and undertakes biannual migrations along the EAAF to non-breeding habitat in Australia. The great knot winters in Australia and has been recorded around the entirety of the Australian coast the greatest numbers are found in northern Western Australia (Pilbara (Dampier Archipelago) and Kimberley and the Northern Territory. In Australia, this species prefers sheltered, coastal habitat with large intertidal mudflats or sandflats (inkling inlets, bays, harbours, estuaries and lagoons). High numbers (exceeding several thousand birds are regularly recorded from Roebuck Bay. The great knot feeds on a variety of invertebrates by pecking at or just below the surface of moist mud or sand (Threatened Species Scientific Committee, 2016a).
Bar-tailed godwit (*menzbieri*)	The bar-tailed godwit is a large, migratory shorebird and there are two sub-species in the EAAF (*Limosa lapponica baueri* and *L. l. menzbieri*). The sub-species *L. l. menzbieri* breeds in northern Siberia and spends its non-breeding period mostly in the north of WA but also in South-east Asia. The bar-tailed godwit (*menzbieri*) usually forages near the water in shallow water, mainly in tidal estuaries and harbours with a preference for exposed sandy or soft mud substrates on intertidal flats, banks and beaches (Threatened Species Scientific Committee, 2016c).
Red knot (*piersmai*)	This species is a small to medium migratory shorebird. There are two sub-species that cannot be distinguished from each other in nonbreeding plumage, however, *Calidris canutus piersmai* tend to overwinter almost exclusively in north-west Australia. The red knot migrates long distances from breeding grounds in high northern latitudes, where it breeds during the boreal summer, to the Southern Hemisphere during the austral summer with migration along the EAAF. Very large numbers are recorded for the north-west Australia and is common in all suitable habitats around the coast, including inland clay pans near Roebuck Bay (where the species roosts). The red knot usually forages in soft substrate along the waters edge on intertidal mudflats, sandflats and sandy beaches of sheltered coasts (Threatened Species Scientific Committee, 2016b).
Lesser sand plover	The lesser sand plover is a small to medium shorebird and one of 36 migratory shorebirds that breed in the Northern Hemisphere during the boreal summer and are known to annually migrate to the non-breeding grounds of Australia along the EAAF for the austral summer. There are five different sub-species and it is most likely the non-breeding ranges of the sub-species *Charadrius m. mongolus* overlaps with the NWMR. This species is widespread in coastal regions, preferring sandy beaches, mudflats of coastal bays and estuaries (Threatened Species Scientific Committee, 2016e).
Greater sand plover	The greater sand plover is a small to medium shorebird and in its non-breeding plumage is difficult to distinguish from the lesser sand plover. This species breeds in the Northern

Species	Key Information
	Hemisphere and undertakes annual migrations to and from Southern Hemisphere feeding grounds in the austral summer along the EAAF. The species distribution in Australia during the non-breeding season is widespread, in WA the greater sand plover is widespread between Northwest Cape and Roebuck Bay (Threatened Species Scientific Committee, 2016d).

9. KEY ECOLOGICAL FEATURES

Key ecological features (KEFs) are elements of the Commonwealth marine environment that are considered to be important for a marine region's biodiversity or ecosystem function and integrity. KEFs have been identified by the Australian Government based on advice from scientists about the ecological processes and characteristics of the area.

KEFs meet one or more of the following criteria:

- a species, group of species, or a community with a regionally important ecological role (e.g. a predator, prey that affects a large biomass or number of other marine species),
- a species, group of species or a community that is nationally or regionally important for biodiversity,
- an area or habitat that is nationally or regionally important for:
  - enhanced or high productivity (such as predictable upwellings – an upwelling occurs when cold nutrient-rich waters from the bottom of the ocean rise to the surface),
  - aggregations of marine life (such as feeding, resting, breeding or nursery areas), or
  - biodiversity and endemism (species which only occur in a specific area),
- a unique seafloor feature, with known or presumed ecological properties of regional significance.

Thirteen KEFs are designated within the NWMR, twelve KEFs within the SWMR and eight KEFs within the NMR. These KEFs have been identified in the Protected Matters search (**Appendix A**) and outlined in **Table 9-1, Table 9-2** and **Table 9-3,** and **Figure 9-1, Figure 9-2** and **Figure 9-3**.

Table 9-1 Key Ecological Features (KEF) within the NWMR

KEF Name	Woodside Activity Area			Values[1]	Description
	Browse	NWS/S	NW Cape		
Carbonate bank and terrace system of the Sahul Shelf	✓	-	-	Unique seafloor feature with ecological properties of regional significance Regionally important because of their role in enhancing biodiversity and local productivity relative to their surrounds. The carbonate banks and terraces provide areas of hard substrate in an otherwise soft sediment environment which are important for sessile species	The Carbonate banks and terrace system of the Sahul Shelf are located in the western Joseph Bonaparte Gulf and to the north of Cape Bougainville and Cape Londonderry. The carbonate banks and terraces are part of a larger complex of banks and terraces that occurs on the Van Diemen Rise in the adjacent NMR. The bank and terrace system of the Van Diemen Rise covers approximately 31,278 km^2 and forms part of the larger system associated with the Sahul Banks to the north and Londonderry Rise to the east. The feature is characterised by terrace, banks, channels and valleys (DSEWPAC, 2012c). The banks, ridges and terraces of the Van Diemen Rise are raised geomorphic features with relatively high proportions of hard substrate that support sponge and octocoral gardens. These, in turn, provide habitat to other epifauna, by providing structure in an otherwise flat environment (Przeslawski *et al.*, 2011). Plains and valleys are characterised by scattered epifauna and infauna that include polychaetes and ascidians. These epibenthic communities support higher order species such as olive ridley turtles, sea snakes and sharks (DSEWPAC, 2012c)
Pinnacles of the Bonaparte Basin	✓	-	-	Unique seafloor feature with ecological properties of regional significance Provide areas of hard substrate in an otherwise soft sediment environment and so are important for sessile species Recognised as a biodiversity hotspot for sponges The Pinnacles of the Bonaparte Basin KEF is located within both the NWMR and NMR (refer **Table 9-3**)	The Pinnacles of the Bonaparte Basin provide areas of hard substrate in an otherwise relatively featureless environment, the pinnacles are likely to support a high number of species, although a better understanding of the species richness and diversity associated with these structures is required (DSEWPAC, 2012a, 2012c). Covering >520 km^2 within the Bonaparte Basin, this feature contains the largest concentration of pinnacles along the Australian margin. The Pinnacles of the Bonaparte Basin are thought to be the eroded remnants of underlying strata; it is likely that the vertical walls generate local upwelling of nutrient-rich water, leading to phytoplankton productivity that attracts aggregations of planktivorous and predatory fish, seabirds, and foraging turtles (DSEWPAC, 2012a, 2012c).
Ashmore Reef and Cartier Island and surrounding Commonwealth waters	✓	-	-	High productivity, biodiversity and aggregation of marine life that apply to both the benthic and pelagic habitats within the feature	Ashmore Reef is the largest of only three emergent oceanic reefs present in the north-eastern Indian Ocean and is the only oceanic reef in the region with vegetated islands. Ashmore contains a large reef shelf, two large lagoons, several channelled carbonate sand flats, shifting sand cays, an extensive reef flat, three vegetated islands—East, Middle and West islands—and

KEF Name	Woodside Activity Area			Values[1]	Description
	Browse	NWS/S	NW Cape		
					surrounding waters. Rising from a depth of more than 100 m, the reef platform is at the edge of the NWS and covers an area of 239 km². Ashmore Reef and Cartier Island and the surrounding Commonwealth waters are regionally important for feeding and breeding aggregations of birds and other marine life; they are areas of enhanced primary productivity in an otherwise low-nutrient environment (DSEWPAC, 2012a). Ashmore Reef supports the highest number of coral species of any reef off the WA coast.
Seringapatam Reef and the Commonwealth waters in the Scott Reef complex	✓	-	-	Support diverse aggregations of marine life, have high primary productivity relative to other parts of the region, are relatively pristine and have high species richness, which apply to both the benthic and pelagic habitats within the feature	Seringapatam Reef and the Commonwealth waters in the Scott Reef complex are regionally important in supporting the diverse aggregations of marine life, high primary productivity, and high species richness associated with the reefs themselves. As two of the few offshore reefs in the north-west, they provide an important biophysical environment in the region (DSEWPAC, 2012a).
Continental slope demersal fish communities	✓	✓	✓	High biodiversity of demersal fish assemblages, including high levels of endemism	The diversity of demersal fish assemblages on the continental slope in the Timor Province, the Northwest Transition and the North-west Province is high compared to elsewhere along the Australian continental slope (DSEWPAC, 2012a). The continental slope between North-west Cape and the Montebello Trough has more than 500 fish species, 76 of which are endemic, which makes it the most diverse slope bioregion in Australia (Last *et al.*, 2005). The slope of the Timor Province and the Northwest Transition also contains more than 500 species of demersal fishes of which 64 are considered endemic (Last *et al.*, 2005), making it the second richest area for demersal fishes throughout the whole continental slope. Demersal fish species occupy two distinct demersal biomes associated with the upper slope (225–500 m water depths) and the mid-slope (750–1000 m). Although poorly known, it is suggested that the demersal slope communities rely on bacteria and detritus-based systems comprised of infauna and epifauna, which in turn become prey for a range of teleost fishes, molluscs and crustaceans (Brewer *et al.*, 2007). Higher-order consumers may include carnivorous fishes, deepwater sharks, large squid, and toothed whales (Brewer *et al.*, 2007). Pelagic production is phytoplankton-based, with hot spots around oceanic reefs and islands (Brewer *et al.*, 2007).

KEF Name	Woodside Activity Area			Values[1]	Description
	Browse	NWS/S	NW Cape		
Ancient coastline at 125 m depth contour	✓	✓	✓	Unique seafloor feature with ecological properties of regional significance Provides areas of hard substrate and therefore may provide sites for higher diversity and enhanced species richness relative to surrounding areas of predominantly soft sediment	Several steps and terraces as a result of Holocene sea level changes occur in the region, with the most prominent of these features occurring as an escarpment along the NWMR and Sahul Shelf at a water depth of 125 m. The Ancient Coastline is not continuous throughout the NWMR and coincides with a well-documented eustatic stillstand at about 130 m worldwide (Falkner *et al.*, 2009). Where the Ancient Coastline provides areas of hard substrate, it may contribute to higher diversity and enhanced species richness relative to soft sediment habitat (Falkner *et al.*, 2009). Parts of the Ancient Coastline, represented as rocky escarpment, are considered to provide biologically important habitat in an area predominantly made up of soft sediment. The escarpment type features may also potentially facilitate mixing within the water column due to upwelling, providing a nutrient-rich environment. Although the Ancient Coastline adds additional habitat types to a representative system, the habitat types are not unique to the coastline as they are widespread on the upper shelf (Falkner *et al.*, 2009)
Canyons linking the Argo Abyssal Plain and Scott Plateau	-	✓	-	Facilitates nutrient upwelling, creating enhanced productivity and encouraging diverse aggregations of marine life	Interactions with the Leeuwin Current and strong internal tides are thought to result in upwelling at the canyon heads, thus creating conditions for enhanced productivity in the region (Brewer *et al.*, 2007). As a result, aggregations of whale sharks, manta rays, humpback whales, sea snakes, sharks, predatory fishes and seabirds are known to occur in the area due to its enhanced productivity (Sleeman *et al.*, 2007).
Glomar Shoal	-	✓	-	An area of high productivity and aggregations of marine life including commercial and recreational fish species	Glomar Shoal is a submerged littoral feature located about 150 km north of Dampier on the Rowley shelf at depths of 33–77 m (Falkner *et al.*, 2009). Studies by Abdul Wahab *et al.* (2018) found a number of hard coral and sponge species in water depths less than 40 m. One hundred and seventy (170) different species of fishes were detected with greatest species richness and abundance in shallow habitats (Abdul Wahab *et al.*, 2018). Fish species present include a number of commercial and recreational species such as Rankin cod, brown striped snapper, red emperor, crimson snapper, bream and yellow-spotted triggerfish (Falkner *et al.*, 2009; Fletcher and Santoro, 2009). These species have recorded high catch rates associated with Glomar Shoal, indicating that the shoal is likely to be an area of high productivity.

KEF Name	Woodside Activity Area			Values[1]	Description
	Browse	NWS/S	NW Cape		
Mermaid Reef and Commonwealth waters surrounding Rowley Shoals	-	✓	-	Regionally important in supporting high species richness, higher productivity and aggregations of marine life	The Mermaid Reef and Commonwealth waters surrounding the Rowley Shoals KEF and is adjacent to the three nautical mile State waters limit surrounding Clerke and Imperieuse reefs, and include the Mermaid Reef Marine Park as described in **Section 10**. The reefs provide a distinctive biophysical environment in the region. They have steep and distinct reef slopes and associated fish communities. In evolutionary terms, the reefs may play a role in supplying coral and fish larvae to reefs further south via the southward flowing Indonesian Throughflow. Both coral communities and fish assemblages differ from similar habitats in eastern Australia (Done *et al.*, 1994).
Exmouth Plateau	-	✓	✓	Unique seafloor feature with ecological properties of regional significance, which apply to both benthic and pelagic habitats Likely to be an important area of biodiversity as it provides an extended area offshore for communities adapted to depths of approximately 1000 m	The Exmouth Plateau is a large, mid-slope, continental margin plateau that lies off the northwest coast of Australia. It ranges in depth from about 500 to more than 5000 m and is a major structural element of the Carnarvon Basin (Miyazaki and Stagg, 2013). The large size of the Exmouth Plateau and its expansive surface may modify deep water flow and be associated with the generation of internal tides; both of which may subsequently contribute to the upwelling of deeper, nutrient-rich waters closer to the surface (Brewer *et al.*, 2007). Satellite observations suggest that productivity is enhanced along the northern and southern boundaries of the plateau (Brewer *et al.*, 2007). Sediments on the plateau suggest that biological communities include scavengers, benthic filter feeders and epifauna (DSEWPAC, 2012a). Fauna in the pelagic waters above the plateau are likely to include small pelagic species and nekton attracted to seasonal upwellings, as well as larger predators such as billfishes, sharks and dolphins (Brewer *et al.*, 2007). Protected and migratory species are also known to pass through the region, including whale sharks and cetaceans.
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	-	-	✓	Unique seafloor feature with ecological properties of regional significance The feature is an area of moderately enhanced productivity, attracting aggregations of fish and higher-order consumers such as large predatory	The canyons are associated with upwelling as they channel deep water from the Cuvier Abyssal Plain up onto the slope. This nutrient-rich water interacts with the Leeuwin Current at the canyon heads (DSEWPAC, 2012a). Aggregations of whale sharks, manta rays, sea snakes, sharks, large predatory fish, and seabirds are known to occur in this area.

KEF Name	Woodside Activity Area			Values[1]	Description
	Browse	NWS/S	NW Cape		
				fish, sharks, toothed whales and dolphins Likely to be important due to their historical association with sperm whale aggregations	
Commonwealth waters adjacent to Ningaloo Reef	-	-	✓	High productivity and diverse aggregations of marine life The Commonwealth waters adjacent to Ningaloo Reef and associated canyons and plateau are interconnected and support the high productivity and species richness of Ningaloo Reef, globally significant as the only extensive coral reef in the world that fringes the west coast of a continent	The Leeuwin and Ningaloo currents interact, leading to areas of enhanced productivity in the Commonwealth waters adjacent to Ningaloo Reef. Aggregations of whale sharks, manta rays, humpback whales, sea snakes, sharks, large predatory fish, and seabirds are known to occur in this area (DSEWPAC, 2012a). The spatial boundary of this KEF, as defined in the NCVA, is defined as the waters contained in the existing Ningaloo AMP provided in **Section 10**.
Wallaby Saddle	-	-	✓	High productivity and aggregations of marine life: Representing almost the entire area of this type of geomorphic feature in the NWMR. It is a unique habitat that neither occurs anywhere else nearby (within hundreds of kilometres) nor with as large an area (Falkner *et al.* 2009)	The Wallaby Saddle may be an area of enhanced productivity. Historical whaling records provide evidence of sperm whale aggregations in the area of the Wallaby Saddle, possibly due to the enhanced productivity of the area and aggregations of baitfish (DSEWPAC, 2012a).

[1] Values description sourced from Marine bioregional plan for the North-west Marine Region (DSEWPAC, 2012a) and the Department of Agriculture, Water and the Environment (DAWE) SPRAT database.

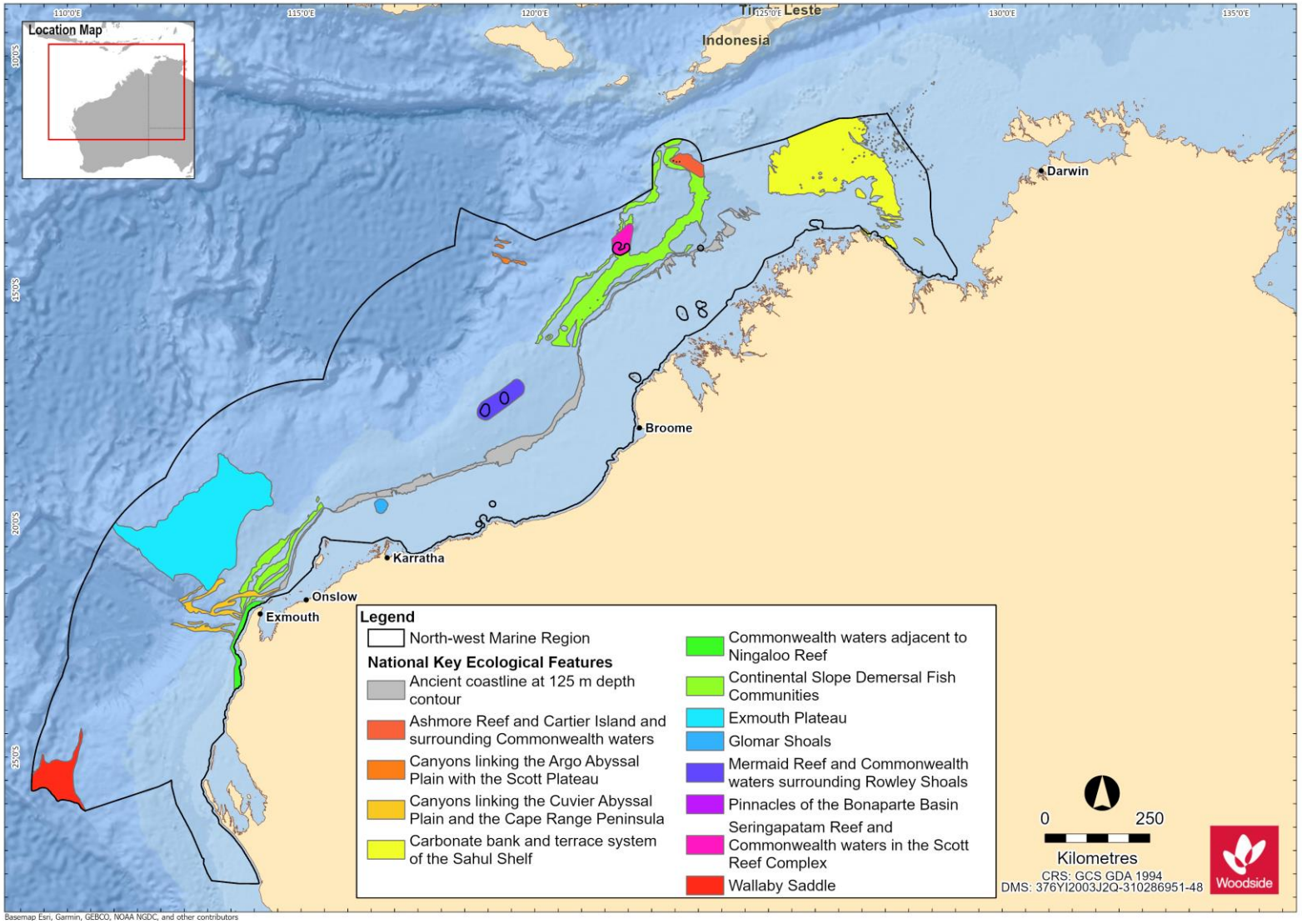

Figure 9-1 Key Ecological Features (KEFs) within the NWMR.

Table 9-2 Key Ecological Features (KEF) within the SWMR

KEF Name	Values[1]	Description
Albany Canyons group and adjacent shelf break	High productivity and aggregations of marine life, and unique seafloor feature with ecological properties of regional significance Both benthic and demersal habitats within the feature are of conservation value	The Albany Canyons group is thought to be associated with small, periodic subsurface upwelling events, which may drive localised regions of high productivity. The canyons are known to be a feeding area for sperm whale and sites of orange roughy aggregations. Anecdotal evidence also indicates that this area supports fish aggregations that attract large predatory fish and sharks.
Ancient coastline at 90-120 m depth	Relatively high productivity and aggregations of marine life, and high levels of biodiversity and endemism The feature creates topographic complexity, that may facilitate benthic biodiversity and enhanced biological productivity	Benthic biodiversity and productivity occur where the ancient coastline forms a prominent escarpment, such as in the western Great Australian Bight, where the sea floor is dominated by sponge communities of significant biodiversity and structural complexity.
Cape Mentelle upwelling	Facilitates nutrient upwelling, supporting high productivity and diverse aggregations of marine life	The Cape Mentelle upwelling draws relatively nutrient-rich water from the base of the Leeuwin Current, up the continental slope and onto the inner continental shelf, where it results in phytoplankton blooms at the surface. The phytoplankton blooms provide the basis for an extended food chain characterised by feeding aggregations of small pelagic fish, larger predatory fish, seabirds, dolphins and sharks.
Commonwealth marine environment surrounding the Houtman Abrolhos Islands (and adjacent shelf break)	High levels of biodiversity and endemism within benthic and pelagic habitats	The Houtman Abrolhos Islands and surrounding reefs support a unique mix of temperate and tropical species, resulting from the southward transport of species by the Leeuwin Current over thousands of years. The Houtman Abrolhos Islands are the largest seabird breeding station in the eastern Indian Ocean. They support more than one million pairs of breeding seabirds.

KEF Name	Values[1]	Description
Commonwealth marine environment surrounding the Recherche Archipelago	Aggregations of marine life and high levels of biodiversity and endemism within benthic and demersal communities	The Recherche Archipelago is the most extensive area of reef in the SWMR. Its reef and seagrass habitat supports a high species diversity of warm temperate species, including 263 known species of fish, 347 known species of molluscs, 300 known species of sponges, and 242 known species of macroalgae. The islands also provide haul-out (resting areas) and breeding sites for Australian sea lions and New Zealand fur seals.
Commonwealth marine environment within and adjacent to the west-coast inshore lagoons	High productivity and aggregations of marine life within benthic and pelagic habitats Important for benthic productivity and recruitment for a range of marine species	These lagoons are important for benthic productivity, including macroalgae and seagrass communities, and breeding and nursery aggregations for many temperate and tropical marine species. They are important areas for the recruitment of commercially and recreationally important fish species. Extensive schools of migratory fish visit the area annually, including herring, garfish, tailor and Australian salmon.
Commonwealth marine environment within and adjacent to Geographe Bay	High productivity and aggregations of marine life, and high levels of biodiversity, recruitment within benthic and pelagic communities	Geographe Bay is known for its extensive beds of tropical and temperate seagrass that support a diversity of species, many of them not found anywhere else. The bay provides important nursery habitat for many species. Juvenile dusky whaler sharks use the shallow seagrass habitat as nursery grounds for several years, before ranging out to adult feeding grounds along the shelf break. The seagrass also provides valuable habitat for fish and invertebrates (Carruthers *et al.*, 2007). It is also an important resting area for migratory humpback whales.
Diamantina Fracture Zone	Unique seafloor feature with ecological properties of regional significance which apply to its benthic and demersal habitats	The Diamantina Fracture Zone is a rugged, deep- water environment of seamounts and numerous closely spaced troughs and ridges. Very little is known about the ecology of this remote, deep- water feature, but marine experts suggest that its size and physical complexity mean that it is likely to support deep-water communities characterised by high species diversity, with many species found nowhere else.
Naturaliste Plateau	Unique seafloor feature with ecological properties of regional significance including high species diversity and endemism which apply to its benthic and demersal habitats	The Naturaliste Plateau is Australia's deepest temperate marginal plateau. The combination of its structural complexity, mixed water dynamics and relative isolation indicate that it supports deep- water communities with high species diversity and endemism.
Perth Canyon and adjacent shelf break, and other west-coast canyons	An area of higher productivity that attracts feeding aggregations of deep-diving mammals and large predatory fish. It is also recognised as a unique seafloor feature with ecological properties of regional significance	The Perth Canyon is the largest known undersea canyon in Australian waters. Deep ocean currents rise to the surface, creating a nutrient-rich cold- water habitat attracting feeding aggregations of deep-diving mammals, such as pygmy blue whales and large predatory fish that feed on aggregations of small fish, krill and squid.

KEF Name	Values[1]	Description
Western demersal slope and associated fish communities of the Central Western Province	Provides important habitat for demersal fish communities and supports species groups that are nationally or regionally important to biodiversity	The western demersal slope provides important habitat for demersal fish communities, with a high level of diversity and endemism. A diverse assemblage of demersal fish species below a depth of 400 m is dominated by relatively small benthic species such as grenadiers, dogfish and cucumber fish. Unlike other slope fish communities in Australia, many of these species display unique physical adaptations to feed on the sea floor (such as a mouth position adapted to bottom feeding), and many do not appear to migrate vertically in their daily feeding habits.
Western rock lobster	A species that plays a regionally important ecological role	This species is the dominant large benthic invertebrate in the region. The lobster plays an important trophic role in many of the inshore ecosystems of the SWMR. Western rock lobsters are an important part of the food web on the inner shelf, particularly as juveniles.

1. Values description sourced from Marine bioregional plan for the South-west Marine Region (DSEWPAC, 2012b) and the Department of Agriculture, Water and the Environment (DAWE) SPRAT database

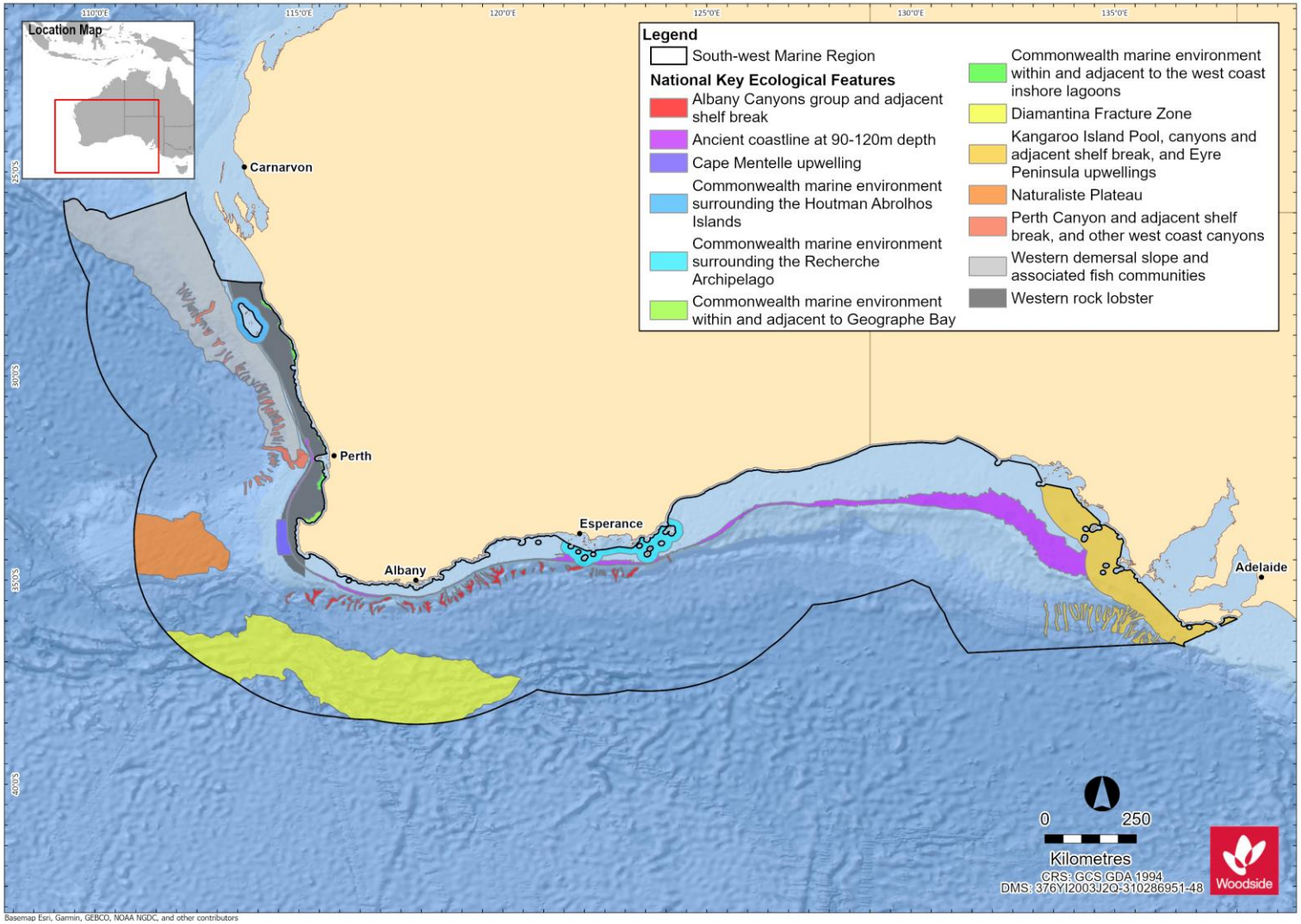

Figure 9-2. Key Ecological Features (KEFs) within the SWMR

Table 9-3 Key Ecological Features (KEF) within the NMR

KEF Name	Values[1]	Description
Carbonate bank and terrace system of the Van Diemen Rise	Important for its role in enhancing biodiversity and local productivity relative to its surrounds and for supporting relatively high species diversity The feature has been identified as a sponge biodiversity hotspot (Przeslawski *et al.* 2014)	The bank and terrace system of the Van Diemen Rise is part of the larger system associated with the Sahul Banks to the north and Londonderry Rise to the east; it is characterised by terrace, banks, channels and valleys. The variability in water depth and substrate composition may contribute to the presence of unique ecosystems in the channels. Species present include sponges, soft corals and other sessile filter feeders associated with hard substrate sediments of the deep channels; epifauna and infauna include polychaetes and ascidians. Olive ridley turtles, sea snakes and sharks are also found associated with this feature.
Gulf of Carpentaria basin	Regional importance for biodiversity, endemism and aggregations of marine life relevant to benthic and pelagic habitats	The Gulf of Carpentaria basin is one of the few remaining near-pristine marine environments in the world. Primary productivity in the Gulf of Carpentaria basin is mainly driven by cyanobacteria that fix nitrogen but is also strongly influenced by seasonal processes. The soft sediments of the basin are characterised by moderately abundant and diverse communities of infauna and mobile epifauna dominated by polychaetes, crustaceans, molluscs, and echinoderms. The basin also supports assemblages of pelagic fish species including planktivorous and schooling fish, with top predators such as shark, snapper, tuna, and mackerel.
Gulf of Carpentaria coastal zone	High productivity, aggregations of marine life (including several endemic species) and high biodiversity compared to broader region	Nutrient inflow from rivers adjacent to the NMR generates higher productivity and more diverse and abundant biota within the Gulf of Carpentaria coastal zone than elsewhere in the region. The coastal zone is near pristine and supports many protected species such as marine turtles, dugongs, and sawfishes. Ecosystem processes and connectivity remain intact; river flows are mostly uninterrupted by artificial barriers and healthy, diverse estuarine and coastal ecosystems support many species that move between freshwater and saltwater environments.
Pinnacles of the Bonaparte Basin	Unique seafloor feature with ecological properties of regional significance Provide areas of hard substrate in an otherwise soft sediment environment and so are important for sessile species Recognised as a biodiversity hotspot for sponges The Pinnacles of the Bonaparte Basin KEF is located within both the NWMR and NMR (refer **Table 9-1**)	Covering more than 520 km^2 within the Bonaparte Basin, this feature contains the largest concentration of pinnacles along the Australian margin. The Pinnacles of the Bonaparte Basin are thought to be the eroded remnants of underlying strata; it is likely that the vertical walls generate local upwelling of nutrient-rich water, leading to phytoplankton productivity that attracts aggregations of planktivorous and predatory fish, seabirds and foraging turtles.

KEF Name	Values[1]	Description
Plateaux and saddle north-west of the Wellesley Islands	High species abundance, diversity and endemism of marine life	Abundance and species density are high in the plateaux and saddle as a result of increased biological productivity associated with habitats rather than currents. Submerged reefs support corals that are typical of northern Australia, including corals that have bleach-resistant zooxanthellae; and particular reef fish species that are different to those found elsewhere in the Gulf of Carpentaria. Species present include marine turtles and reef fish such as coral trout, cod, mackerel, and shark. Seabirds frequent the plateaux and saddle, most likely due to the presence of predictable food resources for feeding offspring.
Shelf break and slope of the Arafura Shelf	The Shelf break and slope of the Arafura Shelf is defined as a key ecological feature for its ecological significance associated with productivity emanating from the slope It also forms part of a unique biogeographic province (Last *et al.*, 2005)	The shelf break and slope of the Arafura Shelf is characterised by continental slope and patch reefs and hard substrate pinnacles. The ecosystem processes of the feature are largely unknown in the region; however, the Indonesian Throughflow and surface wind-driven circulation are likely to influence nutrients, pelagic dispersal and species and biological productivity in the region. Biota associated with the feature is largely of Timor–Indonesian Malay affinity.
Submerged coral reefs of the Gulf of Carpentaria	High aggregations of marine life, biodiversity and endemism Twenty per cent of the reefs found in the NMR are situated within this KEF (Harris *et al.*, 2007)	The submerged coral reefs of the Gulf of Carpentaria are characterised by submerged patch, platform and barrier reefs that form a broken margin around the perimeter of the Gulf of Carpentaria basin, rising from the sea floor at depths of 30–50 m. These reefs provide breeding and aggregation areas for many fish species including mackerel and snapper and offer refuges for sea snakes and apex predators such as sharks. Coral trout species that inhabit the submerged reefs are smaller than those found in the Great Barrier Reef and may prove to be an endemic sub-species.
Tributary Canyons of the Arafura Depression	High productivity and high levels of species diversity and endemism of marine life within the benthic and pelagic habitats of the feature	The tributary canyons are approximately 80–100 m deep and 20 km wide. The largest of the canyons extend some 400 km from Cape Wessel into the Arafura Depression, and are the remnants of a drowned river system that existed during the Pleistocene era. Sediments in this feature are mainly calcium-carbonate rich, although sediment type varies from sandy substrate to soft muddy sediments and hard, rocky substrate. Marine turtles, deep sea sponges, barnacles and stalked crinoids have all been identified in the area.

[1] *Values description sourced from Marine bioregional plan for the North Marine Region (DSEWPAC, 2012c) and Department of Agriculture, Water and the Environment (DAWE) SPRAT database.*

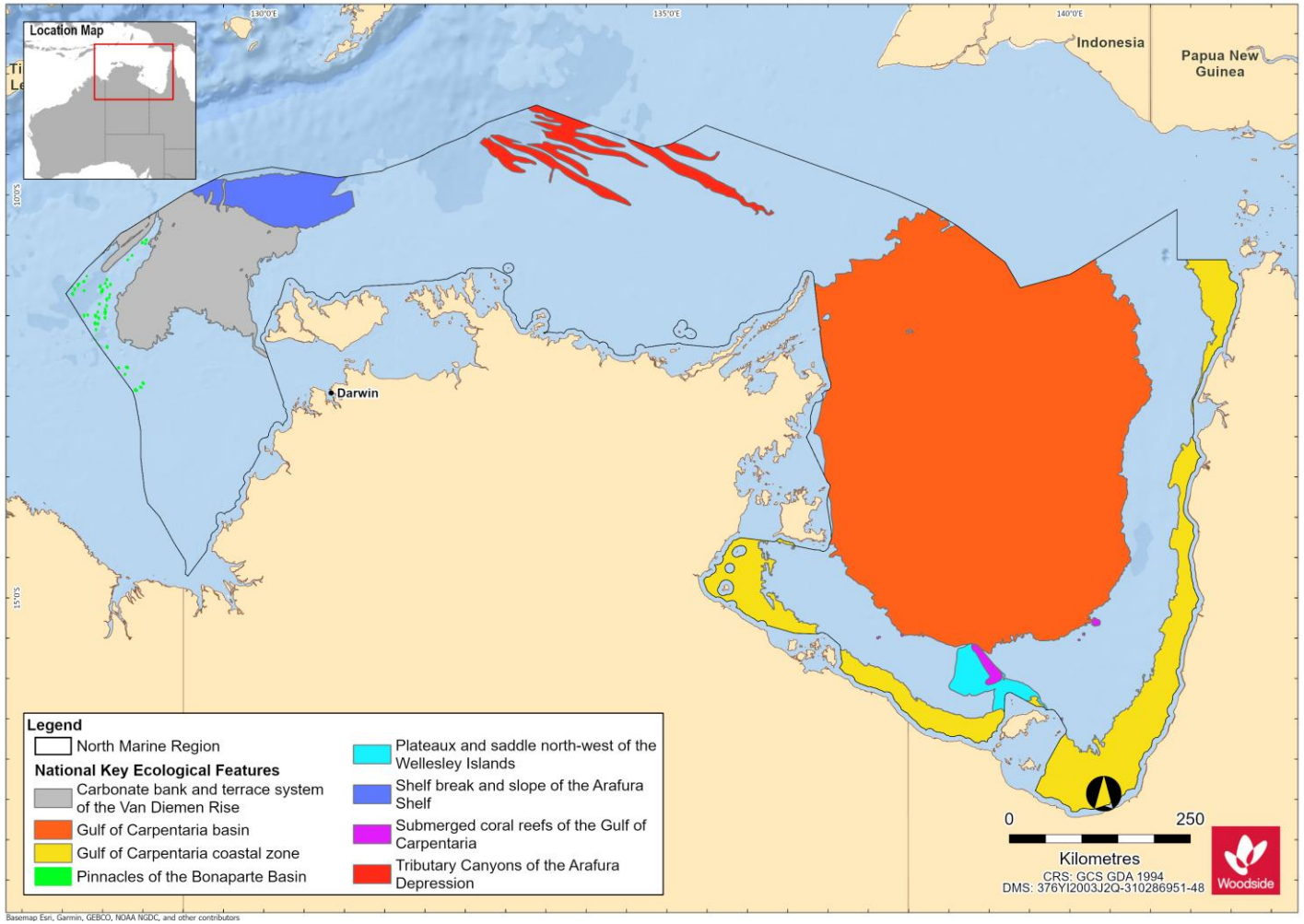

Figure 9-3. Key Ecological Features (KEFs) within the NMR

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10. PROTECTED AREAS

10.1 Regional Context

Protected areas included World Heritage Properties, National Heritage Places, Wetlands of International Importance, Australian Marine Parks, State Marine Parks and Reserves, Threatened Ecological Communities and the Australian Whale Sanctuary. The PMST Reports (**Appendix A**) shows that there are twenty-nine protected areas found in the NWMR, eighteen in the SWMR and nine in the NMR.

Table 10-1, Table 10-2 and **Table 10-3** outline the protected areas of each of the marine regions NWMR, SWMR and NMR, respectively.

10.2 World Heritage Properties

Properties nominated for World Heritage listing are inscribed on the list only after they have been carefully assessed as representing the best examples of the world's cultural and natural heritage. Only World Heritage listings classed as natural are discussed in this section. World Heritage sites classed as cultural are discussed in **Section 11**.

The list of Australia's World Heritage Properties and the PMST Reports (**Appendix A**) show two World Heritage Properties within the NWMR (**Table 10-1**), no World Heritage Properties within the SWMR (**Table 10-2),** and though not reported in the NMR PMST Report, Kakadu National Park and World Heritage Area is included in **Table 10-3**.

10.3 National and Commonwealth Heritage Places - Natural

The National Heritage List is Australia's list of natural, historic, and Indigenous places of outstanding significance to the nation. The National Heritage List Spatial Database describes the place name, class (Indigenous, natural, historic), and status. Commonwealth Heritage Places are a collection of sites recognised for their Indigenous, historical and/or natural values which are owned or controlled by the Australian Government.

Only National and Commonwealth Heritage Places classed as natural are discussed in this section. Heritage Places classed as indigenous or historic are discussed in **Section 11**.

A search of the National Heritage List Spatial Database and the PMST Reports (**Appendix A**) identified three natural National Heritage Places in the NWMR (**Table 10-1**), three in the SWMR (**Table 10-2**) and for the NMR, Kakadu National Park (not included in the PMST report) is included in **Table 10-3**.

A search of the Commonwealth Heritage List identified four natural commonwealth heritage places within the NWMR (**Table 10-1**).

10.4 Wetlands of International Importance (listed under the Ramsar Convention)

Australia has 65 Ramsar wetlands that cover >8.3 million ha. Ramsar wetlands are those that are representative, rare, or unique wetlands, or that are important for conserving biological diversity.

The List of Wetlands of International Importance held under the Ramsar Convention and the PMST Reports (**Appendix A**) identified four Ramsar Sites with coastal features within the NWMR (**Table 10-1**), four in the SWMR (**Table 10-2**) and two for the New Territory, included for the NMR (**Table 10-3**).

10.5 Australian Marine Parks

Australian Marine Parks (AMPs), proclaimed under the EPBC Act in 2007 and 2013, are located in Commonwealth waters that start at the outer edge of State and Territory waters, generally three

nautical miles (~5.5 km) from the shore, and extend to the outer boundary of Australia's EEZ, 200 nm (~370 km) from the shore.

PMST Reports (**Appendix A**) show sixteen AMPs within the NWMR (**Table 10-1**), ten within the SWMR (**Table 10-2**) and eight within the NMR (**Table 10-3**).

10.6 Threatened Ecological Communities

No Threatened Ecological Communities (TECs) as listed under the EPBC Act are known to occur within the marine waters of the NWMR, SWMR or NMR as indicated by the PMST Reports (**Appendix A**).

10.7 Australian Whale Sanctuary

The Australian Whale Sanctuary has been established to protect all whales and dolphins found in Australian waters. Under the EPBC Act all cetaceans (whales, dolphins and porpoises) are protected in Australian waters.

The Australian Whale Sanctuary includes all Commonwealth waters from the three nautical mile State/Territory waters limit out to the boundary of the EEZ (i.e. out to 200 nm and further in some places). Within the Sanctuary it is an offence to kill, injure or interfere with a cetacean. Severe penalties apply to anyone convicted of such offences.

10.8 State Marine Parks and Reserves

State Marine Parks and Reserves, proclaimed under the *Conservation and Land Management Act 1984* (CALM Act), are located in State waters and vested in the WA Conservation and Parks Commission. State Marine Parks and Reserves of Western Australia have been considered, with 14 occurring in the NWMR (**Table 10-1**) and six occurring in the SWMR (**Table 10-2**).

10.9 Summary of Protected Areas within the NWMR

Table 10-1 Protected Areas within the NWMR

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
World Heritage Properties						
Shark Bay World Heritage Property	-	-	✓		The Shark Bay World Heritage Property is adjacent to the Shark Bay AMP and was included on the World Heritage List in 1991.	Universal values of the Shark Bay World Heritage Property include large and diverse seagrass beds, stromatolites and populations of dugong and threatened species. Inscribed under Natural Criteria vii, viii, ix and x.
The Ningaloo Coast World Heritage Property	-	-	✓		The Ningaloo Coast World Heritage Property lies within the Ningaloo AMP and was included on the World Heritage List in 2011.	Universal values of the Ningaloo Coast World Heritage Property include high marine species diversity and abundance; in particular, Ningaloo Reef supports both tropical and temperate marine reptiles and mammals. Inscribed under Natural Criteria vii and x.
National Heritage Places - Natural						
Shark Bay	-	-	✓		The Shark Bay National Heritage Place consists of the same area included in the Shark Bay World Heritage Property (refer above) and was established on the National Heritage List in 2007.	The national heritage place has a number of exceptional natural features, including one of the largest and most diverse seagrass beds in the world, colonies of stromatolites and rich marine life including a large population of dugongs, and also provides a refuge for a number of other globally threatened species. Shark Bay meets the national heritage listing criteria a, b, c, d, e, f, g, h and i.
The Ningaloo Coast	-	-	✓		The Ningaloo Coast National Heritage Place consists of the same area included in the Ningaloo	The Ningaloo Coast contains one of the best developed near-shore reefs in the world, being home to rugged limestone peninsulas, spectacular coral and sponge gardens and the whale shark.

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					Coast World Heritage Property (refer above) and was established on the National Heritage List in 2010.	The Ningaloo Coast meets the national heritage listing criteria a, b, c, d, and f.
The West Kimberley	✓	✓	-		The West Kimberley National Heritage Place covers an area of around 192,000 km^2 located in the north-west of Australia from Broome to Wyndham, and was established on the National Heritage List in 2011.	The Kimberley plateau, north-western coastline and northern rivers of the West Kimberley provide a vital refuge for many native plants and animals that are found nowhere else or which have disappeared from much of the rest of Australia. In addition, Roebuck Bay is internationally recognised as one of Australia's most significant sites for migratory wading birds. The national heritage place also contains a remarkable history of Aboriginal occupation, with many places of indigenous sacred value. The West Kimberley meets the national heritage listing criteria a, b, c, d, e, f, g, h and i.
Commonwealth Heritage Places - Natural						
Mermaid Reef – Rowley Shoals	-	✓	-	N/A	The Mermaid Reef – Rowley Shoals Commonwealth Heritage Place is located within the boundary of the Mermaid Reef Marine National Nature Reserve. The site was listed as a Commonwealth Heritage Place in 2004.	The Mermaid Reef-Rowley Shoals Commonwealth Heritage Place is regionally important for the diversity of its fauna and together with Clerke and Imperieuse reefs, has biogeographical significance due to the presence of species which are at, or close to, the limits of their geographic ranges, including fishes known previously only from Indonesian waters. Rowley Shoals is important for benchmark studies as one of the few places off the north-west coast of Western Australia which have been the site of major biological collection trips by the WA Museum.

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
Ashmore Reef National Nature Reserve	✓	-	-		The Ashmore Reef Commonwealth Heritage Place is located within the boundary of the Ashmore Reef Marine Park (refer AMPs below). The site was listed as a Commonwealth Heritage Place in 2004.	Ashmore Reef has major significance as a staging point for wading birds migrating between Australia and the Northern Hemisphere and supports high concentrations of breeding seabirds, many of which are nomadic and typically breed on small isolated islands. Ashmore Reef is an important scientific reference area for migratory seabirds, sea snakes and marine invertebrates. The Ashmore Reef Commonwealth Heritage Place is significant for its history of human occupation and use. The island is believed to have been visited by Indonesian fisherman since the early eighteenth century. The islands were used both for fishing and as a staging point for voyages to the southern reefs off Australia's coast.
Scott Reef and Surrounds – Commonwealth Area	✓	-	-		Scott Reef and Surrounds Commonwealth Heritage Place is located within the Western Australian Coastal Waters surrounding North and South Scott Reef. The site was listed as a Commonwealth Heritage Place in 2004.	The Scott Reef and Surrounds Commonwealth Heritage Place is regionally important for the diversity of its fauna and has biogeographical significance due to the presence of species which are at, or close to, the limits of their geographic ranges, including fish known previously only from Indonesian waters. Scott Reef is recognised as important for scientific research and benchmark studies due to its age, the extensive documentation of its geophysical and physical environmental characteristics and its use as a site of major biological collection trips and surveys by the WA Museum and the Australian Institute of Marine Science.

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
Ningaloo Marine Area – Commonwealth Waters	-	-	✓		The Ningaloo Marine Area Commonwealth Heritage Place is located within the Commonwealth waters of the Ningaloo Marine Park (refer AMPs below). The site was listed as a Commonwealth Heritage Place in 2004.	The Ningaloo Marine Area Commonwealth Heritage Place provides a migratory pathway for humpback whales and foraging habitat for whale sharks. The place is an important breeding area for billfish and manta ray. The Ningaloo Marine Area provides opportunities for scientific research relating to aspects of the area's unique features including tourism (marine ecology, whales, turtles, whale sharks, fish and oceanography.
Wetlands of International Importance (Ramsar)						
Ashmore Reef National Nature Reserve	✓	-	-	Ramsar	The Ashmore Reef Ramsar site is located within the boundary of the Ashmore Reef Marine Park (refer AMPs below). The site was listed under the Ramsar Convention in 2002.	Ashmore Reef Ramsar site supports internationally significant populations of seabirds and shorebirds, is important for turtles (green, hawksbill and loggerhead) and dugong, and has the highest diversity of hermatypic (reef-building) corals on the WA coast. It is known for its abundance and diversity of sea snakes. However, since 1998 populations of sea snakes at Ashmore Reef have been in decline.
Eighty Mile Beach	-	✓	-	Ramsar	The Eighty Mile Beach Ramsar site covers an area of 1250 km^2, located along a long section of the Western Australian coastline adjacent to the Eighty Mile Beach AMP (refer below).	The Eighty Mile Beach Ramsar site includes saltmarsh and a raised peat bog more than 7000 years old. The site contains the most important wetland for waders in north-western Australia, supporting up to 336,000 birds, and is especially important as a land fall for waders migrating south for the austral summer.
Roebuck Bay	-	✓	-	Ramsar	The Roebuck Bay Ramsar site covers an area of 550	The Roebuck Bay Ramsar site is recognised as one of the most important areas for migratory shorebirds in Australia.

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					km^2, located south of Broome and adjacent to the Roebuck AMP (refer below).	The site regularly supports over 100,000 waterbirds, with numbers being highest in the austral spring when migrant species breeding in the Palearctic stop to feed during migration.
Ord River Floodplain	✓			Ramsar	The Ord River Floodplain Ramsar Site is in the East Kimberley region and encompasses an extensive system of river, seasonal creek, tidal mudflat, and floodplain wetlands. The Ramsar Site is a nursery, feeding and/or breeding ground for migratory birds, waterbirds, fish, crabs, prawns, and crocodiles.	The site represents the best example of wetlands associated with the floodplain and estuary of a tropical river system in the Tanami-Timor Sea Coast Bioregion in the Kimberley. In addition, the False Mouths of the Ord are the most extensive mudflat and tidal waterway complex in Western Australia.
Wetlands of National Importance (DAWE, 2019)						
Ashmore Reef	✓	-	-		Ashmore Reef is a shelf-edge platform reef located among the Sahul Banks of north-western Australia. It covers an area of 583 km^2 and consists of three islets surrounded by intertidal reef and sand flats.	These islets are major seabird nesting sites with 20 breeding species recorded to date. The total bird population has been estimated to exceed 100,000 during the peak breeding season. The marine reserve also has the highest diversity of marine fauna of the reefs on the NWS and differs from other reefs and coastal areas in the region. The area meets criteria 1, 3, 4 and 5 for inclusion on the Directory of Important Wetlands in Australia.
Mermaid Reef	-	✓	-		Mermaid Reef Marine Park covers an area of around 540 km^2, located ~280 km west north-west of Broome, and is the most north-easterly atoll of the Rowley Shoals.	The reefs of the Mermaid Reef Marine Park have biogeographic value due to the presence of species that are at or close to the limit of their distribution. The coral communities are one of the special values of Mermaid Reef. The area meets criteria 1, 2 and 3 for inclusion on the Directory of Important Wetlands in Australia.

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
Exmouth Gulf East	-	-	✓		Exmouth Gulf East covers an area of 800 km^2 and includes wetlands in the eastern part of Exmouth Gulf, from Giralia Bay; to Urala Creek, Locker Point.	The Exmouth Gulf East is an outstanding example of tidal wetland systems of low coast of north-west Australia, with well- developed tidal creeks, extensive mangrove swamps and broad saline coastal flats. The site is one of the major population centres for dugong in WA and its seagrass beds and extensive mangroves provide nursery and feeding areas for marine fishes and crustaceans in the Gulf. The area meets criteria 1, 2 and 3 for inclusion on the Directory of Important Wetlands in Australia.
Hamelin Pool	-	-	✓		Hamelin Pool covers an area of 900 km^2 in the far south-east part of Shark Bay.	Hamelin Pool is an outstanding example of a hypersaline marine embayment and supports extensive microbialite (subtidal stromatolite) formations, which are the most abundant and diverse examples of growing marine microbialites in the world. The area meets criteria 1 and 6 for inclusion on the Directory of Important Wetlands in Australia.
Shark Bay East	-	-	✓		Shark Bay East covers a 250 km area of coastline comprising tidal wetlands, and marine waters less than 6 m deep at low tide, in the east arm of Shark Bay.	The site is an outstanding example of a very large, shallow marine embayment, with particularly extensive occurrence of seagrass beds and substantial areas of intertidal mud/sandflats and mangrove swamp. The site supports what is probably the world's largest discrete population of dugong; it is also a major nursery and/or feeding area for turtles, rays, sharks, other fishes, prawns and other marine fauna; and is a major migration stop-over area for shorebirds. The area meets criteria 1, 2, 3, 4, 5 and 6 for inclusion on the Directory of Important Wetlands in Australia.
Australian Marine Parks (DNP, 2018a)						
Abrolhos Marine Park	-	-	✓	II, IV, VI	Abrolhos Marine Park is located adjacent to the WA Houtman Abrolhos Islands, covering a large offshore	Abrolhos Marine Park is significant because it contains habitats, species and ecological communities associated with four bioregions:

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					area of 88,060 km^2 extending from the WA State waters boundary to the edge of Australia's EEZ. The Abrolhos Marine Park is located within both the NWMR and SWMR.	• Central Western Province • Central Western Shelf Province • Central Western Transition • South-west Shelf Transition It includes seven KEFs: Commonwealth marine environment surrounding the Houtman Abrolhos Islands; Demersal slope and associated fish communities of the Central Western Province; Mesoscale eddies; Perth Canyon and adjacent shelf break, and other west-coast canyons; Western rock lobster; Ancient coastline at 90-120 m depth; and Wallaby Saddle. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging and breeding habitat for seabirds, foraging habitat for Australian sea lions and white sharks, and a migratory pathway for humpback and pygmy blue whales. The AMP is adjacent to the northernmost Australian sea lion breeding colony in Australia on the Houtman Abrolhos Islands.
Carnarvon Canyon Marine Park	-	-	✓	IV	Carnarvon Canyon Marine Park covers an area of 6177 km^2, located ~300 km north-west of Carnarvon.	Carnarvon Canyon Marine Park is significant because it contains habitats, species and ecological communities associated with the Central Western Transition bioregion. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. There is limited information about species' use of this AMP.
Shark Bay Marine Park	-	-	✓	VI	Shark Bay Marine Park covers an area of 7443 km^2 located ~60 km offshore of Carnarvon, adjacent to the Shark Bay World Heritage Property and National Heritage Place.	Shark Bay Marine Park is significant because it contains habitats, species and ecological communities associated with two bioregions: • Central Western Shelf Province • Central Western Transition. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
						the EPBC Act. BIAs within the AMP include breeding habitat for seabirds, internesting habitat for marine turtles, and a migratory pathway for humpback whales.
Gascoyne Marine Park	-	-	✓	II, IV, VI	Gascoyne Marine Park covers an area of 81,766 km^2, located ~20 km off the west coast of the Cape Range Peninsula, adjacent to the Ningaloo Marine Park.	Gascoyne Marine Park is significant because it contains habitats, species and ecological communities associated with three bioregions: • Central Western Shelf Transition • Central Western Transition • Northwest Province. It includes four KEFs: Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula; Commonwealth waters adjacent to Ningaloo Reef; Continental slope demersal fish communities; and Exmouth Plateau. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding habitat for seabirds, internesting habitat for marine turtles, a migratory pathway for humpback whales, and foraging habitat and migratory pathway for pygmy blue whales.
Ningaloo Marine Park	-	-	✓	II, IV	Ningaloo Marine Park covers an area of 2435 km^2, stretching ~300 km along the west coast of the Cape Range Peninsula, and is adjacent to the WA Ningaloo Marine Park and Gascoyne Marine Park.	Ningaloo Marine Park is significant because it contains habitats, species and ecological communities associated with four bioregions: • Central Western Shelf Transition • Central Western Transition • Northwest Province • Northwest Shelf Province. It includes three KEFs: Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula; Commonwealth waters adjacent to Ningaloo Reef; and Continental slope demersal fish communities. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding and

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
						or foraging habitat for seabirds, internesting habitat for marine turtles, a migratory pathway for humpback whales, foraging habitat and migratory pathway for pygmy blue whales, breeding, calving, foraging and nursing habitat for dugong and foraging habitat for whale sharks.
Montebello Marine Park	-	✓	-	VI	Montebello Marine Park covers an area of 3413 km^2, located offshore of Barrow Island and 80 km west of Dampier extending from the WA State waters boundary, and is adjacent to the WA Barrow Island and Montebello Islands Marine Parks.	Montebello Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Province bioregion. It includes one KEF: Ancient coastline at 125 m depth contour. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding habitat for seabirds, internesting, foraging, mating, and nesting habitat for marine turtles, a migratory pathway for humpback whales and foraging habitat for whale sharks.
Dampier Marine Park	-	✓	-	II, IV, VI	Dampier Marine Park covers an area of 1252 km^2, located ~10 km north-east of Cape Lambert and 40 km from Dampier extending from the WA State waters boundary.	Dampier Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Province bioregion. The AMP provides protection for offshore shelf habitats adjacent to the Dampier Archipelago, and the area between Dampier and Port Hedland, and is a hotspot for sponge biodiversity. The AMP supports a range of species including those listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding and foraging habitat for seabirds, internesting habitat for marine turtles and a migratory pathway for humpback whales.
Eighty Mile Beach Marine Park	-	✓	-	VI	Eighty Mile Beach Marine Park covers an area of 10,785 km^2, located ~74 km north-east of Port Hedland, adjacent to the	Eighty Mile Beach Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Province and consists of shallow shelf habitats, including terrace, banks and shoals.

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					WA Eighty Mile Beach Marine Park.	The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding, foraging and resting habitat for seabirds, internesting and nesting habitat for marine turtles, foraging, nursing and pupping habitat for sawfishes and a migratory pathway for humpback whales.
Argo – Rowley Terrace Marine Park	✓	✓	-	II, VI, VI (Trawl)	Argo-Rowley Terrace Marine Park covers an area of 146,003 km^2, located ~270 km north-west of Broome, and extends to the limit of Australia's EEZ. The AMP is adjacent to the Mermaid Reef Marine Park and the WA Rowley Shoals Marine Park.	Argo–Rowley Marine Park is significant because it contains habitats, species and ecological communities associated with two bioregions: • Northwest Transition • Timor Province. It includes two KEFs: Canyons linking the Argo Abyssal Plain with the Scott Plateau; and Mermaid Reef and Commonwealth waters surrounding Rowley Shoals. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include resting and breeding habitat for seabirds and a migratory pathway for the pygmy blue whale.
Mermaid Reef Marine Park	-	✓	-	II	Mermaid Reef Marine Park covers an area of 540 km^2, located ~280 km north-west of Broome, adjacent to the Argo–Rowley Terrace Marine Park and ~13 km from the WA Rowley Shoals Marine Park. Mermaid Reef is one of three reefs forming the Rowley Shoals. The other two are Clerke Reef and Imperieuse Reef, to the	Mermaid Reef Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Transition. It includes one KEF: Mermaid Reef and Commonwealth waters surrounding Rowley Shoals. The Rowley Shoals have been described as the best geological examples of shelf atolls in Australian waters. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding habitat for seabirds and a migratory pathway for the pygmy blue whale.

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					south-west of the AMP, which are included in the WA Rowley Shoals Marine Park.	
Roebuck Marine Park	-	✓	-	VI	Roebuck Marine Park covers an area of 304 km^2, located ~12 km offshore of Broome, and is adjacent to the WA Yawuru Nagulagun/Roebuck Bay Marine Park.	Roebuck Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Province and consists entirely of shallow continental shelf habitat. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding and resting habitat for seabirds, foraging and internesting habitat for marine turtles, a migratory pathway for humpback whales and foraging habitat for dugong.
Kimberley Marine Park	✓	✓	-	II, IV, VI	Kimberley Marine Park covers an area of 74,469 km^2, located ~100 km north of Broome, extending from the WA State waters boundary north from the Lacepede Islands to the Holothuria Banks offshore from Cape Bougainville.	Kimberley Marine Park is significant because it includes habitats, species and ecological communities associated with three bioregions: • Northwest Shelf Province • Northwest Shelf Transition • Timor Province. It includes two KEFs: Ancient coastline at 125 m depth contour; and Continental slope demersal fish communities. The AMP supports a range of species, including protected species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding and foraging habitat for seabirds, internesting and nesting habitat for marine turtles, breeding, calving and foraging habitat for inshore dolphins, calving, migratory pathway and nursing habitat for humpback whales, migratory pathway for pygmy blue whales, foraging habitat for dugong and foraging habitat for whale sharks.
Ashmore Reef Marine Park	✓	-	-	Ia, IV	Ashmore Reef Marine Park covers an area of 583 km^2, located ~630 km north of	Ashmore Reef Marine Park is significant because it includes habitats, species and ecological communities associated with the Timor Province. It includes two KEFs:

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					Broome and 110 km south of the Indonesian island of Roti. The AMP is located in Australia's External Territory of Ashmore and Cartier Islands and is within an area subject to a Memorandum of Understanding (MoU) between Indonesia and Australia, known as the MoU Box.	Ashmore Reef and Cartier Island and surrounding Commonwealth waters; and Continental slope demersal fish communities. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding, foraging and resting habitat for seabirds, resting and foraging habitat for migratory shorebirds, foraging, mating, nesting and internesting habitat for marine turtles, foraging habitat for dugong, and a migratory pathway for pygmy blue whales.
Cartier Island Marine Park	✓	-	-	Ia	Cartier Island Marine Park covers an area of 172 km^2, located ~45 km south-east of Ashmore Reef Marine Park and 610 km north of Broome. It is also located in Australia's External Territory of Ashmore and Cartier Islands and within an area subject to an MoU between Indonesia and Australia, known as the MoU Box.	Cartier Island Marine Park is significant because it includes habitats, species and ecological communities associated with the Timor Province. It includes two key ecological features: Ashmore Reef and Cartier Island and surrounding Commonwealth waters and continental slope demersal fish communities. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding and foraging habitat for seabirds, internesting, nesting and foraging habitat for marine turtles and foraging habitat for whale sharks. The AMP is also internationally significant for its abundance and diversity of sea snakes, some of which are listed species under the EPBC Act.
Joseph Bonaparte Gulf Marine Park	✓	-	-	VI	Joseph Bonaparte Gulf Marine Park covers an area of 8597 km^2 and is located ~15 km west of Wadeye, NT, and ~90 km north of Wyndham, WA, in the Joseph Bonaparte Gulf.	Joseph Bonaparte Gulf Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Transition bioregion. It includes one KEF: Carbonate bank and terrace system of the Sahul Shelf. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					It is adjacent to the WA North Kimberley Marine Park. The Joseph Bonaparte Gulf Marine Park is located within both the NWMR and NMR.	the EPBC Act. BIAs within the AMP include foraging habitat for marine turtles and the Australian snubfin dolphin.
Oceanic Shoals Marine Park	✓	-	-	II, IV, VI	Oceanic Shoals Marine Park covers an area of 71,743 km^2 and is located west of the Tiwi Islands, ~155 km north-west of Darwin, NT and 305 km north of Wyndham, WA. The Oceanic Shoals Marine Park is located within both the NWMR and NMR.	Oceanic Shoals Marine Park is significant because it contains habitats, species and ecological communities associated with the Northwest Shelf Transition bioregion. It contains four KEFs: Carbonate bank and terrace systems of the Van Diemen Rise; Carbonate bank and terrace systems of the Sahul Shelf; Pinnacles of the Bonaparte Basin; and Shelf break and slope of the Arafura Shelf. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging and internesting habitat for marine turtles.
State Marine Parks and Reserves						
North Kimberley Marine Park	✓	-	-	Sanctuary, Special Purpose and General Use Zones	The North Kimberley Marine Park covers approx. 18,450 km^2 with its south-western boundary located ~270 km north-east of Derby.	The coral reefs of the north Kimberley have the greatest diversity in Western Australia and are some of the most pristine and remarkable reefs in the world. The park surrounds more than 1000 islands and is home to listed species such as dugongs, marine turtles, and sawfishes (DPAW, 2016a).
Lalang-garram / Horizontal Falls Marine Park and North Lalang-garram Marine Park (jointly managed)	✓	-	-	Sanctuary, Special Purpose and General Use Zones	The Lalang-garram / Horizontal Falls Marine Park covers ~3530 km^2 from Talbot Bay in the west and Glenelg River in the east. The North Lalang-garram Marine Park covers ~1100	The Lalang-garram / Horizontal Falls Marine Park's most celebrated attraction is created by massive tides of up to 10 m and narrow gaps in two parallel tongues of land meaning the tide falls faster than the water can escape, producing 'horizontal falls'. There are also islands with fringing coral reefs and mangrove-lined creeks and bays. The North Lalang-garram Marine Park has a number of islands fringed with coral reef and has been identified as an

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
					km^2 between Camden Sound and North Kimberley Marine Parks.	ecological hotspot and supports more than 1% of the world's population of brown boobies, with up to 2000 breeding pairs. About 500 pairs of crested terns also nest on the island (DPAW, 2016b).
Lalang-garram / Camden Sound Marine Park	✓	-	-	Sanctuary, Special Purpose and General Use Zones	Lalang-garram / Camden Sound Marine Park covers 7050 km^2 located about 150 km north of Derby.	The Lalang-garram / Camden Sound Marine Park is the most important humpback whale nursery in the Southern Hemisphere. It also features the spectacular coastal Montgomery Reef. The marine park is home to six species of threatened marine turtle. Australian snubfin and Indo-Pacific humpback dolphins, dugongs, saltwater crocodiles, and several species of sawfish (DPAW, 2013).
Rowley Shoals Marine Park	-	✓	-	Sanctuary, Recreation and General Use Zones	The Rowley Shoals comprise of three reef systems, Mermaid Reef, Clerke Reef and Imperieuse Reef, all 30-40 km apart. These reef systems are located ~300 km west north-west of Broome.	The three coral atolls of the Rowley Shoals Marine Park comprise of shallow lagoons inhabited by diverse corals and abundant marine life, each covering around 80 km^2 at the edge of Australia's continental shelf. Further offshore, the seafloor slopes away to the abyssal plain, some 6000 m below. Undersea canyons slice the slope; these features are commonly associated with diverse communities of deep-water corals and sponges and create localised upwellings that aggregate pelagic species like tunas and billfish (DEC, 2007a).
Yawuru Nagulagun / Roebuck Bay Marine Park	-	✓	-	Special Purpose Zone	Yawuru Nagulagun / Roebuck Bay Marine Park is a series of intertidal flats lying on the coast to the south-east of Broome.	Roebuck Bay is an internationally significant wetland and one of the most important feeding grounds for migratory shorebirds in Australia. Australian snubfin and Australian humpback dolphins frequent the waters and humpback whales pass through on their annual migration. Flatback turtles nest on the shores and are found in the bay's waters with other sea turtle species. Seagrass and macroalgae communities provide food for protected species such as the dugong and flatback turtle (DPAW, 2016c).
Eighty Mile Beach Marine Park	-	✓	-	Sanctuary, Recreation, Special	Eighty Mile Beach Marine Park covers ~2000 km^2 stretching across 220km of	Eighty Mile Beach Marine Park is one of the world's most important feeding grounds for small wading birds that migrate to the area each summer, travelling from countries

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
				Purpose and General Use Zones	coastline between Port Hedland and Broome.	thousands of kilometres away. The marine park is a major nesting area for flatback turtles which are found only in northern Australia. Sawfishes, dugongs, dolphins and millions of invertebrates inhabit the sand and mud flats, seagrass meadows, coral reefs and mangroves (DPAW, 2014).
Montebello Islands Marine Park, Barrow Island Marine Park and Barrow Island Marine Management Area (jointly managed)	-	✓	-	Sanctuary, Recreation, General Use and Special Purpose Zones	The Montebello Islands Marine Park, Barrow Island Marine Park and Barrow Island Marine Management Area are located off the north-west coast of WA, ~1600 km north of Perth, and cover areas of ~583 km^2, 42 km^2 and 1,147 km^2, respectively.	The Montebello/Barrow islands marine conservation reserves have very complex seabed and island topography, resulting in a myriad of different habitats subtidal coral reefs, macroalgal and seagrass communities, subtidal soft-bottom communities, rocky shores and intertidal reef platforms, which support a rich diversity of invertebrates and finfish. The reserves are important breeding areas for several species of marine turtles and seabirds, which use the undisturbed sandy beaches for nesting. Humpback whales migrate through the reserves and dugongs occur in the shallow warm waters (DEC, 2007b).
Ningaloo Marine Park and Muiron Islands Marine Management Area (jointly managed)	-	-	✓	Sanctuary, Recreation, General Use and Special Purpose Zones	The Ningaloo Marine Park and Muiron Islands Marine Management Area are located off the North-west Cape of WA, ~1200 km north of Perth, and cover areas of ~2633 km^2 and 286 km^2, respectively.	Ningaloo Reef is the largest fringing coral reef in Australia. Temperate and tropical currents converge in the Ningaloo region resulting in highly diverse marine life including spectacular coral reefs, abundant fishes and species with special conservation significance such as turtles, whale sharks, dugongs, whales and dolphins. The region has diverse marine communities including mangroves, algae and filter-feeding communities and has high water quality. These values contribute to the Ningaloo Marine Park being regarded as the State's premier marine conservation icon. The Muiron Islands Marine Management Area is also important, containing a very diverse marine environment, with coral reefs, filter-feeding communities and macroalgal beds. In addition, the Islands are important seabird and green turtle nesting areas. (CALM, 2005a).

Protected Area	Woodside Activity Area			IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
	Browse	NWS/S	NW Cape			
Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve (jointly managed)	-	-	✓	Sanctuary, Recreation, General Use and Special Purpose Zones	The Shark Bay Marine Park and Hamelin Pool Marine Nature Reserves are located 400 km north of Geraldton, covering areas of ~7487 km^2 and 1270 km^2, respectively.	Seagrass covers over 4000 km^2 of the Shark Bay Marine Park, with 12 different species making it one of the most diverse seagrass assemblages in the world. Dugongs regularly use this habitat, with the bay containing one of the largest dugong populations in the world. Humpback whales also use the bay as a staging post in their migration along the coast. Green and loggerhead turtles occur in the bay with Dirk Hartog Island providing the most important nesting site for loggerheads in Western Australia. Hamelin Pool contains the most diverse and abundant examples of stromatolites found in the world. These are living representatives of stromatolites that existed some 3500 million years ago (CALM, 1996).

**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 (DNP, 2018a)

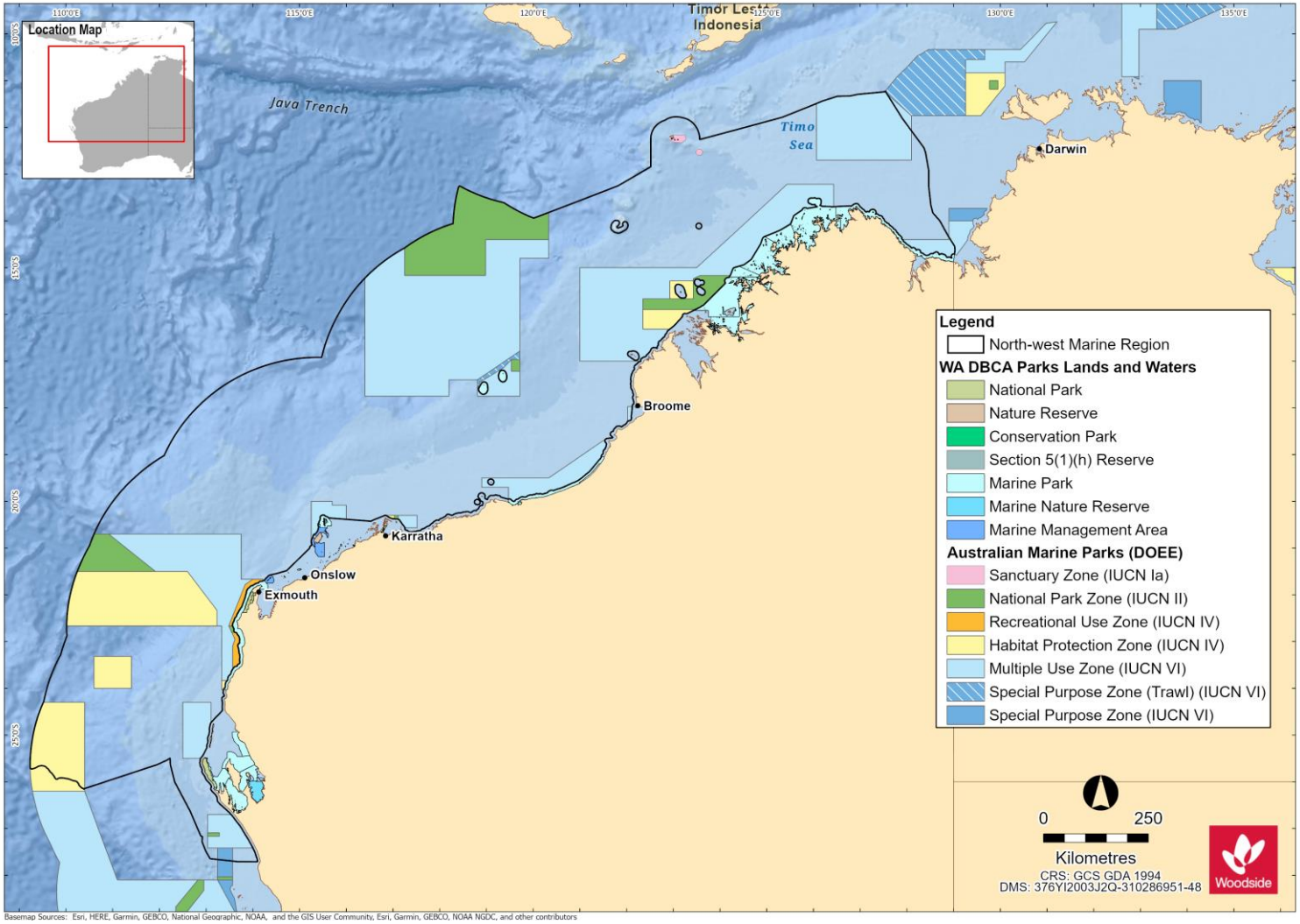

Figure 10-1 Commonwealth and State Marine Protected Areas for the NWMR

10.10 Summary of Protected Areas within the SWMR

Table 10-2 Protected Areas within the SWMR

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
World Heritage Properties			
N/A			
National Heritage Places - Natural			
N/A			
Commonwealth Heritage Places - Natural			
N/A			
Wetlands of International Importance (Ramsar)			
Beecher Point Wetlands	Ramsar	Beecher Point Wetlands is a system of about sixty small wetlands located near Rockingham in south-west WA, covering an area of around 7 km^2. The site was listed under the Ramsar Convention in 2001.	The wetlands support sedgelands, herblands, grasslands, open-shrublands and low open-forests. The sedgelands that occur within the linear wetland depressions of the Ramsar site are a nationally listed TEC. At least four species of amphibians and twenty-one (21) species of reptiles have been recorded on the site. The site also supports the southern brown bandicoot. The site meets criteria 1 and 2 of the Ramsar Convention.
Forrestdale and Thomsons Lakes	Ramsar	Forrestdale Lake is located in the City of Armadale and Thomsons Lake is located in the City of Cockburn both of which lie within the southern Perth metropolitan area, in Western Australia. The site was listed under the Ramsar Convention in 1990.	The lakes are surrounded by medium density urban development and some agricultural land. The sediments of Thomsons Lake are between 30,000 and 40,000 years old, which are the oldest lake sediments discovered in WA to date. These lakes are the best remaining examples of brackish, seasonal lakes with extensive fringing sedgeland, typical of the Swan Coastal Plain. The site meets criteria 1, 3, 5 and 6 of the Ramsar Convention.
Peel-Yalgorup System	Ramsar	Peel-Yalgorup System, located adjacent to the City of Mandurah in	Peel-Yalgorup System Ramsar site is the most important area for waterbirds in south-western Australia. It supports a large number of waterbirds, and a

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
		WA, is a large and diverse system of shallow estuaries, coastal saline lakes and freshwater marshes. The site was listed under the Ramsar Convention in 1990.	wide variety of waterbird species. It also supports a wide variety of invertebrates, and estuarine and marine fish. The site meets criteria 1, 3, 5 and 6 of the Ramsar Convention.
Vasse-wonnerup system	Ramsar	Vasse-Wonnerup System Ramsar wetland is situated in the Perth Basin, south-western WA. The site was listed under the Ramsar Convention in 1990.	Vasse-Wonnerup System is an extensive, shallow, nutrient-enriched wetland system of highly varied salinities. Large areas of the wetland dry out in late summer. Vasse-Wonnerup System supports tens of thousands of resident and migrant waterbirds of a wide variety of species. More than 80 species of waterbird have been recorded in the System such as red-necked avocets and black-winged stilts, wood sandpiper, sharp-tailed sandpiper, long-toed stint, curlew sandpiper and common greenshank. Thirteen waterbird species are also known to breed at the Ramsar site, including the largest regular breeding colony of black swans in south-western Australia. The site meets criteria 5 and 6 of the Ramsar Convention.
Wetlands of National Importance (DAWE, 2019)			
Rottnest Island Lakes		The Rottnest Island Lakes site is the cluster of 18 lakes and swamps on the north-east part of Rottnest Island.	An outstanding example of a series of lakes/swamps of varied depth and salinity located on an offshore island; the only island among 200 plus in WA exceeding 10 ha in area, that has a salt-lake complex; the only known example of seasonally meromictic lakes in Australia. The area meets criteria 1, 2, 3 and 6 for inclusion on the Directory of Important Wetlands in Australia.
Australian Marine Parks (DNP, 2018b)			
Abrolhos Marine Park	II, IV, VI	The Abrolhos Marine Park is located within both the NWMR and SWMR. Refer **Table 10-1** for description and conservation values.	
Bremer Marine Park	II, VI	Bremer Marine Park covers an area of 4472 km^2 and is located approximately half-way between Albany and Esperance, offshore from the Fitzgerald River National Park, extending from the WA State waters boundary.	Bremer Marine Park is significant because it contains habitats, species and ecological communities associated with two bioregions: • Southern Province • South-west Shelf Province. It includes two KEFs: Albany Canyon group and adjacent shelf break; and Ancient coastline at 90-120 m depth.

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
			The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, Australian sea lions, and white sharks, a migratory pathway for humpback whales, and a significant calving area for southern right whales. The AMP includes canyons—important aggregation areas for killer whales.
Eastern Recherche Marine Park	II, VI	Eastern Recherche Marine Park covers an area of 20,575 km^2 and is located ~135 km east of Esperance, adjacent to the Recherche Archipelago, close to the WA Cape Arid National Park.	Eastern Recherche Marine Park is significant because it contains habitats, species and ecological communities associated with three bioregions: • South-west Shelf Province • Southern Province • Great Australian Bight Shelf Transition. It includes three KEFs: Mesoscale eddies; Ancient coastline at 90-120 m depth; and Commonwealth marine environment surrounding the Recherche Archipelago. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, Australian sea lions and white sharks, and a calving buffer area for southern right whales.
Geographe Marine Park	II, IV, VI	Geographe Marine Park covers an area of 977 km^2 and is located in Geographe Bay, ~8 km west of Bunbury and 8 km north of Busselton, adjacent to the WA Ngari Capes Marine Park.	Geographe Marine Park is significant because it contains habitats, species and ecological communities associated with the South-west Shelf Province bioregion. It includes two KEFs: Commonwealth marine environment within and adjacent to Geographe Bay; and Western rock lobster. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, a migratory pathway for humpback and pygmy blue whales, and a calving buffer area for southern right whales.
Great Australian Bight Marine Park	II, VI	Great Australian Bight Marine Park covers an area of 45,822 km^2 and is located ~12 km south-east of Eucla and 174 km west of Ceduna, adjacent to the SA Far West Coast and Nuyts Archipelago Marine Parks.	Great Australian Bight Marine Park is significant because it contains habitats, species and ecological communities associated with two bioregions: • Great Australian Bight Shelf Transition • Southern Province. It includes three KEFs: Ancient coastline at 90-120 m depth; Benthic invertebrate communities of the eastern Great Australian Bight; and Small pelagic fish of the South-west Marine Region. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, Australian sea lions, white sharks and

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
			pygmy blue and sperm whales, and a calving area, migratory pathway and large aggregation area for southern right whales.
Jurien Marine Park	II, VI	Jurien Marine Park covers an area of 1851 km^2 and is located ~148 km north of Perth and 155 km south of Geraldton, adjacent to the WA Jurien Bay Marine Park.	Jurien Marine Park is significant because it includes habitats, species and ecological communities associated with two bioregions: • South-west Shelf Transition • Central Western Province. It includes three KEFs: Ancient coastline at 90-120 m depth; Demersal slope and associated fish communities of the Central Western Province; and Western rock lobster The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, Australian sea lions and white sharks, and a migratory pathway for humpback and pygmy blue whales.
Perth Canyon Marine Park	II, IV, VI	Perth Canyon Marine Park covers an area of 7409 km^2 and is located ~52 km west of Perth and ~19 km west of Rottnest Island.	Perth Canyon Marine Park is significant because it includes habitats, species and ecological communities associated with four bioregions: • Central Western Province • South-west Shelf Province • Southwest Transition • South-west Shelf Transition. It includes four KEFs: Perth Canyon and adjacent shelf break, and other west-coast canyons; Demersal slope and associated fish communities of the Central Western Province; Western rock lobster; and Mesoscale eddies. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, Antarctic blue, pygmy blue and sperm whales, a migratory pathway for humpback, Antarctic blue and pygmy blue whales, and a calving buffer area for southern right whales.
South-west Corner Marine Park	II, IV, VI	South-west Corner Marine Park covers an area of 271,833 km^2 and is located adjacent to the WA Ngari Capes Marine Park. It covers an extensive offshore area that is closest to WA State waters ~48 km west of Esperance, 73 km west of Albany and 68 km west of Bunbury.	South-west Corner Marine Park is significant because it contains habitats, species and ecological communities associated with three bioregions: • Southern Province • South-west Transition • South-west Shelf Province. It includes six KEFs: Albany Canyon group and adjacent shelf break; Cape Mentelle upwelling; Diamantina Fracture Zone; Naturaliste Plateau; Western rock lobster; and Ancient coastline at 90 m-120 m depth.

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
			The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, Australian sea lions, white sharks and sperm whales, a migratory pathway for Antarctic blue, pygmy blue and humpback whales, and a calving buffer area for southern right whales.
Twilight Marine Park	II, VI	Twilight Marine Park covers an area of 4641 km^2 and is located ~245 km south-west of Eucla and 373 km north-east of Esperance, adjacent to the WA State waters boundary.	Twilight Marine Park is significant because it contains habitats, species and ecological communities associated with the Great Australian Bight Shelf Transition bioregion. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds, Australian sea lions and white sharks, and a calving buffer area for southern right whales.
Two Rocks Marine Park	II, VI	Two Rocks Marine Park covers an area of 882 km^2 and is located ~25 km north-west of Perth, to the north-west of the WA Marmion Marine Park.	Two Rocks Marine Park is significant because it includes habitats, species and ecological communities associated with the South-west Shelf Transition bioregion. It includes three KEFs: Commonwealth marine environment within and adjacent to the west-coast inshore lagoons; Western rock lobster; and Ancient coastline at 90-120 m depth. The AMP supports a range of species including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat for seabirds and Australian sea lions, a migratory pathway for humpback and pygmy blue whales, and a calving buffer area for southern right whales.
State Marine Parks and Reserves			
Jurien Bay Marine Park	Sanctuary, Special Purpose and General Use Zones.	The Jurien Bay Marine Park is located on the central west coast of WA ~200 km north of Perth and covers an area of 824 km^2.	An extensive limestone reef system parallel to the shore has created a huge shallow lagoon that provides perfect habitat for Australian sea lions, dolphins and a myriad of juvenile fish. Extensive seagrass meadows inside the reef shelter many marine animals such as western rock lobsters, octopus and cuttlefish that make up the diet of young sea lions. The marine park also surrounds dozens of ecologically important islands that contain rare and endangered animals found nowhere else in the world (CALM, 2005b).
Marmion Marine Park	Sanctuary, Recreation and Special Use Zones.	The Marmion Marine Park lies within State waters between Trigg Island and Burns Beach and encompasses a coastal area of ~95 km^2. Marmion	The marine park has a number of sanctuary zones including Little Island, The Lumps and the Boyinaboat Reef protecting a variety of habitats from limestone reefs, seagrass beds and clear shallow lagoons that support a diversity of marine life. In addition, to a general use zone and the Waterman Recreation Area. The marine park contains important habitat for the endemic Australian

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
		Marine Park was the State's first marine park, declared in 1987.	sea lion, an array of seabird species migratory whales are regular visitors (CALM, 1992; DPAW, 2016d).
Swan Estuary Marine Park	Special Purpose and Nature Reserve Zones.	Three biologically important areas of Perth's Swan River make up the Swan Estuary Marine Park, including Alfred Cove, Pelican Point and Crawley. These three sites cover a total area of 3.4 km^2.	The sand flats, mud flats and beaches at the three locations of the Swan Estuary Marine Park provide the only remaining significant feeding and resting areas in the Swan Estuary, for trans-equatorial migratory wading and waterbirds. The Park and adjacent reserves also provide habitat for a diverse assemblage of aquatic and terrestrial flora and fauna (CALM, 1999).
Shoalwater Islands Marine Park	Sanctuary, Special Purpose and General Use Zones.	The Shoalwater Islands Maine Park is located adjacent to Rockingham on the south-west coast of WA, ~50 km south of Perth and covers an area of ~66 km^2.	The Shoalwater Islands Marine Park consists of a complex seabed and coastal topography consisting of islands, limestone ridges and reef platforms, protected inshore areas and deeper basins, sandbars and beaches, and is home to five species of cetacean and 14 species of sea and shore bird. The waters of the marine park are also used to access feeding grounds for the little penguin (*Eudyptula minor*) colony on Penguin Island, which is close to the northernmost limit of the species' range and is the largest known breeding colony in Western Australia (DEC, 2007c).
Ngari Capes Marine Park	Sanctuary, Special Purpose and Recreation Zones.	The Ngari Capes Marine Park is located off the south-west coast of WA, ~250 km south of Perth, covering ~1238 km^2.	The Ngari Capes Marine Park consists of a complex arrangement of sandy bays, high energy limestone and granite reefs bordered by headlands and cliffs and two weathered capes. Coral communities consist of both tropical and temperate species. Cetaceans and pinnipeds are resident in and/or transient through the marine park as well as a diverse range of seabirds and shorebirds (DEC, 2013).
Walpole and Nornalup Inlets Marine Park	Recreation Zone.	The Walpole and Nornalup Inlets Marine Park is located adjacent to the towns of Walpole and Nornalup on the south coast of WA, ~120 km west of Albany, and covers ~14 km^2.	The Walpole and Nornalup Inlets Marine Park consists of a geologically complex lagoonal estuarine system comprising three significant rivers and two connected inlets that are permanently open to the ocean. Approximately 40 marine and estuarine finfish species commonly inhabit the inlet system, as well as a variety of shark and ray species and numerous seabirds and shorebirds. The sandy beaches and shoreline vegetation of the inlet system are of high ecological and social importance to the marine park (DEC, 2009).

**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 South-west Marine Parks Network Management Plan 2018 (DNP, 2018b)

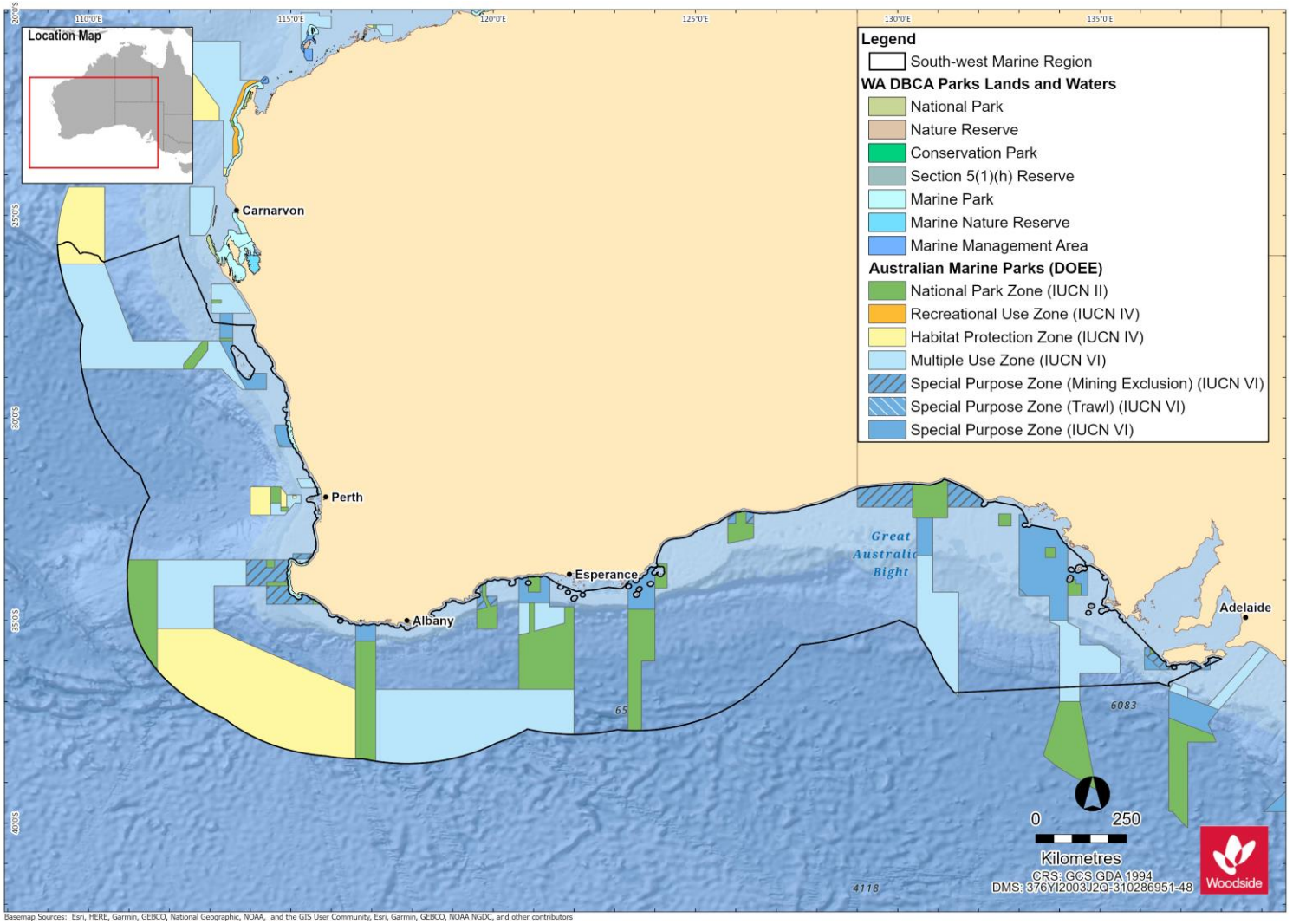

Figure 10-2. Commonwealth and State Marine Protected Areas for the SWMR

10.11 Summary of Protected Areas within the NMR

Table 10-3 Protected Areas within the NMR

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
World Heritage Properties			
Kakadu National Park		Kakadu National Park is a living landscape with exceptional natural and cultural values. It is the largest National Park in Australia and preserves the greatest variety of ecosystems on the Australian continent including extensive areas of floodplains, mangroves, tidal mudflats, coastal areas and monsoon forests. The park was inscribed the World Heritage list in three stages over 11 years. It is located in tropical north Australia covering a total area of 19,804 square kilometres.	The conservation values reflect the WHA Criterion: (i), (vi), (vii) and (ix): Natural features relate to Criterion (vii) – the remarkable contrast between the internationally recognised Ramsar-listed wetlands and the spectacular rocky escarpment and its outliers and Criterion (ix) – four major river systems of tropical Australia and floodplains that are dynamic environments, shaped by changing sea levels and big floods every wet season. These floodplains illustrate the ecological and geomorphological effects that have accompanied Holocene climate change and sea level rise. Kakadu National Park contains important and significant habitats supporting a diverse range of flora and fauna.
National Heritage Places - Natural			
Kakadu National Park		Refer to World Heritage property description above.	Refer to World Heritage property conservation values above
Commonwealth Heritage Places - Natural			
N/A			
Wetlands of International Importance (Ramsar)			
Kakadu National Park		Australian Ramsar site number 2. The stage 1 and 2 Ramsar sites, established in 1980, 1985 and 1989, respectfully were combined into a single Ramsar site in 2010.	The Kakadu National Park Ramsar site straddles the western edge of the Arnhem Land Plateau encompassing a range of landforms and extensive floodplains. It is a mosaic of contiguous wetlands comprising the catchments of two large river systems, the East and South Alligator rivers and encompasses extensive tidal mudflat areas. It is an internationally important site for migratory shorebirds as part of the EAAF.

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
Cobourg Peninsula		Australian Ramsar site number 1 established in 1974. This Ramsar site includes freshwater and extensive intertidal areas but excludes subtidal areas. It is in a remote location and there has been minimal human impact on the site.	The wetlands encompassed in the Ramsar site are some of the better protected and near-natural wetlands in the bioregion and there is a diverse array of wetland in a confined area. The site supports important turtle nesting habitat and habitat for coastal dolphin species and is an internationally significant migratory shorebird habitat as part of the EAAF and an important location for seabird breeding colonies.
Wetlands of National Importance (DAWE, 2019)			
Southern Gulf Aggregation		The site is a complex continuous wetland aggregation in the Gulf of Carpentaria, covering an area of ~5460 km^2 located 58 km east of Burketown, Queensland.	The Southern Gulf Aggregation is the largest continuous estuarine wetland aggregation of its type in northern Australia. It is one of the three most important areas for shorebirds in Australia. The area meets criteria 1, 2, 3, 4, 5 and 6 for inclusion on the Directory of Important Wetlands in Australia.
Australian Marine Parks (DNP, 2018c)			
Arafura Marine Park	VI	Arafura Marine Park covers an area of 22,924 km^2 is located ~256 km north-east of Darwin and 8 km offshore of Croker Island, NT. It extends from NT waters to the limit of Australia's EEZ.	The AMP is significant because it contains habitats, species and ecological communities associated with two bioregions: • Northern Shelf Province • Timor Transition. It includes one KEF: Tributary canyons of the Arafura Depression. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include internesting habitat for marine turtles and important foraging and breeding habitat for seabirds.
Arnhem Marine Park	VI	Arnhem Marine Park covers an area of 7125 km^2 and is located ~100 km south-east of Croker Island and 60 km south-east of the Arafura Marine Park. It extends from NT waters surrounding the Goulburn Islands, to the waters north of Maningrida.	Arnhem Marine Park is significant because it contains habitats, species and ecological communities associated with the Northern Shelf Province bioregion. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include foraging habitat and a migratory pathway for marine turtles and seabirds.
Gulf of Carpentaria Marine Park	II, VI	Gulf of Carpentaria Marine Park covers an area of 23,771 km^2 and is located ~90 km north-west of Karumba, Queensland and is adjacent to the Wellesley Islands in	Gulf of Carpentaria Marine Park is significant because it contains habitats, species and ecological communities associated with the Northern Shelf Province bioregion.

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
		the south of the Gulf of Carpentaria basin.	It includes four KEFs: Gulf of Carpentaria basin; Gulf of Carpentaria coastal zone; Plateaux and saddle north-west of the Wellesley Islands; and Submerged coral reefs of the Gulf of Carpentaria. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding and foraging areas for seabirds and internesting and foraging areas for turtles.
Joseph Bonaparte Gulf Marine Park	VI	The Joseph Bonaparte Gulf Marine Park is located within both the NWMR and NMR. Refer **Table 10-1** for description and conservation values.	
Limmen Marine Park	IV	Limmen Marine Park covers an area of 1399 km^2 and is located ~315 km south-west of Nhulunbuy, NT, in the south-west of the Gulf of Carpentaria. It extends from NT waters, between the Sir Edward Pellew Group of Islands and Maria Island in the Limmen Bight, adjacent to the NT Limmen Bight Marine Park.	Limmen Marine Park is significant because it contains habitats, species and ecological communities associated with the Northern Shelf bioregion. It includes one KEF: Gulf of Carpentaria coastal zone. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include internesting and foraging habitat for marine turtles.
Oceanic Shoals Marine Park	II, IV, VI	The Oceanic Shoals Marine Park is located within both the NWMR and NMR. Refer **Table 10-1** for description and conservation values.	
Wessel Marine Park	IV, VI	Wessel Marine Park covers an area of 5908 km^2 and is located ~22 km east of Nhulunbuy, NT. It extends from NT waters adjacent to the tip of the Wessel Islands to NT waters adjacent to Cape Arnhem.	Wessel Marine Park is significant because it contains habitats, species and ecological communities associated with the Northern Shelf bioregion. It includes one KEF: Gulf of Carpentaria basin. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding habitat for seabirds and internesting and foraging habitat for marine turtles.
West Cape York Marine Park	II, IV, VI	West Cape York Marine Park covers an area of 16,012 km^2 and is located adjacent to the northern end	West Cape York Marine Park is significant because it contains species and ecological communities associated with two bioregions: • Northeast Shelf Transition

Protected Area	IUCN Protected Area Category* or Relevant Park Zone	Description	Conservation Values
		of Cape York Peninsula ~25 km south-west of Thursday Island and 40 km north-west of Weipa, Queensland.	• Northern Shelf Province. It includes two KEFs: Gulf of Carpentaria basin; and Gulf of Carpentaria coastal zone. The AMP supports a range of species, including species listed as threatened, migratory, marine or cetacean under the EPBC Act. BIAs within the AMP include breeding and foraging habitat for seabirds, internesting and foraging habitat for marine turtles and dugong, and foraging, breeding and calving habitat for dolphins.
Territory Marine Parks and Reserves			
Cobourg Marine Park	II, IV, VI	Cobourg Marine Park covers an area of 2,290 km^2 and is located in the waters surrounding the Cobourg Peninsula ~220 km north-east of Darwin. The Marine Park is part of the larger Garig Gunak Barlu National Park. Garig Gunak Barlu National Park includes both the Marine Park and the Cobourg Sanctuary.	Cobourg Marine Park is located in the Cobourg and Van Diemen Gulf marine bioregions with the northern portion of the Park covered by the Cobourg marine bioregion and the southern portion covered by the Van Diemen Gulf marine bioregion. The Marine Park is characterised by a number of deeply incised bays and estuaries on its northern shores. These bays are ancient river valleys that were drowned during periods of sea level rise and provide a varied environment and habitat that is quite distinct from the open water areas of the Park. The areas of the Park that have been studied and where extensive collections have been made indicates that the Park supports rich and diverse marine life including live coral reefs, seagrass, diverse reef and pelagic fish populations, marine turtles and dugong.

**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 Marine Parks Network Management Plan 2018 (DNP, 2018c)

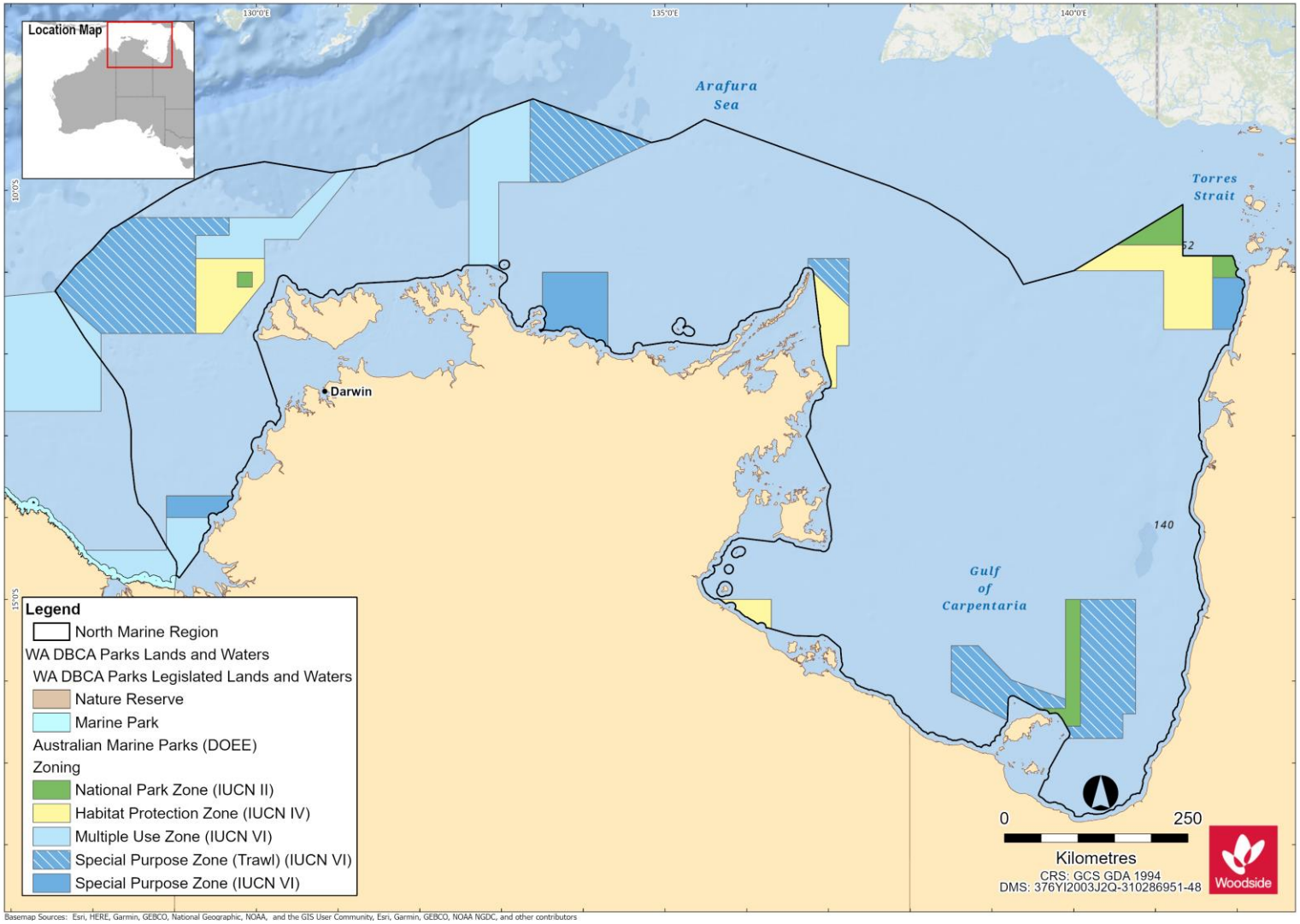

Figure 10-3. Commonwealth and State Marine Protected Areas within the NMR

11. SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

This section summarises the information relating to the socio-economic and cultural environment of the regions offshore Western Australia, with a focus on the NWMR and to a lesser extent the SWMR and NWR.

The cultural environment includes Indigenous and European heritage values, including underwater values such as historic shipwrecks. Socio-economic values include commercial and traditional fishing, tourism and recreation, shipping, oil and gas activities and defence activities.

11.1 Cultural Heritage

11.1.1 Indigenous Sites of Significance

Murujuga (the Burrup Peninsula) has a very high density of significant Indigenous heritage sites and places with tangible and intangible heritage values. The area has one of the largest, densest, and most diverse collections of rock art in the world. It is estimated that the peninsula and surrounding islands contain over a million petroglyphs (rock engravings) covering a broad range of styles and subjects. The landscape also contains quarries, middens, fish traps, rock shelters, ceremonial sites, artefact scatters, grinding patches and stone arrangements that evidence tens of thousands of years of human occupation. These places are linked to Aboriginal cosmology, Dreaming stories and songs through the stories, knowledge and customs that are still held by traditional custodians.

In 2007 the Dampier Archipelago (including the Burrup Peninsula) was included on the National Heritage List due to outstanding heritage values relating to Australia's cultural history contained in the large number, density, diversity, distribution and fine execution of rock art. Within the National Heritage Place, the Murujuga National Park covers 4913 ha and is co-managed by the Murujuga Aboriginal Corporation and the Department of Biodiversity, Conservation and Attractions. The Murujuga Cultural Landscape was also added to Australia's Tentative World Heritage List in 2020, with full World Heritage Listing anticipated in 2024.

Woodside also recognises the potential for heritage to survive in submerged landscapes. Sea-level rises since the last ice age mean that areas now under the sea were once exposed, that many of today's islands would have been connected to the mainland, and that Aboriginal people are highly likely to have inhabited these places. Woodside works with traditional custodians, academics and heritage professionals to identify tangible and intangible heritage values in the submerged landscape to avoid disturbing heritage where possible and to minimise impacts where heritage cannot be avoided.

It is an offence to excavate, destroy, damage, conceal or alter Indigenous heritage onshore or in state waters under section 17 of the *Aboriginal Heritage Act 1972 (WA) (AHA)* without ministerial authorisation. Where there is a risk of injury or desecration to a significant Aboriginal area, even where permitted under the AHA, any Aboriginal person may apply to the federal Environment Minister for a declaration under sections 9 or 10 of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)* for the protection and preservation of that area.

The Department of Planning, Lands and Heritage maintains a register of registered sites and heritage places including middens, burial, ceremonial [sites], artefacts, rock shelters, mythological [sites] and engraving sites. There are over 1600 registered sites on Murujuga and the Dampier Archipelago with around 1100 other heritage places. This register is not comprehensive and will be complemented by heritage surveys where necessary. Protection of National and World Heritage values is also legislated through various provisions of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. Murujuga National Park is managed under the *Conservation and Land Management Act 1984 (WA)*.

11.1.2 European Sites of Significance

European sites of significance and heritage value are found along adjacent foreshores of the SWMR, NWMR and NWR. Heritage values are protected in Western Australia under the *Heritage Act 2018*.

11.1.3 Underwater Cultural Heritage

Places of historic cultural significance are protected under Commonwealth, State and local regimes. Places inscribed on the National or World Heritage list are protected through various provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Historic places may also be protected under the *Heritage Act 2018* (WA); under section 129 the prohibited alteration, demolition, damage, despoilment or removal of objects from a registered place may result in a fine of A$1 million. Protection of heritage by local government typically emanates from local planning schemes produced under Part 5 of the *Planning and Development Act 2005* (WA).

The remains of vessels and aircraft in Commonwealth waters, along with any associated article, are automatically protected under the *Underwater Cultural Heritage Act 2018* (Cth) after 75 years. Remains and relics of any ship lost, wrecked or abandoned in Western Australian waters before 1900 are protected by the *Maritime Archaeology Act 1973* (WA).

The Australian National Shipwreck Database and the WA Maritime Museum Shipwreck Database list these protected wrecks.

11.1.4 National and Commonwealth Listed Heritage Places

Australia's National Heritage Sites are those of outstanding natural, historic and/or Indigenous significance to Australia. National Heritage places classed as natural are discussed in **Section 10.3**. Historic and/or Indigenous National Heritage Listed Places of the NWMR include:

- Dampier Archipelago (including Burrup Peninsula)
- Dirk Hartog Landing Site/Cape Inscription
- HMAS Sydney II and the HSK Kormoran Shipwreck Sites
- Batavia Shipwreck Site and Survivor Camps Area 1629 – Houtman Abrolhos

Commonwealth Heritage Places are a collection of sites recognised for their Indigenous, historical and/or natural values, which are owned or controlled by the Australian Government. A number of these sites are owned or controlled by the Department of Defence, as well as Government agencies relating to maritime safety, customs and communication. Commonwealth Heritage places classed as natural are discussed in **Section 10.3**. Listed Heritage Places in the NWMR include:

- Mermaid Reef – Rowley Shoals (refer **Section 10.3**)
- Ashmore Reef National Nature Reserve (refer **Section 10.3**)
- Scott Reef and Surrounds – Commonwealth Area (refer **Section 10.3**)
- Ningaloo Marine Area (refer **Section 10.3**)

World Heritage Properties are those sites that hold universal value which transcends any value they may be held by any one nation. These sites and their qualities are detailed in the Convention concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention), to which Australia is a founding member. The Protected Matters Search Report (**Appendix A**) lists two natural World Heritage Properties in the NWMR (refer **Section 10.2**). There are no cultural heritage listings located within the NWMR.

Summary tables of heritage places for NWMR, SWMR and NMR are presented in **Table 11-1,Table 11-2** and **Table 11-3**.

11.2 Summary of Heritage Places within the NWMR

Table 11-1 Heritage Places (Indigenous and Historic) within the NWMR

Heritage Places	Woodside Activity Area			Class	Description	Conservation Values
	Browse	NWS/S	NW Cape			
National Heritage Properties						
Dampier Archipelago (including Burrup Peninsula)	-	✓	-	Indigenous	The Dampier Archipelago (including the Burrup Peninsula) contains one of the densest concentrations of rock engravings in Australia with some sites containing thousands or tens of thousands of images.	The rock engravings comprise images of avian, marine and terrestrial fauna, schematised human figures, figures with mixed human and animal characteristics and geometric designs. At a national level it has an exceptionally diverse and dynamic range of schematised human figures some of which are arranged in complex scenes. The fine execution and dynamic nature of the engravings, particularly some of the composite panels, exhibit a degree of creativity that is unusual in Australian rock engravings.
Dirk Hartog Landing Site 1616 – Cape Inscription Area	-	-	✓	Historic	Cape Inscription is the site of the oldest known landings of Europeans on the WA coastline.	The Cape Inscription area displays uncommon aspects of Australia's cultural history because of the cumulative effect its association with these explorers and surveyors had on growing knowledge of the great southern continent in Europe. The association of the site with these early navigators stimulated the development of the European view of the great southern continent at a time when they began to look at the world with a modern scientific outlook.
Commonwealth Heritage Properties						
N/A						

11.3 Summary of Heritage Places within the NMR

Table 11-2 Heritage Places (Indigenous and Historic) within the NMR

Heritage Places	Class	Description	Conservation Values
National Heritage Properties			
None			
Commonwealth Heritage Properties			
None			

11.4 Summary of Heritage Places within the SWMR

Table 11-3 Heritage Places (Indigenous and Historic) within the SWMR

Heritage Places	Class	Description	Conservation Values
National Heritage Properties			
Cheetup Rock Shelter	Indigenous	Cheetup meaning “place of the birds” is the name of a spacious rock shelter located in Cape Le Grand National Park, about 55 km east of Esperance in WA. Aboriginal people associated with the place identify themselves as Nyungar/Noongar, Ngadju (shortened from Ngadjunmaia) or Mirning.	Cheetup rock shelter provides outstanding evidence for the antiquity of processing and use of cycad seeds by Aboriginal people. The seeds of the cycad are extremely toxic and can cause speedy death if eaten fresh without proper preparation to remove the toxins. The presence of *Macrozamia riedlei* seeds in a pit lined with Xanthorrhoea (grass tree) leaf bases indicates that the Aboriginal people in the Esperance region had the knowledge to remove the toxins of this important source of carbohydrate and protein at least 13,200 years ago.

Heritage Places	Class	Description	Conservation Values
Batavia Shipwreck Site and Survivor Camps Area 1629 – Houtman Abrolhos	Historic	The Batavia and its associated sites hold an important place in the discovery and delineation of the WA coastline. The wreck of the Batavia, and other Dutch ships like her, convinced the VOC (Dutch East India Company) of the necessity of more accurate charts of the coastline and resulted in the commissioning of Vlamingh's 1696 voyage.	Because of its relatively undisturbed nature the archaeological investigation of the wreck itself has revealed a range of objects of considerable value as well as to artefact specialists and historians.
HMAS Sydney II and HSK Kormoran Shipwreck Sites	Historic	The naval battle fought between the Australian warship HMAS Sydney II and the German commerce raider HSK Kormoran off the WA coast during World War II was a defining event in Australia's cultural history. HMAS Sydney II was Australia's most famous warship of the time and this battle has forever linked the stories of these warships to each other. The loss of HMAS Sydney II along with its entire crew of 645 following the battle with HSK Kormoran, remains as Australia's worst naval disaster.	The shipwreck sites of HMAS Sydney II and HSK Kormoran have outstanding heritage value to the nation because of their importance in a defining event in Australia's cultural history and for their part in development of the process of the defence of Australia.
Commonwealth Heritage Properties			
Cliff Point Historic Sites	Historic	Cliff Head is a limestone bluff on the east coast of Garden Island. Evidence of occupation has been reported from the beach just north of the head, the immediate hinterland, the ridge above and on the south face of the ridge.	The Cliff Point Historic Site, individually significant within the area of Garden Island is important as the first site inhabited by Governor Stirling's party in 1829 when founding the colony of WA, and as WA's first official non-convict settlement. The site was occupied in the first instance by Captain Charles Fremantle before the arrival of Captain Stirling. The party occupied the site for two months before a move was made to the Swan River settlement on the mainland.
HMAS Sydney II and HSK Kormoran Shipwreck Sites	Historic	As above	As above
J Gun Battery	Historic	J Battery comprised two 155 mm long range guns, the other similar battery being at Cape Peron on the mainland at the entrance to Cockburn Sound. Located in the dune systems at the north western	J Gun Battery (1942) is individually significant within the area of Garden Island (Register No. 019544) and is historically important as the first gun battery constructed on Garden Island and as one of two long range gun batteries which played a

Heritage Places	Class	Description	Conservation Values
		corner of Garden Island elements of the J Battery complex are now covered in part by sand.	strategic role in the coastal defences of Cockburn Sound and Fremantle following the entry of Japan into the Second World War (1939-45).

11.5 Fisheries - Commercial

11.5.1 Commonwealth and State Fisheries

The diverse range of habitats and species offshore WA has allowed for various fisheries to develop and operate throughout the region.

The Australian Fisheries Management Authority (AFMA) manages fisheries on behalf of the Commonwealth Government and is bound by objectives under the Commonwealth *Fisheries Management Act 1991*.

WA State commercial fisheries are managed by the WA Department of Primary Industries and Regional Development (WA DPIRD) under the WA *Fish Resources Management Act 1994* (FRMA), Fisheries Resources Management Regulations 1995, relevant gazetted notices and licence conditions, and applicable Fishery Management Plans.

Commonwealth and State managed fisheries that operate within the NWMR and in areas beyond this region are summarised in the **Table 11-4**.

Table 11-4 Commonwealth and State managed fisheries

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
Commonwealth Managed Fisheries							
Southern Bluefin Tuna Fishery	✓	✓	✓	**Management area**	The Southern Bluefin Tuna Fishery (SBTF) covers the entire EEZ around Australia, out to 200 nm from the coast. They do not fish in the Woodside activity area.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Southern bluefin tuna (*Thunnus maccoyii*)		Longline and purse seine fishing.	Southern bluefin tuna is a pelagic species which can be found to depths of 500 m (AFMA, 2021a)
				Fishing effort	Most of the Australian fishing effort is by purse-seine vessels in the Great Australian Bight and waters off South Australia during summer months, and by longline off the New South Wales coastline during winter months (Patterson *et al*., 2020). SBTF is a fishery that is shared amongst many countries. Australia currently has a 35% share of the total global allowable catch, and while wild capture fishing in Australia to sell directly to market can occur anywhere throughout the SBTF's range, currently the vast majority of that quota is value-added through ranching (on-growing the wild captured fish for extra 5-6 months). Ranching requires significant infrastructure, a resident labour force, plus proximity to a fishery able to supply a large quantity of natural feed/sardines (40,000+ tonnes) (for example as available in Port Lincoln). North-west WA is critically important regardless of how the quota is fished because of the proximity to the single spawning ground of this global roaming species. The stock remains classified as overfished.		
				Active licences/vessels	Seven purse seine vessels, 20 longline vessels (Patterson *et al*., 2020).		
Western Skipjack Tuna Fishery	✓	✓	✓	**Management area**	The combined western and eastern skipjack tuna (*Katsuwonus pelamis*) fisheries (STF) encompass the entire Australian EEZ. The Western Skipjack Tuna Fishery (WSTF) extends westward from the SA/Victorian border across the Great Australian Bight and around the west coast of WA to the Cape York Peninsula.		

Fishery	Woodside Activity Area			Description		
	Browse	NWS/S	NW Cape			
				Species targeted	**Fishing methods**	**Fishing depth**
				Western skipjack tuna (*Katsuwonus pelamis*)	Fishers use purse seine gear (about 98% of catch) and sometimes pole and line when fishing for skipjack tuna.	Western skipjack tuna is a pelagic species that can be found to depths of 260 m (AFMA, 2021b).
				Fishing effort:	The Skipjack Tuna Fishery (STF) has not been actively fished since the 2008-2009 fishing season (Patterson *et al*., 2020). The management arrangements for this fishery will be reviewed if active boats re-enter the fishery.	
				Active licences/vessels:	No active vessels operating since 2009.	
Western Tuna and Billfish Fishery	✓	✓	✓	**Management area**	The Western Tuna and Billfish Fishery (WTBF) extends to the Australian EEZ boundary in the Indian Ocean.	
				Species targeted	**Fishing methods**	**Fishing depth**
				Bigeye tuna (*Thunnus obesus*) Yellowfin tuna (*Thunnus albacares*) Swordfish (*Xiphias gladius*) Albacore (*Thunnus alalonga*) Striped marlin (*Kajikia audax*)	Fishers mainly use pelagic longline fishing gear to catch the targeted species. Minor line (including handline, troll, rod and reel) can also be used.	Species have a broad depth distribution, with tuna occurring at 150 – 300 m, striped marlin at 150 m and swordfish at up to 600 m (BRS, 2007).
				Fishing effort:	The WTBF operates in Australia's EEZ and high seas of the Indian Ocean. Fishing effort in recent years has been concentrated off south-west WA, with occasional activity off SA.	
				Active licences/vessels:	Two pelagic longline vessels and two minor longline vessels (Patterson *et al*., 2020).	
Western Deepwater Trawl Fishery			✓	**Management area**	The Western Deepwater Trawl Fishery (WDTF) is located in deep water off WA, from the line approximating the 200 m isobath to the edge of the Australian Fishing Zone (AFZ).	

<table>
<tr><th rowspan="2">Fishery</th><th colspan="3">Woodside Activity Area</th><th rowspan="2">Description</th></tr>
<tr><th>Browse</th><th>NWS/S</th><th>NW Cape</th></tr>
<tr><td></td><td></td><td></td><td></td><td>
<table>
<tr><th>Species targeted</th><th>Fishing methods</th><th>Fishing depth</th></tr>
<tr><td>More than 50 species, historically dominated by six commercial finfish species or species groups:
Orange roughy (Hoplostethus atlanticus)
Oreos (Oreosomatidae)
Boarfish (Pentacerotidae)
Eteline snapper (Lutjanidae: Etelinae)
Apsiline snapper (Lutjanidae: Apsilinae)
Sea bream (Lethrinidae)</td><td>Demersal trawl.</td><td>Water deeper than 200 m, stakeholder consultation has indicated that this may be to depths of 800 m.</td></tr>
<tr><td>Fishing effort:</td><td colspan="2">The number of vessels active in the fishery and total hours trawled have fluctuated from year to year. Notably, total hours trawled were relatively high for a brief period during the early 2000s when fishers targeted ruby snapper and deepwater bugs (Patterson et al., 2020). Total fishing effort has been variable but relatively low since then. Effort in 2018-2019 (492 trawl hours) was less than half that of 2017-2018 (1108 trawl hours) (Patterson et al., 2020).</td></tr>
<tr><td>Active licences/vessels:</td><td colspan="2">One active vessel in 2018-2019 (Patterson et al., 2020).</td></tr>
</table>
</td></tr>
<tr><td>North-west Slope Trawl Fishery</td><td>✓</td><td>✓</td><td></td><td>
<table>
<tr><td>Management area</td><td colspan="2">The North-west Slope Trawl Fishery (NWSTF) extends, from 114 °E to 125 °E, from the 200 m isobath to the outer limit of the AFZ (200 nm from the coastline, which is the boundary of the Australian EEZ).</td></tr>
<tr><td colspan="2">Species targeted</td><td>Fishing methods</td><td>Fishing depth</td></tr>
<tr><td colspan="2">Australian scampi (Metanephrops australiensis) and smaller quantities of velvet and Boschma’s scampi (M. velutinus and M. boschmai)
Mixed snappers have historically been an important component of the catch.</td><td>Demersal trawl.</td><td>Typically at depths of 350 to 600 m (Patterson et al., 2017), however stakeholder consultation has indicated that this may be to depths of 800 m.</td></tr>
</table>
</td></tr>
</table>

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
				Fishing effort:	The NWSTF commenced in 1985 and the number of active vessels peaked at 21 in the 1986-1987 season and declined through the 1990s before increasing to 10 vessels in 2000-2001 and 2002-2002 seasons. Four vessels operated in the 2017-2018 and 2018-2019 seasons (Patterson *et. al*. 2020). Fishing for scampi occurs over soft, muddy sediments or sandy habitats, using demersal trawl gear on the continental slope (Patterson *et al*., 2017).		
				Active licences/vessels:	Four vessels (Patterson *et. al*., 2020).		
State Managed Fisheries							
Pilbara Fish Trawl (Interim) Managed Fishery		✓		**Management area**	The Pilbara Trawl (Interim) Managed Fishery is of high intensity and is divided into two zones and an area governed by Schedule 5 (prohibited to trawling). In addition to the Prohibited Trawl Fishing area, no fish trawl units are allocated for use in Zone 1 or Areas 3 and 6 of Zone 2 (which comprises six management areas) (Newman *et al*., 2020a). No fish trawl units have been allocated for use in Area 6 of Zone 2 since the management plan commenced operation in 1998.		
				Species targeted		**Fishing methods**	**Fishing depth**
				The Pilbara Fish Trawl (Interim) Managed Fishery (PFTIMF) targets more than 50 scalefish species. The five main demersal scalefish species landed by the fisheries in the Pilbara region are blue-spotted emperor, crimson snapper, rosy threadfin bream, red emperor and goldband snapper in 2018 (Newman *et al*., 2020a).	Demersal trawl.	The Pilbara Fish Trawl Fishery lands the largest component of the catch and operates in waters between 50 and 200 m water depth (Allen *et al*., 2014, Newman et al. 2015). Stakeholders have advised that trawling can occur in depths of up to approximately 800 m.
				Fishing effort:	Based on State of the Fisheries annual reports provided by DPIRD, catch trends are seen to be increasing over the past reporting years:		

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
					Pilbara Trawl (Interim) Managed Fishery caught 1996 t in 2018-19, 1780 t in 2017-18, 1529 t in 2016-17, 1172 t in 2015-16, 1105 t in 2014-15.		
				Active licences/vessels:	Two Pilbara Trawl (Interim) Managed Fishery vessels in 2017 (Newman *et al*., 2020a). Active vessels data are confidential as there were fewer than three vessels in the Pilbara Fish Trawl Interim Managed Fishery (Newman *et al*., 2020a).		
Pilbara Trap Managed Fishery		✓	✓	**Management area**	The Pilbara Trap Fishery covers the area from Exmouth northwards and eastwards to the 120° line of longitude, and offshore as far as the 200 m isobath. Like the trawl fishery, the trap fishery is also managed using input controls in the form of individual transferable effort allocations monitored with a satellite-based vessel management system. The fishery includes six licences allocated to three vessels, operating principally from Onslow.		
				Species targeted		**Fishing methods**	**Fishing depths**
				Pilbara Trap Managed Fishery catch is made up of around 45-50 different fish species. The four main species landed by the fisheries in the Pilbara region are blue-spotted emperor, red emperor, goldband snapper and Rankin cod.		Demersal fish traps.	Greatest effort in waters less than 50 m depth targeting high value species such as red emperor and goldband snapper.
				Fishing effort	Based on State of the Fisheries annual reports provided by DPIRD, catch trends are seen to be increasing over the past reporting years: Pilbara Trap Managed Fishery caught 563 t in 2018-19, 573 t in 2017-18, 495 t in 2016-17, 510 t in 2015-16, 268 t in 2014-15. In 2018, the total catch for the Pilbara Trap Managed Fishery was 563 t, making up 21% of the total catch by the Pilbara Demersal Scale Fishery (Newman *et al*., 2019).		

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
				Active licences/vessels	In the 2019 season, there were six licences in the Pilbara Trap Managed Fishery, (Newman *et al*., 2020a). Active vessels data are confidential as there were fewer than three vessels in the Pilbara Trap Managed Fishery (Newman *et al*., 2019).		
Pilbara Line Managed Fishery		✓	✓	**Management area**	The Pilbara Line Managed Fishery boat licences are permitted to operate anywhere within "Pilbara waters", bounded by a line commencing at the intersection of 21°56'S latitude and the high water mark on the western side of the North-west Cape on the mainland of WA; west along the parallel to the intersection of 21°56'S latitude and the boundary of the AFZ and north to longitude 120°E.		
				Species targeted		**Fishing method**	**Fishing depths**
				The Pilbara Line Managed Fishery catch is made up around 45-50 different fish species. The Pilbara Line Managed Fishery targets similar demersal species to the Pilbara Trap and Trawl fisheries, as well as some deeper offshore species such as ruby snapper and eightbar grouper The Pilbara Line Managed Fishery operates on an exemption basis that enables licence holders to fish for any nominated five-month block during the year.		Demersal long line.	Pilbara Line Fishing Depth: Operates up to a depth of 600 m.
				Fishing effort	Based on State of the Fisheries annual reports provided by DPIRD, catch trends are seen to be increasing over the past reporting years: Pilbara Line Managed Fishery caught 93 t in 2018-19, 143 t in 2017-18, 126 t in 2016-17, 97 t in 2015-16, 40 t in 2014-15. The total catch in 2018 for the Pilbara Line Managed Fishery was 93 t, making up 3% of the total catch by the Pilbara Demersal Scalefish Fishery (Newman *et al*., 2019).		

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
				Active licences/vessels	In the 2018 season there are nine individual licences in the Pilbara Line Fishery, held by seven operators. Active vessels data is confidential as there were fewer than three vessels in the Pilbara Line Fishery (Newman *et al*., 2018).		
Mackerel Managed Fishery	✓	✓	✓	**Management area**	The commercial fishery extends from Geraldton to the Northern Territory border. There are three managed fishing areas: Kimberley (Area 1), Pilbara (Area 2), and Gascoyne and West Coast (Area 3).		
				Species targeted		**Fishing methods**	**Fishing depth**
				Spanish mackerel (*Scomberomorus commerson*) Grey mackerel (*S. semifasciatus*) Other species from the genus *Scomberomorus*		Near-surface trawling gear. Jig fishing.	Previous engagement with WAFIC suggests that the depth of fisheries may extend to 70 m.
				Fishing effort:	Most of the catch is taken from waters off the Kimberley coasts (Lewis and Brand-Gardner, 2018), reflecting the tropical distribution of mackerel species (Molony *et al.*, 2015). Most fishing activity occurs around the coastal reefs of the Dampier Archipelago and Port Hedland area, with the seasonal appearance of mackerel in shallower coastal waters most likely associated with feeding and gonad development before spawning (Mackie *et al.*, 2003). Based on State of the Fisheries annual reports provided by DPIRD, catch trends are as follows: 213 t in 2018-19 (the lowest on record (Lewis *et al*., 2020), 283 t in 2017-18, 276 t in 2016-17, 302 t in 2015-16, 322 t in 2014-15.		
				Active licences/vessels:	Fifteen boats fished in 2018, with approximately 35-40 people directly employed in the Mackerel Managed Fishery, primarily from May-November (Lewis *et al*., 2020).		
Marine Aquarium Managed Fishery	✓	✓	✓	**Management area**	The Marine Aquarium Managed Fishery is able to operate in all State waters. The fishery is typically more active in waters south of Broome and higher levels of effort around the Capes region, Perth, Geraldton, Exmouth, Dampier and Broome (Newman *et al.*, 2020b).		
				Species targeted		**Fishing methods**	**Fishing depth**

Fishery	Woodside Activity Area			Description		
	Browse	NWS/S	NW Cape			
				Finfish, hard coral, soft coral, tridacnid clams, syngnathids (seahorses and pipefish), other invertebrates (including molluscs, crustaceans, echinoderms etc.), algae, seagrasses and 'live rock'.	The fishery is diver-based, which typically restricts effort to safe diving depths (less than 30 m).	Less than 30 m, as advised by WAFIC.
				Fishing effort:	Total catch for the Marine Aquarium Managed Fishery in 2018 was 156,188 fishes, 32.025 t of coral, live rock and living sand and 176.02 L of marine plants and live feed.	
				Active licences/vessels:	Eleven licences were active in 2019 (Newman *et al.*, 2020b).	
Beche-de-mer Fishery	✓	✓	✓	**Management area**	Fishing occurs in the northern half of WA from Exmouth Gulf to the NT border and is managed under Ministerial Exemptions.	
				Species targeted	**Fishing methods**	**Fishing depth**
				The sea cucumber fishery targets two main species: sandfish (*Holothuria scabra*) and redfish (*Actinopyga echinites*).	Diving	The targeted species typically inhabit nearshore in shallow depths.
				Fishing effort	Based on State of the Fisheries annual reports provided by DPRID, catch trends are as follows: 62t in 2018 (Gaughan and Santoro, 2020), 135t in 2017, 93t in 2016, 38t in 2015	
				Active licences/vessels	Six active licences in 2019 (Hart *et al*., 2019). Active vessels data is confidential as there were fewer than three vessels.	
Onslow Prawn Managed Fishery		✓		**Management area**	The Onslow Prawn Managed Fishery encompasses a portion of the continental shelf off the Pilbara.	
				Species targeted	**Fishing methods**	**Fishing depth**

Fishery	Woodside Activity Area			Description		
	Browse	NWS/S	NW Cape			
				The fishery targets: Western king prawns (*Penaeus esculentus*) Brown tiger prawns (*Penaeus esculentus*) Blue endeavour prawns (*Metapenaeus endeavouri*	Low opening, otter prawn trawl systems.	Prawn trawling takes place in water depths of approximately 30 metres and less (licence holder feedback). Fishery and or fishing activity overlaps the Beadon Creek dredging scope (Sporer *et al*., 2015).
				Fishing effort:	The total landings for the Onslow Prawn Managed Fishery in 2018 were less than 60 t below the target catch range (Kangas *et al.*, 2020a).	
				Active licences/vessels:	One vessel (Kangas *et al.*, 2020a).	
Pearl Oyster Managed Fishery	✓	✓	✓	**Management area**	Located in shallow coastal waters with the pearl oyster managed fishery designated by four zones extending from Exmouth to Kununurra and the seaward boundary demarcated by the 200 nm EEZ.	
				Species targeted	**Fishing methods**	**Fishing depth**
				Pearl oysters (*Pinctada maxima*).	Drift diving.	Fishing effort is mostly focussed in shallow coastal waters (10-15 m depth), with a maximum depth of 35 m (Lulofs *et al.* 2002).
				Fishing effort:	In 2018, catch was taken from Zones 2 and 3 with no fishing in Zone 1. The number of pearl oysters caught for 2018-19 was 614,002. Total effort was 15,637 dive hours, this was an increase from 2017 effort of 12,845 hours. No fishing occurred in Zone 1 in 2017 and 2018 (Gaughan and Santoro, 2020).	
				Active licences/vessels:	15,637 diver hours (Hart *et al.*, 2020a).	
		✓	✓	**Management area**	The Pilbara Crab Managed Fishery comprises WA waters off the north-western coast of WA north of 23° 34′ south latitude and west of 120° 00′ east longitude. Areas of the fishery north and east of Exmouth and	

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
Pilbara Crab Managed Fishery					nearshore are currently closed as per Schedule 2 of the Draft Management Plan for the Pilbara Crab Managed Fishery.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Crabs of the Family Portunidae, excluding crabs of the genus *Scylla*.		Traps.	Up to 50 m deep.
				Fishing effort:	The capacity of the fishery is 600 traps.		
				Active licences/vessels:	No information available at this time.		
South-west Coast Salmon Managed Fishery	✓	✓	✓	**Management area**	The South-west Coast Salmon Managed Fishery operates on various beaches south of the metropolitan area and includes all WA waters north of Cape Beaufort except Geographe Bay.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Western Australian salmon (*Arripis truttaceus*)		Beach seine nets.	Information not available however, species generally found in shallow waters (up to 30 m).
				Fishing effort:	No fishing occurs north of the Perth metropolitan area, despite the managed fishery boundary extending to Cape Beaufort (WA/Northern Territory border), as advised by WAFIC. The 2018 commercial catch was 191 t, with 72% taken by the South West Coast Salmon Managed Fishery, 25% by the South Coast Salmon Managed Fishery and 3% by other fisheries (Duffy and Blay, 2020a).		
				Active licences/vessels:	Six licences.		
	✓	✓	✓	**Management area**	The Specimen Shell Managed Fishery (SSMF) encompasses the entire WA coastline, but effort is concentrated in areas adjacent to the population centres such as Broome, Exmouth, Shark Bay,		

<table>
<tr><th rowspan="2">Fishery</th><th colspan="3">Woodside Activity Area</th><th rowspan="2">Description</th></tr>
<tr><th>Browse</th><th>NWS/S</th><th>NW Cape</th></tr>
<tr><td>Specimen Shell Managed Fishery</td><td></td><td></td><td></td><td colspan="4">
<table>
<tr><td></td><td colspan="3">Geraldton, Perth, Mandurah, the Capes area and Albany (Hart et al., 2020b). There are a number of closed areas where the SSMF is not permitted to operate. These include various marine parks and aquatic reserves, such as Ningaloo Marine Park.</td></tr>
<tr><td colspan="2">Species targeted</td><td>Fishing methods</td><td>Fishing depth</td></tr>
<tr><td colspan="2">The Specimen Shell Managed Fishery targets the collection of specimen shells for display, collection, cataloguing and sale.</td><td>Collection is predominantly by hand when diving to wading in shallow, coastal waters, though in deeper water collection may be conducted by remotely operated vehicles (limited to one per licence).</td><td>For collection by hand, (diver-based) this typically restricts effort to safe diving depths (less than 30 m).
ROV collection could enable depths up to 300 m (Hart et al., 2017). In the past there has been one licence holder in the Specimen Shell Managed Fishery who has trialled ROV means of shell collection, WAFIC have provided advice that this fishery is no longer active.</td></tr>
<tr><td>Fishing effort:</td><td colspan="3">Information not available.</td></tr>
<tr><td>Active licences/vessels:</td><td colspan="3">In 2018 there were 31 licences with only two divers allowed in the water per licences at one time (Hart et al., 2018). The number of people employed regularly in the fishery is likely to be about 21 (Hart et al., 2018).</td></tr>
</table>
</td></tr>
<tr><td>West Australian Abalone Fishery</td><td>✓</td><td>✓</td><td>✓</td><td colspan="4">
<table>
<tr><td>Management area</td><td colspan="3">The Western Australian Abalone Fishery includes all coastal waters from the WA and SA border to the WA and NT border. The fishery is concentrated on the south coast and the west coast.</td></tr>
<tr><td colspan="2">Species targeted</td><td>Fishing methods</td><td>Fishing depth</td></tr>
<tr><td colspan="2">Greenlip abalone (Haliotis laevigata)
Brownlip abalone (Haliotis conicopora)
Roe’s abalone (Haliotis roei)</td><td>Divers.</td><td>Distribution to 5 m depth for Roe’s abalone and 40 m depth for greenlip / brownlip abalone (DOF, 2011).</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th rowspan="2">Fishery</th><th colspan="3">Woodside Activity Area</th><th colspan="4" rowspan="2">Description</th></tr>
<tr><th>Browse</th><th>NWS/S</th><th>NW Cape</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Fishing effort:</td><td colspan="3">In 2018, the total commercial catch was 48 t, 1 t less than the catch in each of the last two seasons. No commercial fishing for abalone north of Moore River (Zone 8 of the managed fishery) has occurred since 2011–2012 (Strain et al., 2018).</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Active licences/vessels:</td><td colspan="3">26 vessels active in Roe’s abalone fishery (WAFIC[5]).</td></tr>
<tr><td rowspan="5">West Coast Deep Sea Crustacean Managed Fishery</td><td rowspan="5">✓</td><td rowspan="5">✓</td><td rowspan="5">✓</td><td>Management area</td><td colspan="3">The West Coast Deep Sea Crustacean Managed Fishery extends north from Cape Leeuwin to the WA/NT border in water depths greater than 150 m within the AFZ.</td></tr>
<tr><td colspan="2">Species targeted</td><td>Fishing methods</td><td>Fishing depth</td></tr>
<tr><td colspan="2">The fishery targets deepwater crustaceans. Catches were dominated by crystal crabs of which 99% of their Total Allowable Catch (TAC) was landed (How and Orme, 2020a).
Crystal (snow) crab (Chaceon albus)
Giant (king) crab (Pseudocarcinus gigas)
Champagne (spiny) crabs (Hypothalassia acerba)</td><td>Baited pots, or traps, are operated in long-lines which have between 80 and 180 pots attached to a main line marked by a float at each end.</td><td>Deeper than 150 m (and mostly at depths of between 500 m – 800 m). Most of the commercial Crystal crab catch is taken in depths of 500 m – 800 m (WAFIC[6]).</td></tr>
<tr><td>Fishing effort:</td><td colspan="3">The total landings in 2018 was 168. t. Two vessels operated in the fishery in 2017, using baited pots operated in a longline formation in the shelf edge waters, mostly in depths between 500 and 800 m (How and Orme, 2020a). Fishing effort was concentrated between Fremantle and Carnarvon.</td></tr>
<tr><td>Active licences/vessels:</td><td colspan="3">There were four active vessels in 2018 (How and Orme, 2020a).</td></tr>
</table>

[5] https://www.wafic.org.au/fishery/roes-abalone-fishery/

[6] https://www.wafic.org.au/fishery/west-coast-deep-sea-crustacean-fishery/

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
Abrolhos Islands and Mid-West Trawl Fishery			✓	**Management area**	The Abrolhos Islands and Mid-West Trawl Fishery (AIMWTMF) operates around the Abrolhos Islands within the SWMR.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Saucer scallops (*Ylistrum balloti,* formerly *Amusium balloti*)		Trawl.	Information not available, however, the species occurs at depth of around 30-60 m and therefore fishing effort would likely be at these depths (Himmelman *et al*., 2009).
				Fishing effort:	The scallop landings in the AIMWTMF were 31.0 t meat weight (154.8 t whole weight). Between 2011 and 2015, the annual pre-season surveys showed very low recruitment (1-year old), as a result of the 2011 extreme marine heatwave and subsequent poor pawning stock (Kangas *et al.*, 2020b). The fishery was closed between 2011 and 2016.		
				Active licences/vessels:	Information about licences or vessels is not available but the Department of Primary Industry and Regional Development reported 774 t of catch from this fishery in the 2019 annual report (DPIRD, 2019).		
Broome Prawn Managed Fishery	✓			**Management area**	The Broome Prawn Managed Fishery (BPMF) operates off Broome and forms part of the North Coast Prawn Fishery.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Western king prawn (*Penaeus latisulcatus*) Coral prawn		Trawl.	Trawling is generally in waters between 30 and 60 m deep, however can occur down to 100 m (DOEH, 2004).
				Fishing effort:	BPMF recorded extremely low fishing effort in 2018. Only two vessels undertook trial fishing to investigate whether the catch rates were sufficient for commercial fishing. This resulted in negligible landings of Western king prawn (Kangas *et al*., 2020a).		

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
				Active licences/vessels:	Two vessels conducting fishing trial operated in 2018 (Kangas *et al*., 2020a).		
Exmouth Gulf Prawn Managed Fishery			✓	**Management area**	The estimated employment in the fishery in 2017 was 18 people including skippers and other crew (Kangas *et al*., 2018). The fishery occupies a total area of 4000 km², with only half of this area being trawled (Fletcher and Santoro, 2015).		
				Species targeted		**Fishing methods**	**Fishing depth**
				Western king prawn (*Penaeus latisulcatus*) Brown tiger prawn (*Penaeus esculentus*) Blue endeavour prawn (*Metapenaeus endeavouri*) Banana prawn (*Penaeus merguinensis*)		Trawl.	Information not available.
				Fishing effort:	The total landings of prawns in 2018 were 880 t (Kangas *et al*., 2020a). In the 2016 season, a fishing effort of about 23,000 hours resulted in a catch of 822 t.		
				Active licences/vessels:	The precise number of vessels is unreported. Eighteen people were said to be employed in this fishery in 2018 (Kangas *et al.*, 2019); however, in 2013 it was reported that 18 skippers as well as other crew and support staff were employed (WAFIC[7]).		
Gascoyne Demersal Scalefish Managed Fishery			✓	**Management area**	The Gascoyne Demersal Scalefish Fishery (GDSF) is located between the southern Ningaloo Coast to south of Shark Bay (23°07.30'S to 26°.30'S) with a closure area at Point Maud to Tantabiddi (21°56.30'S) (WAFIC[8]).		
				Species targeted		**Fishing methods**	**Fishing depth**

[7] https://www.wafic.org.au/fishery/exmouth-gulf-prawn-fishery/

[8] https://www.wafic.org.au/fishery/gascoyne-demersal-scalefish-fishery/

Fishery	Woodside Activity Area			Description		
	Browse	NWS/S	NW Cape			
				Pink snapper (*Chrysophrys auratus*) Goldband snapper (*Pristipomoides multidens*) Red emperor (*Lutjanus sebae*) Cods (*Gadus morhua*) Emperors (*Lethrinus miniatus)*	Mechanised handlines.	Information not available.
				Fishing effort:	The GDSF reported a total commercial catch of 210 t in 2017-18.	
				Active licences/vessels:	In 2018, 13 vessels fished during the season, in the 2017 season there were 16 vessels (Gaughan and Santoro, 2018).	
Kimberley Developing Mud Crab Fishery	✓			**Management area**	The Kimberley Developing Mud Crab Fishery is one of two small trap-based crab fisheries that exist in the North Coast Bioregion between Cambridge Gulf and Broome (Gaughan and Santoro, 2018).	
				Species targeted	**Fishing methods**	**Fishing depth**
				Brown mud crab (*Scylla olivacea*) Green mud crab (*Scylla serrata*)	Trap.	Information not available.
				Fishing effort:	The catch landed represents all commercially caught mud crabs landed in WA for 2018. A nominal catch rate of 0.66 kg/traplift was recorded for 2018, which is a 28% decrease from 2017 but remains above the harvest strategy threshold (Johnston *et al*., 2020).	
				Active licences/vessels:	There are currently three licences issued to commercial operators (600 trap limit), and three exemptions issued to Indigenous groups (total of 210 traps currently allocated of a maximum 600 traps) (Johnston *et al*., 2020).	
Nickol Bay Prawn Managed Fishery		✓		**Management area**	The Nickol Bay Prawn Managed Fishery operates in nearshore and offshore waters of the Pilbara region along the NWS.	
				Species targeted	**Fishing methods**	**Fishing depth**

Fishery	Woodside Activity Area			Description		
	Browse	NWS/S	NW Cape			
				Banana prawn (*Penaeus merguiensis*) Western king prawn (*Penaeus latisulcatus*) Brown tiger prawn (*Penaeus esculentus*) Blue endeavour prawn (*Metapenaeus endeavouri*)	Trawl.	Information not available.
				Fishing effort:	Trawling has been reported to occur at several locations along the Pilbara coast to the east of the Burrup Peninsula, including within the waters of Nickol Bay (Fletcher and Santoro, 2015). The total landings for the 2018 season were 81 t. Fishing effort was less than half at 138 days, compared to 281 boat days in 2017 (Kangas *et al*., 2020a).	
				Active licences/vessels:	The precise number of vessels is unreported, though low effort produced a catch of 17 t in 2016 (Kangas *et al.*, 2018).	
Northern Demersal Scalefish Managed Fishery	✓			**Management area**	The fishery is divided into two fishing areas: an inshore sector (Area 1) and an offshore sector (Area 2) (Newman *et al.*, 2018). Area 1 permits line fishing only, between the high water mark and the 30 m isobath. Area 2 permits handline, dropline and fish trap fishing methods and is further divided into zones. Zone A is an inshore area, Zone B comprises the area with most historical fishing activity, and Zone C is an offshore deep slope area representing waters deeper than 200 m (Fletcher *et al.*, 2017).	
				Species targeted	**Fishing methods**	**Fishing depth**
				Goldband snapper (*Pristipomoides multidens*) Blue-spotted emperor (*Lethrinus punctulantus*) Red emperor (*Lutjanus sebae*) Rankin cod (*Epinephelus multinotatus*)	Line fishing, handline, dropline and fish trap fishing.	Information not available.

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
				Fishing effort:	In 2018, the fishery reported a total catch of 1297 t. Most of the catch is landed from Zone B, with a catch of 1106 t in 2018. The level of catch in Zone B is the highest reported since zoning was implemented in 2006 (Newman *et al.*, 2019).		
				Active licences/vessels:	Six vessels fished in the 2018 season and at least 20 people were directly employed (Gaughan and Santoro, 2018).		
Octopus Interim Management Fishery				**Management area**	The developing Octopus Fishery operates from Kalbarri Cliffs in the north to Esperance in the south.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Octopus sp. cf. tetricus		Passive shelter pots and active traps.	In inshore waters to a depth of 70 m (DPIRD, 2018).
				Fishing effort:	In 2019, the total commercial octopus catch was 314 t, which was 22% higher than the 2017 catch of 257 t. In 2016, about 200 vessels reported a total catch of 252 t (Hart *et al.*, 2020c).		
				Active licences/vessels:	About 21 vessels fish within the octopus specific fisheries, and about 200 vessels from the West Coast Rock Lobster Fishery catch octopus as bycatch (Gaughan and Santoro, 2018).		
Shark Bay Beach Seine and Mesh Net Managed Fishery				**Management area**	The Shark Bay Beach Seine and Mesh Net Managed Fishery operates from Denham.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Whiting *(*yellowfin *Sillago schomburgkii* and goldenline *S. analis*) Sea mullet *(Mugil cephalus*) Tailor (*Pomatomus saltatrix*) Western yellowfin bream (*Acanthopagrus australis*)		Beach seine and mesh net.	Information not available.

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
				Fishing effort:	In 2018, the total catch was 176 t (Gaughan and Santoro, 2020). The fishery currently employs about 14 fishers based on the seven fishery licences in operation (WAFIC[9]).		
				Active licences/vessels:	Six vessels operated employing around 12 fishers (Gaughan and Santoro, 2018).		
Shark Bay Crab Managed Fishery				**Management area**	The Shark Bay Crab Managed Fishery operates within the NWMR.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Blue swimmer crab (*Portunus armatus*)		Trap and trawl.	Information not available.
				Fishing effort:	Commercial fishing for blue swimmer crabs in Shark Bay was voluntarily halted by industry in 2012 to facilitate stock rebuilding. The stock is still in a recovery phase; however, the fishery has resumed and reported a total commercial catch of 518 t in the 2017/18 season. The average commercial trap catch rate was 1.5 kg/traplift during 2017/18 (Chandrapavan *et al.*, 2017).		
				Active licences/vessels:	The precise number of vessels in the Shark Bay Blue Swimmer Crab Fishery is unreported. There are five crab trap permits. These permits are consolidated onto three active vessels (WAFIC[10]).		
Shark Bay Prawn and Scallop Managed Fishery				**Management area**	The Shark Bay Prawn Managed Fishery is the highest producing WA fishery for prawns.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Western king prawn (*Penaeus latisulcatus*) Brown tiger prawn (*Penaeus esculentus*)		Low-opening otter trawls.	Information not available.

[9] https://www.wafic.org.au/fishery/inner-shark-bay-scalefish-fishery/

[10] https://www.wafic.org.au/fishery/shark-bay-prawn-and-scallop-managed-fisheries/

Fishery	Woodside Activity Area			Description		
	Browse	NWS/S	NW Cape			
				Endeavour prawns (*Metapenaeus endeavouri*) Coral prawns (*Metapenaeopsis sp*.) Saucer scallop (*Amusium balloti*)		
				Fishing effort:	The Shark Bay Scallop Managed Fishery is currently in a recovery phase due to the results from the pre-season survey of stock abundance (Fletcher and Santoro, 2015; Kangas *et al.*, 2018).	
				Active licences/vessels:	The precise number of vessels in the Shark Bay Prawn Managed Fishery is unreported; however, about 100 people are employed in this fishery (Gaughan and Santoro, 2018). About 20 skippers and crew are employed in scallop fishing in the Shark Bay and South Coast fisheries across 18 vessels in 2015 (Sporer *et al.*, 2015).	
South Coast Crustacean Managed Fishery	-	-	-	**Management area**	The South Coast Crustacean Managed Fishery comprises four fisheries: the Windy Harbour/Augusta Rock Lobster Managed Fishery, the Esperance Rock Lobster Managed Fishery, the Southern Rock Lobster Pot Regulation Fishery and the South Coast Deep-Sea Crab Fishery.	
				Species targeted	**Fishing methods**	**Fishing depth**
				Southern rock lobster (*Jasus edwardsii*) Western rock lobster (*Panulirus cygnus*) Giant crab (*Pseudocarcinus gigas*) Crystal crab (*Chaceon albus*) Champagne crab (*Hypothalassia acerba*)	Pots.	Information not available.
				Fishing effort:	The South Coast Crustacean Managed Fishery reported a total catch of 101.2 t in 2018 season and the value of the fishery for 2017/2018 was about $5.9 million (Howe and Orme, 2020b).	
				Active licences/vessels:	The number of vessels is unknown; however, a total of 1977 pots are licensed to be used.	
	-	-	-	**Management area**	The fishery is active in coastal waters between Cape Leeuwin and the South Australia border. Landings are primarily at Albany, Bremer Bay and Esperance (Norriss and Blazeski, 2020).	

<table>
<tr><th rowspan="2">Fishery</th><th colspan="3">Woodside Activity Area</th><th rowspan="2">Description</th></tr>
<tr><th>Browse</th><th>NWS/S</th><th>NW Cape</th></tr>
<tr><td>South Coast Purse Seine Managed Fishery</td><td></td><td></td><td></td><td>
<table>
<tr><th>Species targeted</th><th>Fishing methods</th><th>Fishing depth</th></tr>
<tr><td>Small pelagic finfish such as pilchards and yellowtail scad using purse seine nets from vessels.
Sandy sprat (Hyperlophus vittatus)
Blue sprat (Spratelloides robustus)</td><td>Purse seine.</td><td>Information not available.</td></tr>
<tr><td>Fishing effort:</td><td colspan="2">In the 2017/18 season the total catch effort was 2,168 t (Norriss and Blazeski, 2020).</td></tr>
<tr><td>Active licences/vessels:</td><td colspan="2">Nine active vessels in 2017/18 (Norriss and Blazeski, 2020).</td></tr>
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</td></tr>
<tr><td>South-west Trawl Managed Fishery</td><td>-</td><td>-</td><td>-</td><td>
<table>
<tr><td>Management area</td><td colspan="2">The South-west Trawl Managed Fishery is a multi-species fishery and includes two of WA’s smaller scallop fishing grounds at Fremantle and north of Geographe Bay (Fairclough and Walters, 2018).</td></tr>
<tr><th>Species targeted</th><th>Fishing methods</th><th>Fishing depth</th></tr>
<tr><td>Scallops (Ylistrum balloti, formerly Amusium balloti) and associated by-products
Western king prawn (Penaeus latisulcatus)
In years of low scallop catches licencees may use other trawl gear to target fin-fish species.</td><td>Trawl.</td><td>Information not available.</td></tr>
<tr><td>Fishing effort:</td><td colspan="2">Effort in the fishery is highly variable and typically fluctuates in response to recruitment variability in saucer scallops and prawns. The fishery was not active in 2015 or 2016 (Fairclough and Walters, 2018).</td></tr>
<tr><td>Active licences/vessels:</td><td colspan="2">Only one boat fished in 2018 for a total of 5 boat days for minimal catch (Fairclough and Walters, 2018).</td></tr>
</table>
</td></tr>
</table>

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
The South Coast Salmon Managed Fishery	-	-	-	**Management area**	The South Coast Salmon Managed Fishery is one of two fisheries operating in the South Coast Bioregion that target nearshore and estuarine finfish.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Western Australian salmon (*Arripis truttaceus*) Southern school whiting (*Sillago bassensis*) Australian herring (*Arripis georgianus*) King George whiting (*Sillaginodes punctatus*) Sea mullet (*Mugil cephalus*) Estuary cobbler (*Cnidoglanis macrocephalus*) Black bream (*Acanthopagrus butcheri*)		Beach seines, haul nets and gill nets.	Information not available.
				Fishing effort:	The total catch for 2018 was 243 t (Duffy and Blay, 2020b).		
				Active licences/vessels:	Number of vessels is unknown; however, 12 commercial fishers were employed in 2018 (Duffy and Blay, 2020b).		
West Coast Beach Bait Managed Fishery	-	-	-	**Management area**	Primarily active in the Bunbury areas in the SWMR.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Whitebait		Beach-based haul nets.	Information not available.
				Fishing effort:	In recent years the fishery is primarily active in the Bunbury area. Total catch of whitebait in 2015 was 40.2 t (Duffy and Blay, 2020c).		

Fishery	Woodside Activity Area			Description			
	Browse	NWS/S	NW Cape				
				Active licences/vessels:	Number of vessels is unknown; however, only one license was issued (DPIRD, 2019).		
West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery	-	-	-	**Management area**	The West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery (WCDGDLF) is part of the Temperate Demersal Gillnet and Demersal Longline Fishery (TDGDLF), which operates between 26° and 33° S, and the Joint Authority Southern Demersal Gillnet and Demersal Longline Managed Fishery (JASDGDLF), which operates from 33° S to the WA/SA border (Braccini and Blay, 2020).		
				Species targeted		**Fishing methods**	**Fishing depth**
				Gummy shark (*Mustelus antarcticus*) Dusky shark (*Carcharhinus obscurus*) Whiskery shark (*Furgaleus macki*) Sandbar shark (*C. plumbeus*)		Gillnet and longline.	Information not available.
				Fishing effort:	Catch estimated annual value of the fishery was $0.2 million for 2017 to 2018 (Braccini and Blay, 2020).		
				Active licences/vessels:	Vessel numbers are unknown; however, 17 interim managed fishery permits were held in 2019 (DPIRD, 2019) and between 18 and 21 skippers and crew were employed between 2016 and 2017.		
West Coast Demersal Scalefish Fishery	-	-	-	**Management area**	These fisheries include the West Coast Demersal Scalefish (Interim) Managed Fishery (51 boats), the West Coast Demersal Gillnet and Demersal Longline (Interim) Managed Fishery and the temperate Demersal Gillnet and Demersal Longline Fisheries. The West Coast Demersal Scalefish Managed Fishery is the main commercial fishery that targets demersal species in the West Coast Bioregion. It encompasses the waters from just south of Shark Bay down to just east of Augusta and extends seaward to the 200 nm boundary. The fishery is divided into four inshore management areas and one offshore management area.		
				Species targeted		**Fishing methods**	**Fishing depth**
				Baldchin groper (*Choerodon rubescens*) Dhufish (*Glaucosoma hebraicum*) Pink snapper *(Pagrus auratus*)		Lines.	Inshore species – 20 to 250 m water depth.

Fishery	Woodside Activity Area			Description		
	Browse	NWS/S	NW Cape			
						Offshore species – more than 250 m water depth.
				Fishing effort:	In 2016, the West Coast Demersal Scalefish (interim) Managed Fishery reported a total catch of 256 t.	
				Active licences/vessels:	The precise number of vessels in the West Coast Demersal Scalefish Fisheries is unreported; however, it is restricted to 60 interim managed fishery permit holders.	
West Coast Purse Seine Managed Fishery	-	-	-	**Management area**	Located in waters from Cape Bouvard extending to Lancelin.	
				Species targeted	**Fishing methods**	**Fishing depth**
				Small pelagic finfish such as: Scaly mackerel (*Sardinella lemuru*) Pilchards (*Sardinops sagax*) Australian anchovy (*Engraulis australis*) Yellowtail scad (*Trachurus novaezelandiae*) Maray (*Etrumeus teres*)	Purse seine.	Information not available.
				Fishing effort:	Information not available	
				Active licences/vessels:	Seven vessels in 2017 (Gaughan and Santoro, 2018).	
West Coast Rock Lobster Managed Fishery			✓	**Management area**	The West Coast Rock Lobster Fishery operates from Shark Bay south to Cape Leeuwin. The fishery is managed using zones, seasons and total allowable catch. The recreational fishery targets the western rock lobsters using baited pots and by diving between North-west Cape and Augusta.	

<table>
<tr><th rowspan="2">Fishery</th><th colspan="3">Woodside Activity Area</th><th colspan="3" rowspan="2">Description</th></tr>
<tr><th>Browse</th><th>NWS/S</th><th>NW Cape</th></tr>
<tr><td rowspan="4"></td><td rowspan="4"></td><td rowspan="4"></td><td rowspan="4"></td><td>Species targeted</td><td>Fishing methods</td><td>Fishing depth</td></tr>
<tr><td>Western rock lobster (Panulirus cygnus)</td><td>Baited pots.</td><td>Less than 20 m.</td></tr>
<tr><td>Fishing effort:</td><td colspan="2">In 2018, 234 vessels reported a total catch of 6400 t in 2017 (de Lestang et al., 2018). In 2016, 226 vessels reported a total catch of 6,086 t (Gaughan and Santoro, 2018).</td></tr>
<tr><td>Active licences/vessels:</td><td colspan="2">234 vessels operated in 2017 and 233 vessels operated in 2018 (Gaughan and Santoro, 2018).</td></tr>
</table>

11.5.2 Aquaculture

Aquaculture operations in the northwest are typically restricted to inland and shallow coastal waters.

West Coast Bioregion

Aquaculture activities in the West Coast bioregion, defined by the Department of Primary Industries and Regional Development (DPIRD) (as the government body responsible management of primary industries in WA) are focused on blue mussels and edible oysters (mainly in Cockburn Sound) and marine algae for production of beta-carotene, used as a food additive and as a nutritional supplement. Offshore marine finfish production is also being developed, initially focusing on yellowtail kingfish.

There is also an emerging black pearl industry (from the *Pinctada margaritifera* oyster) in the Abrolhos Islands. As well as expansion in the production of Akoya pearls (small white pearls from *Pinctada fucata martensi*), *Pinctada albina* (small, yellow pearls) and *Pteria penguin*, which are often used to produce half (mabe) pearls in pink and bluish shades.

Aquaculture licences for producing coral and live rock (pieces of old coral reefs colonised by marine life, such as beneficial bacteria, for aquariums) at the Abrolhos Islands have also been issued and other applications are being assessed.

Gascoyne Coast Bioregion

In the Gascoyne Coast bioregion, aquaculture activities are focused on the blacklip oyster (*Pinctada margaritifera*) and Akoya pearl oyster (*Pinctada imbricata*) (Gaughan and Santoro, 2020). Several hatcheries supply *P. margaritifera* juveniles to the region's developing black pearl farms.

Other aquaculture developments in the Gascoyne Coast bioregion include emerging producers of coral and live rock species for aquariums.

North Coast Bioregion

Aquaculture activities in the North Coast bioregion is dominated by the production of pearls. A large number of pearl oysters for seeding are obtained from wild stocks and supplemented by hatchery produced oysters, with major hatcheries operating at Broome and around the Dampier Peninsula (Gaughan and Santoro, 2018). Primary spawning of the pearl oyster occurs from mid-October to December. A smaller secondary spawning occurs in February and March (Gaughan and Santoro, 2020).

Other aquaculture developments in the North Coast include emerging producers of coral and live rock species for aquariums as well as barramundi (*Lates calcarifer)* farms and microalgae culturing for Omega-3, biofuels and protein biomass (Gaughan and Santoro, 2020).

11.6 Fisheries – Traditional

Traditional or customary fisheries are typically restricted to shallow coastal waters and/or areas with structures such as reef.

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.

Indonesian fishers can fish within designated areas under the Australia-Indonesia Memorandum of Understanding regarding the Operations of Indonesian Traditional Fishermen in Areas of the Australian Fishing Zone and Continental Shelf – 1974 (MoU 74). Traditional fishing is allowed within the MoU Box (**Figure 11-1)**, which encompasses: Ashmore Reef (Pulau Pasir), Cartier Island (Pulau Baru), Seringapatam Reef (Afringan), Scott Reef (Pulau Dato) and Browse Island (Berselan). Restrictions have since been introduced around Ashmore Reef and Cartier Island following their

designation as Nature Reserves under the Commonwealth's *National Parks and Wildlife Conservation Act 1975* in 1983 and 2000, respectively.

The MoU allows Indonesian fishers to fish in designated areas using traditional methods only. These methods include reef gleaning, free-diving, hand lining and other non-mechanised methods. Scott Reef is currently the principal reef in the MoU 74 Box and is utilised seasonally by Indonesian fishers to harvest trepang, trochus shells and other reef species. The peak season is July to October due to more favourable wind conditions, and to allow fishers to sun dry their catch on their boat decks (ERM, 2009). Browse Island is also frequently visited by shark fishers who mostly fish along the eastern margin of the MoU 74 Box.

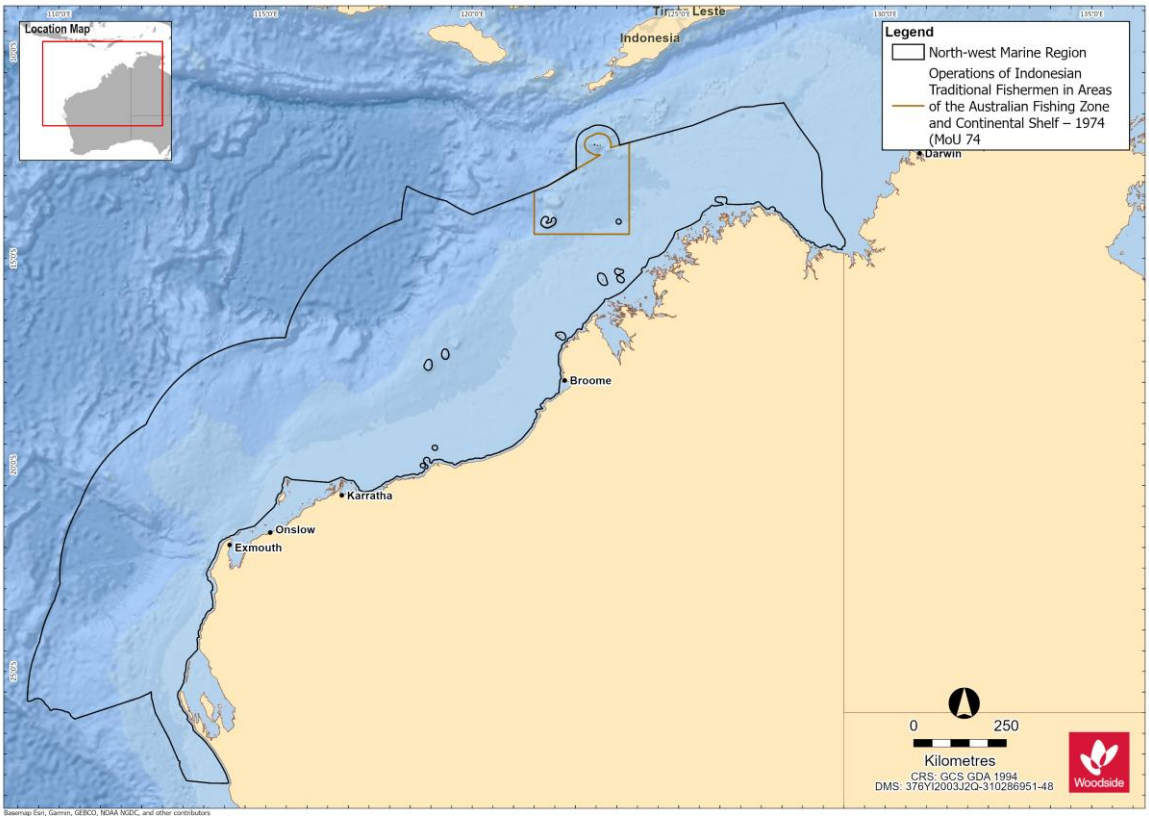

Figure 11-1 MOU 74 Box. Operations of Indonesian Traditional Fishermen in Areas of the Australian Fishing Zone and Continental Shelf – 1974

11.7 Tourism and Recreation

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

Recreational and tourism activities include: charter fishing, other recreational fishing, diving, snorkelling, marine fauna watching, and yachting.

11.7.1 Gascoyne Region

Outside the petroleum industry, tourism is the largest revenue earner of all the major industries of the Gascoyne region. It contributes significantly to the local economy in terms of both income and

employment. In 2018 there was an average of 337,400 visitors with a visitor spend of $359 million (Gascoyne Development Commission[11]).

In 2018-19, the Ningaloo region (Ningaloo Reef and the surrounding coastal region Exmouth Gulf, communities of Exmouth and Coral Bay, and adjacent proposed southern coastal reserves and pastoral leases) contributed an estimated $110 million in value added to the WA economy (DCBA, 2020). Ningaloo's economic contribution to WA is attributed to four key types of economic activity, tourism expenditure by international, interstate and WA visitors to the Ningaloo region, commercial fishing in the Exmouth Gulf, recreation activity involving the Reef by residents of the Ningaloo region and management and research relating to the Reef (DCBA, 2020). More than 90% of this value added is attributed to the domestic and international tourists who visit Ningaloo each year (DCBA, 2020). The main marine nature-based tourist activities are concentrated around and within the Ningaloo WHA.

11.7.2 Pilbara region

Recreation and tourism activities within the Pilbara are of high social value. Tourism is a key economic driver for the Pilbara with more than 1 million visitors to the region every year, generating $413 million in gross revenue annually (Pilbara Development Commission[12]).

Recreational fishing within the Pilbara region tends to be concentrated in State waters adjacent to population centres. Recreational fishing is known to occur around the Dampier Archipelago with boats launched from boat ramps around Dampier and Karratha (Williamson *et al.*, 2006). Once at sea, charter vessels may also frequent the waters surrounding the Montebello Islands.

11.7.3 Kimberley Region

Recreation and tourism activities in the Kimberley region occur predominantly in WA State waters (extending offshore 3 nm from the mainland), adjacent to coastal population centres (e.g. Broome), with a peak in activity during the winter months (dry season). These activities include recreational fishing, diving, snorkelling, wildlife watching and boating.

Primary dive locations in the Kimberley region include the Rowley Shoals, including Mermaid Reef AMP, Scott Reef, Seringapatam Reef, Ashmore Reef AMP and Cartier Island.

11.8 Shipping

Commercial shipping traffic is high within the NWMR with vessel activities including commercial fisheries, tourism such as cruises, international shipping and oil and gas operations. There are 12 ports adjacent to the NWMR, including the major ports of Dampier, Port Hedland and Broome, which are operated by their respective port authorities. These ports handle large tonnages of iron ore and petroleum exports in addition to salt, manganese, feldspar chromite and copper (DEWHA, 2008).

Heavy vessel traffic exists within the Pilbara Port Authority management area which recorded 10,064 vessel movements in Port of Dampier 2019/20 annual reporting period (PPA, 2020). Twenty-six designated anchorages for bulk carriers, petroleum and gas tankers, drilling rigs, offshore platforms, and pipelay vessels are located offshore of Rosemary Island.

In 2012, AMSA established a network of shipping fairways off the northwest coast of Australia. The shipping fairways, while not mandatory, aim to reduce the risk of collision between transiting vessels and offshore infrastructure. The fairways are intended to direct large vessels such as bulk carriers and LNG ships trading to the major ports into pre-defined routes to keep them clear of existing and planned offshore infrastructure (AMSA, 2013).

[11] https://www.gdc.wa.gov.au/industry-profiles/tourism/

[12] https://www.pdc.wa.gov.au/our-focus/strategicinitiatives/tourism

11.9 Oil and Gas Infrastructure

The NWMR supports a number of industries including petroleum exploration and production.

Within the NWMR there are seven sedimentary petroleum basins: Northern and Southern Carnarvon basins, Perth, Browse, Roebuck, Offshore Canning and Bonaparte basins. Of these, the Northern Carnarvon, Browse and Bonaparte basins hold large quantities of gas and comprise most of Australia's reserves of natural gas (DEWHA, 2008), which is reflected by the level of development in the area. In addition to existing facilities, there are proposed developments in the region. This includes proposals to develop gas and condensate from a number of fields within the NWMR.

In addition to the oil and gas industry, other land-based industries depend upon the marine environment in the nearshore area. These include ports, salt mines such as Karratha and Onslow, LNG onshore processing facilities such as Burrup Hub, Thevenard Island, Barrow Island, Varanus Island, and small-scale desalination plants at Barrow Island, Burrup, Cape Preston, and Onslow.

11.10 Defence

Key Australian Department of Defence (DoD) operational areas and facilities areas of the NWMR for training and operational activities, include:

- An operating logistics base has been established in Dampier to support vessels patrolling the waters around offshore oil and gas facilities. A dedicated navy administrative support facility is also being constructed at the nearby township of Karratha.
- The Royal Australian Air Force currently maintains two 'bare bases' in remote areas of WA that are used for military exercises. One of these is the Royal Australian Air Force Base in Learmonth. The Royal Australian Air Force maintains the Commonwealth Heritage listed Learmonth Air Weapons Range Facility, which is located between Ningaloo Station and the Cape Range National Park. The air training area associated with the Learmonth base extends over the offshore region.
- The Royal Australian Air Force Base Curtin is located on the north coast of WA, south-east of Derby and 170 km east of Broome. It provides support for land, air and sea operations aimed to support Australia's northern approaches.
- The Naval Communications Station Harold E. Holt is located ~6 km north of Exmouth. The main role of the station is to communicate at very low frequencies (19.8 kHz) with Australian and United States submarines and ships in the eastern Indian Ocean and the western Pacific Ocean.

12. REFERENCES

[AFMA] Australian Fisheries Management Authority 2021a. Southern Blue Fin Tuna. Accessed 3 June 2021 www.afma.gov.au/fisheries-management/species/southern-bluefin-tuna

[AFMA] Australian Fisheries Management Authority 2021b. Western Skipjack Tuna. Accessed 3 June 2021 www.afma.gov.au/fisheries-management/species/skipjack-tuna

[ALA] Atlas of Living Australia 2020. *Eubalaena australis* (Desmoulins, 1822). Available at: https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:99e19958-7c6e-4f22-ad50-44027af1e418

[AMSA] Australian Maritime Safety Authority 2013. Australian Government Maritime Safety Authority Annual Report 2012/13. Available at: https://www.amsa.gov.au/sites/default/files/amsa191-annual-report-2012-13.pdf

[BOM] Bureau of Meteorology 2021a. Climatology of tropical cyclones in Western Australia. http://www.bom.gov.au/cyclone/climatology/wa.shtml [Accessed 05 May 2021].

[BOM] Bureau of Meteorology 2021b. Climate statistics for Troughton Island, monthly mean maximum air temperatures. http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=36andp_display_type=dataFileandp_startYear=andp_c=andp_stn_num=001007 [Accessed 05 June 2021].

[BOM] Bureau of Meteorology 2021c. Climate Statistics for Troughton Island, monthly mean rainfall. http://www.bom.gov.au/climate/averages/tables/cw_001007.shtml [Accessed 05 June 2021).

[BRS] Bureau of Rural Sciences 2007. Fishery Status Reports 2007. Status of Fish Stocks Managed by the Australian Government. Australian Government Department of Agriculture, Fisheries and Forestry, Bureau of Rural Sciences. 304 pp.

[CALM] Department of Conservation and Land Management 1992. Marmion Marine Park Management Plan 1992-2002, Management Plan No 23. Department of Conservation and Land Management.

[CALM] Department of Conservation and Land Management 1996. Shark Bay Marine Reserves Management Plan 1996-2006. Department of Conservation and Land Management.

[CALM] Department of Conservation and Land Management 1999. Swan Estuary Marine Park and Adjacent Nature Reserves Management Plan 1999-2009, Management Plan No 41. Department of Conservation and Land Management.

[CALM] Department of Conservation and Land Management 2005a. Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005 – 2015. Department of Conservation and Land Management.

[CALM] Department of Conservation and Land Management 2005b. Jurien Bay Marine Park Management Plan 2005-2015, Management Plan No 49. Department of Conservation and Land Management.

[DAWE] Department of Agriculture, Water and the Environment 2019. Directory of Important Wetlands. https://www.environment.gov.au/cgi-bin/wetlands/search.pl?smode=DOIW

[DAWE] Department of Agriculture, Water and the Environment 2020. National Conservation Values Atlas. Available at: https://www.environment.gov.au/marine/marine-bioregional-plans/conservation-values-atlas

[DBCA] Department of Biodiversity Conservation and Attractions 2020. Economic contribution of Ningaloo: one of Australia's best kept secrets. Deloitte Access Economics. June 2020. 58 pp.

[DEC] Department of Environment and Conservation 2007a. Rowley Shoals Marine Park Management 2007-2017 Management Plan No. 56. Department of Environment and Conservation, Perth, Western Australia.

[DEC] Department of Environment and Conservation 2007b. Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007-2017. Management Plan No 55. Department of Environment and Conservation, Perth, Western Australia.

[DEC] Department of Environment and Conservation 2007c. Shoalwater Islands Marine Park Management Plan 2007-2017, Management Plan No 58. Department of Environment and Conservation, Perth, Western Australia.

[DEC] Department of Environment and Conservation 2009. Walpole and Nornalup Inlets Marine Park Management Plan 2009–2019, Management Plan No 62. Department of Environment and Conservation, Perth, Western Australia.

[DEC] Department of Environment and Conservation 2013. Ngari Capes Marine Park management plan 2013– 2023, Management plan number 74. Department of Environment and Conservation,

[DEWHA] Department of Environment, Water, Heritage and the Arts 2007a. A characterisation of the marine environment of the North-west Marine Region. A summary of an expert workshop convened in Perth, Western Australia, 5-6 September 2007. Prepared by the North-west Marine Bioregional Planning section, Marine and Biodiversity Division, Department of the Environment, Water, Heritage and the Arts. 47 pp.

[DEWHA] Department of Environment, Water, Heritage and the Arts 2007b. Characterisation of the marine environment of the North Marine Region. Outcomes of an Expert Workshop, Darwin, Northern Territory, 2-3 April 2007. Prepared by the North Marine Bioregional Planning Section, Marine Division, Department of the Environment, Water, Heritage and the Arts. 37 pp.

[DEWHA] Department of Environment, Water, Heritage and the Arts 2008. The North-west Marine Bioregional Plan, Bioregional Profile. A Description of the Ecosystems, Conservation Values and Uses of the North-west Marine Region. Prepared by the Marine Bioregional Planning – North-west, Marine and Biodiversity Division. Department of the Environment, Water, Heritage and the Arts. 288 pp.

[DEWR] Department of the Environment and Water Resources 2007. A characterisation of the marine environment of the South-west Marine Region: A summary of an expert workshop convened in Perth, Western Australia, September 2006. 40 pp.

[DNP] Director of National Parks 2018a. North-west Marine Parks Network Management Plan 2018, Director of National Parks, Canberra.

[DNP] Director of National Parks 2018b. South-west Marine Parks Network Management Plan 2018, Director of National Parks, Canberra.

[DNP] Director of National Parks 2018c. North Marine Parks Network Management Plan 2018, Director of National Parks, Canberra.

[DOE] Department of the Environment 2014. Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*). Canberra, ACT: Department of the Environment. Available from: http://www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus

[DOE] Department of the Environment 2015a. Conservation Advice *Numenius madagascariensis* eastern curlew. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/847-conservation-advice.pdf

[DOE] Department of the Environment 2015b. Conservation Advice *Calidris ferruginea* curlew sandpiper. Canberra: Department of the Environment. Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice.pdf

[DOEH] Department of Environment and Heritage 2004. Assessment of the Onslow and Nickol Bay Prawn Managed Fisheries, November 2004. 24 pp.

[DOF] Department of Fisheries 2011. State of the Fisheries and Aquatic Resources Report 2010/11. Fletcher, W.J. and Santoro, K. (eds), Department of Fisheries, Perth, Western Australia.

[DPAW] Department of Parks and Wildlife 2013. Lalang-garram / Camden Sound Marine Park management plan 73 2013–2023, Department of Parks and Wildlife, Perth.

[DPAW] Department of Parks and Wildlife 2014. Eighty Mile Beach Marine Park Management Plan 2014-2024. Management Plan No. 80. Department of Parks and Wildlife, Perth, Western Australia.

[DPAW] Department of Parks and Wildlife 2016a. North Kimberley Marine Park Joint Management Plan 2016 Uunguu, Balanggarra, Miriuwung Gajerrong and Wilinggin management areas, Number Plan 89. Department of Parks and Wildlife, Perth.

[DPAW] Department of Parks and Wildlife 2016b. Lalang-garram / Horizontal Falls and North Lalang-garram Marine Parks joint management plan 2016, Management Plan 88. Department of Parks and Wildlife, Perth

[DPAW] Department of Parks and Wildlife 2016c. Yawuru Nagulagun / Roebuck Bay Marine Park joint management plan 2016. Department of Parks and Wildlife, Perth.

[DPAW] Department of Parks and Wildlife 2016d. Marmion Marine Park. Visitor Guide.

[DPIRD] Department of Primary Industries and Regional Development 2018. Western Australian Marine Stewardship Council Report Series No. 14. Resource Assessment Report Western Australian Octopus Resource.

[DPIRD] Department of Primary Industries and Regional Development 2019. Annual Report. Western Australia.

[DSEWPAC] Department of Sustainability, Environment, Water, Population and Communities 2011a. Approved Conservation Advice for *Aipysurus apraefrontalis* (Short-nosed Sea Snake). Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1115-conservation-advice.pdf

[DSEWPAC] Department of Sustainability, Environment, Water, Population and Communities 2011b. Approved Conservation Advice for *Aipysurus foliosquama* (Leaf-scaled Sea Snake). Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1118-conservation-advice.pdf

[DSEWPAC] Department of Sustainability, Environment, Water, Population and Communities 2011c. National recovery plan for threatened albatrosses and giant petrels 2011-2016. Commonwealth of Australia, Hobart. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-threatened-albatrosses-and-giant-petrels-2011-2016

[DSEWPAC] Department of Sustainability, Environment, Water, Population and Communities 2011d. Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern). Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available

from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/82950-conservation-advice.pdf

[DSEWPAC] Department of Sustainability, Environment, Water Population and Communities 2012a. Marine bioregional plan for the North-west Marine Region. Prepared under the *Environment Protection and Biodiversity Conservation Act 1999.* 269 pp.

[DSEWPAC] Department of Sustainability, Environment, Water Population and Communities 2012b. Marine bioregional plan for the South-west Marine Region. Prepared under the *Environment Protection and Biodiversity Conservation Act 1999.* 216 pp.

[DSEWPAC] Department of Sustainability, Environment, Water Population and Communities 2012c. Marine bioregional plan for the North Marine Region. Prepared under the *Environment Protection and Biodiversity Conservation Act 1999.* 200 pp.

[DSEWPAC] Department of Sustainability, Environment, Water, Population and Communities 2012d. Conservation Management Plan for the Southern Right Whale. A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 2011-2021. Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/resource/conservation-management-plan-southern-right-whale-recovery-plan-under-environment

[DSEWPAC] Department of Sustainability, Environment, Water, Populations and Communities 2012e. Species group report card – seabirds and migratory shorebirds. Supporting the marine bioregional plan for the North-west Marine Region.

[DSEWPAC] Department of Sustainability, Environment, Water, Population and Communities 2013a. Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) 2013. Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/system/files/resources/1eb9233c-8474-40bb-8566-0ea02bbaa5b3/files/neophoca-cinerea-recovery-plan.pdf

[DSEWPAC] Department of Sustainability, Environment, Water, Population and Communities 2013b. Recovery Plan for the White Shark (*Carcharodon carcharias*). Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/recovery-plan-white-shark-carcharodon-carcharias

[ERM] Environmental Resources Management 2009. Browse LNG Development: Social Study on Indonesian Fishers (Phase 2) 2008. Report produced for Woodside Energy Limited.

[PPA] Pilbara Ports Authority 2020. 2019-20 Annual Report. Available at: https://www.pilbaraports.com.au/about-ppa/publications/annual-report

Abascal, F.J., Quintans, M., Ramos-Cartelle, A. and Mejuto, J. 2011. Movements and environmental preferences of the shortfin mako, *Isurus oxyrinchus*, in the southeastern Pacific Ocean. Marine Biology 158: 1175–1184.

Abdul Wahab, M.A., Radford, B., Cappo, M., Colquhoun, J., Stewar, M., Depczynski, M., Miller, K. and Heyward, A. 2018. Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems. Coral Reefs 37: 327–343. https://doi.org/10.1007/s00338-017-1655-9

Allen, G.R. and Swainston, R. 1988. The Marine Fishes of North-Western Australia. A Field Guide for Anglers and Divers. Published by the Western Australian Museum, Perth, WA 6000.

Allen, S.J., Cagnazzi, D.D., Hodgson, A.J., Loneragan, N.R. and Bejder, L. 2012. Tropical inshore dolphins of north-western Australia: Unknown populations in a rapidly changing region. Pacific Conservation Biology 18: 56-63. https://doi.org/10.1071/PC120056

Allen, S.J., Tyne, J.A., Kobry, H.T., Bejder, L., Pollock, K.H. and Lonergan, N.R. 2014. Patterns of Dolphin Bycatch in a North-Western Australian Trawl Fishery. PLoS ONE 9(4): e93178. https://doi.org:10.1371/journal.pone.0093178

Anderson, P.K. and Prince, R.I.T. 1985. Predation on dugongs: attacks by killer whales. Journal of Mammalogy 66(3): 554-556.

Andrzejaczek, S., Gleiss, A.C., Jordan, L.K.B. Pattiaratchi, C.B., Howey, L.A., Brooks, E.J. and Meekan, M.G. 2018. Temperature and the vertical movements of oceanic whitetip sharks, *Carcharhinus longimanus*. Scientific Reports 8, 8351. https://doi.org/10.1038/s41598-018-26485-3

Aulich, M.G., McCauley, R.D., Saunders, B.J., and Parsons, M.J.G. 2019. Fin whale (*Balaenoptera physalus*) migration in Australian waters using passive acoustic monitoring. Scientific Reports 9: 8840. https://doi.org/10.1038/s41598-019-45321-w

Baker, C., Potter, A., Tran, M. and Heap, A.D. 2008. Sedimentology and Geomorphology of the North-west Marine Region of Australia. Geoscience Australia, Canberra. 24 pp.

Bamford, M., Watkins, D., Bancroft, W., Tischler, G. and Wahl, J. 2008. Migratory shorebirds of the East Asian-Australasian flyway: population estimates and internationally important sites. Wetlands International – Oceania, Canberra.

Bannister, J., Kemper, C.M. and Warneke, R.M. 1996. The action plan for Australian cetaceans. Australian Nature Conservation Agency, Canberra.

Bannister, J.L. and Hedley, S.L. 2001. Southern Hemisphere group IV humpback whales: their status from recent aerial survey. Memoirs of the Queensland Museum 47(2): 587–98.

Bejder, L., Videsen, S., Hermannsen, L., Simon, M., Hanf, D. and Madsen, P.T. 2019. Low energy expenditure and resting behaviour of humpback whale mother-calf pairs highlights conservation importance of sheltered breeding areas. Scientific Reports 9: 771. https://doi.org/10.1038/s41598-018-36870-7

BirdLife Australia 2018. Seabird and Shorebird Baseline Studies, Ningaloo Region – Report on January 2018 bird surveys.

Blue Planet Marine 2020. Australian Blue Whale Species Assessment Report (No. v4). Unpublished report to Woodside Energy Ltd.

Bouchet, P.J., Thiele, D., Marley, S.A., Waples, K., Weisenberger, F., Balangarra Rangers, Bardi Jawi Rangers, Dambimangari Rangers, Nyamba Buru Yawuru Rangers, Nyul Nyul Rangers, Uunguu Rangers and Raudino, H. 2021. Regional assessment of the conservation status of Snubfin Dolphins (*Orcaella heinsohni*) in the Kimberley Region, Western Australia. Frontiers in Marine Science 7:article 614852.

Braccini, M. and Blay, N. 2020. Temperate Demersal Gillnet and Demersal Longline Fisheries Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 214-220.

Brewer, D., Lyne, V., Skewes, T. and Rothlisberg, P. 2007, Trophic Systems of the North West Marine Region, Report to the Department of the Environment and Water Resources, CSIRO Marine and Atmospheric Research, Cleveland. 167 pp.

Brown, A., Bejder, L., Cagnazzi, D., Parra, G.J. and Allen, S.J. 2012. The North West Cape, Western Australia: a potential hotspot for Indo-Pacific humpback dolphins *Sousa chinensis*? Pacific Conservation Biology 18: 240−246.

Brown, A.M., Bejder, L., Pollock, K.H. and Allen, S.J. 2016. Site-specific assessments of the abundance of three inshore dolphin species to inform conservation and management. Frontiers in Marine Science https://doi.org/10.3389/fmars.2016.00004

Brown, A.M., Kopps, A.M., Allen, S.J., Bejder, L., Littleford-Colquhoun, B., Parra, G.J., Cagnazzi, D., Thiele, D., Palmer, C. and Frère, C.H. 2014. Population differentiation and hybridisation of Australian snubfin (*Orcaella heinsohni*) and Indo-Pacific humpback (*Sousa chinensis*) dolphins in north-western Australia. PLoS ONE 9: e101427.

Bruce, B.D. 2008. The biology and ecology of the white shark, *Carcharodon carcharias*. In: Camhi, M.D., Pikitch, E.K., Babcock, E.A. (eds.), Sharks of the Open Ocean : Biology, Fisheries and Conservation. Blackwell Publishing Limited, Oxford, pp. 69–81.

Bruce, B.D., Stevens, J.D., Malcolm, H. 2006. Movements and swimming behaviour of white sharks (*Carcharodon carcharias*) in Australian waters. Marine Biology 150: 161–172.

Bulman, C., 2006. Trophic webs and modelling of Australia's North West Shelf. North West Shelf Joint Environmental Management Study (NWSJEMS) Technical Report No. 9. CSIRO Marine and Atmospheric Research, Hobart. 49 pp.

Campana, S. and W. Joyce. 2004. Temperature and depth associations of porbeagle shark (*Lamna nasus*) in the northwest Atlantic. Fisheries Oceanography 13 (1): 52-64.

Campana, S.E., Marks, L. and Joyce, W. 2005. The biology and fishery of shortfin mako sharks (*Isurus oxyrinchus*) in Atlantic Canadian waters. Fisheries Research 73: 341–352.

Campana, S.E., Joyce, W. and Fowler, M. 2010. Subtropical pupping ground for a cold-water shark. Canadian Journal of Fisheries and Aquatic Sciences 67: 769-773.

Cannell, B., Hamilton, S. and Driessen, J. 2019. Wedge-tailed shearwater foraging behaviour in the Exmouth Region. BirdLife Australia and University of Western Australian study. Available from: https://www.birdlife.org.au/documents/wedge-tailed%20shearwater%20foraging%20behaviour.pdf

Carruthers, T.J.B., Dennison, W.C., Kendrick, G., Waycott, M., Walker, D.I. and Cambridge, M. 2007. Seagrasses of south west Australia: a conceptual synthesis of the world's most diverse and extensive seagrass meadows. Journal of Experimental Marine Biology & Ecology 350: 21-45.

Ceccarelli, D., McCrea, I., Collis, M. and Nicoll, R. 2011. Australia's Last Great Whale Haven – Cetacean distribution and conservation needs in the north-west marine region. International Fund for Animal Welfare, November 2011. 72 pp.

Chandrapavan, A. ,Sporer, E., Oliver R. and Cavalli, P. 2017. Shark Bay Blue Swimmer Crab Resource Status Report 2016. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2015/16*: The State of the Fisheries eds. W.J. Fletcher, M.D. Mumme and F.J. Webster, Department of Fisheries, Western Australia. pp. 95-98.

Chevron Australia. 2010. Draft Environmental Impact Statement/Environmental Review and Management Programme for the Proposed Wheatstone Project. Appendix Q7 –Baseline water quality assessment report. Chevron Australia, Perth, Western Australia. Available from: https://australia.chevron.com/our-businesses/wheatstone-project/environmental-approvals [Accessed 14 May 2021].

Chidlow, J., Gaughan, D. and McAuley, R. 2006. Identification of Western Australian Grey Nurse Shark Aggregation Sites: Final Report to the Australian Government, Department of the Environment and Heritage. In: Fisheries Research and Development Corporation (ed.), Fisheries Research Report, Perth, Department of Fisheries, Perth.

Cliff, G. and Wilson, G. 1994. Natal sharks board's guide to sharks and other marine animals. Natal Sharks Board, 33 pp.

Commonwealth of Australia 2006. A guide to the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) version 4.0. Department of Environment and Heritage, Canberra, Australia. 16 pp.

Commonwealth of Australia 2015a. Conservation Management Plan for the Blue Whale: A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999* 2015-2025. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/blue-whale-conservation-management-plan

Commonwealth of Australia 2015b. Sawfish and River Sharks Multispecies Recovery Plan. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/sawfish-river-sharks-multispecies-recovery-plan

Commonwealth of Australia 2015c. Wildlife Conservation Plan for Migratory Shorebirds. Canberra, ACT: Commonwealth of Australia. Available from: https://www.environment.gov.au/system/files/resources/9995c620-45c9-4574-af8e-a7cfb9571deb/files/widlife-conservation-plan-migratory-shorebirds.pdf

Commonwealth of Australia 2017. Recovery Plan for Marine Turtles in Australia. Australian Government, Canberra. Available from: http://www.environment.gov.au/marine/publications/recovery-plan-marine-turtles-australia-2017

Commonwealth of Australia 2018. Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Canberra, ACT: Commonwealth of Australia. Available from: https://www.environment.gov.au/biodiversity/threatened/publications/tap/marine-debris-2018

Commonwealth of Australia 2019. Draft Wildlife Conservation Plan for Seabirds. Canberra, ACT: Commonwealth of Australia. Available from: https://www.environment.gov.au/biodiversity/threatened/comment/draft-wildlife-conservation-plan-for-seabirds

Condie, S.A, Andrewartha, J., Mansbridge, J. and Waring, J.R. 2006. Modelling circulation and connectivity on Australia's North West Shelf, Technical Report No. 6, North West Shelf Joint Environmental Management Study, CSIRO Marine and Atmospheric Research, Hobart, Tasmania.

D'Alberto, D.M., Chin, A., Smart, J.J., Baje, L., White, W.T. and Simpfendorfer, C.A. 2017. Age, growth and maturity of oceanic whitetip shark (*Carcharhinus longimanus*) from Papua New Guinea. Marine and Freshwater Research 68: 1118–1129.

D'Anastasi, B., Simpfendorfer, C.A. and van Herwerden, L. 2013. In: The IUCN Red List of Threatened Species. Version 2013.2. *Anoxypristis cuspidata* (Narrow Sawfish). http://www.iucnredlist.org/details/39389/0

Dawson, C.E. 1985. Indo-Pacific pipefishes (Red Sea to the Americas). Gulf Coast Research Laboratory, Ocean Springs, Mississippi, USA.

de Lestang, S., Rossbach, M. and Blay, N. 2018. West Coast Rock Lobster Resource Status Report 2017. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2017/18*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 32-36.

Done, T.J., Williams, D.McB., Speare, P.J., Davidson, J., DeVantier, L.M., Newman, S.J. and Hutchins, J.B. 1994. Surveys of coral and fish communities at Scott Reef and Rowley Shoals., Australian Institute of Marine Science, Townsville.

Duffy, R. and Blay, N. 2020a. West Coast Nearshore and Estuarine Finfish Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 55-64.

Duffy, R. and Blay, N. 2020b. South Coast Estuarine and Nearshore Scalefish and Invertebrate Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 201-209.

Duffy, R. and Blay, N. 2020c. West Coast Nearshore And Estuarine Finfish Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 55-64.

Fairclough, D. and Walters, S. 2018. West Coast Demersal Scalefish Resource Status Report 2018. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2017/18*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 56-62.

Falkner, I., Whiteway, T., Przeslawski, R. and Heap, A.D. 2009. Review of ten key ecological features (KEFs) in the North-west Marine Region. Record 2009/13, Geoscience Australia, Canberra.

Ferreira, L.C., Thums, M., Fossette, S., Wilson, P., Shimada, T., Tucker, A.D., Pendoley, K., Waayers, D., Guinea, M.L., Loewenthal, G., King, J., Speirs, M., Rob, D. and Whiting. S.D. 2021. Multiple satellite tracking datasets inform green turtle conservation at a regional scale. Diversity and Distributions 27(2): 249-266. https://doi.org/10.1111/ddi.13197

Field, I.C., Charters, R., Buckworth, R.C., Meekan, M.G. and Bradshaw, C.J.A. 2008. Distribution and abundance of *Glyphis* and sawfishes in northern Australia and their potential interactions with commercial fisheries. Report to Australian Government, Department of the Environment, Water, Heritage and the Arts. Canberra. 39 pp.

Fletcher, W.J. and Santoro, K. (eds) 2015. *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2014/15*: The State of the Fisheries. Department of Fisheries, Western Australia.

Fletcher, W.J. and Santoro, K. (eds) 2009. State of the fisheries report 2008/09. Western Australian Department of Fisheries, Perth.

Fletcher, W.J., Mumme, M.D. and Webster, F.J. (eds) 2017. *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2015/16: The State of the Fisheries*. Department of Fisheries, Western Australia.

Francis, M., Natanson, L. and Campana, S. 2002. The Biology and Ecology of the Porbeagle Shark, *Lamna nasus*. In: Camhi, M., E. Pikitch and E. Babcock, eds. Sharks of the Open Ocean: Biology, Fisheries and Conservation: 105-113.

Gaughan, D.J. and Santoro, K. (eds), 2018. *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17: The State of the Fisheries*. Department of Primary Industries and Regional Development, Western Australia.

Gaughan, D.J. and Santoro, K. (eds). 2020. *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2018/19: The State of the Fisheries*. Department of Primary Industries and Regional Development, Western Australia.

Gelsleichter, J., Musick, J.A. and Nichols, S. 1999. Food habits of the smooth dogfish, *Mustelus canis*, dusky shark, *Carcharhinus obscurus*, Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, and the sand tiger, Carcharias *taurus*, from the northwest Atlantic Ocean. Environmental Biology of Fishes 54: 205–217.

Goldsworthy, S.D., Shaughnessy, P.D., MacKay, A.I., Bailleul, F., Holman, D., Lowther, A.D., Page, B., Waples, K., Raudino, H., Bryars, S. and Anderson, T. 2021. Assessment of the status and trends in abundance of a coastal pinniped, the Australian sea lion, *Neophoca cinerea*. Endangered Species Research 44: 421-437.

Guinea, M.L. 2006. Sea Turtles, Sea Snakes and Dugongs of Scott Reef, Seringapatam Reef and Browse Island with Notes on West Lacepede Island. Report to URS, Charles Darwin University.

Guinea, M.L. 2007a. Marine snakes: species profile for the north-western planning area, report for the Australian Government Department of the Environment, Water, Heritage and the Arts, Charles Darwin University, Northern Territory.

Guinea, M.L. 2007b. Final report survey March 16 – April 2 2007: sea snakes of Ashmore Reef, Hibernia Reef and Cartier Island with comments on Scott Reef, Charles Darwin University, Darwin.

Guinea, M.L. 2009. Long Term Marine Turtle Monitoring at Scott Reef. Report prepared for Woodside Pty Ltd.

Guinea, M. 2011. Long term monitoring of the marine turtles of Scott Reef satellite tracking of green turtles from Scott Reef #1 (p. 35). Appendix F27. Report prepared by Sinclair Knight Merz. Browse LNG Development.

Guinea, M.L. and Whiting, S.D. 2005. Insights into the distribution and abundance of sea snakes at Ashmore Reef. The Beagle (Supplement 1): 199-206.

Hallegraeff, G.M. 1995. Marine phytoplankton communities in the Australian region: current status and the future threats. Our sea, our future: major findings of the State of the Marine Environment Report for Australia. Great Barrier Reef Marine Park Authority, Canberra, Australia.

Hanf, D.M. 2015. Species Distribution Modelling of Western Pilbara Inshore Dolphins. Masters Research thesis. Murdoch University, Perth, Western Australia.

Hanf, D., Hunt, T. and Parra, G.J. 2016. Humpback dolphins of Western Australia: a review of current knowledge and recommendations for future management. Advances in Marine Biology 73: 193–218. https://doi.org.10.1016/bs.amb.2015.07.004

Hanson, C.E., Pattiaratchi, C.B. and Waite, A.M. 2005. Seasonal production regimes off south-western Australia: influence of the Capes and Leeuwin Currents on phytoplankton dynamics. Marine and Freshwater Research 56(7): 1011-1026.

Hanson, C.E., Waite, A.M., Thompson, P.A. and Pattiaratchi, C.B. 2007. Phytoplankton community structure and nitrogen nutrition in Leeuwin Current and coastal waters off the Gascoyne region of Western Australia. Deep Sea Research Part II: Topical Studies in Oceanography 54 (8–10): 902-924.

Harris, P., Heap, A., Passlow, V., Sbaffi, L. Fellows, M., Porter-Smith, R., Buchanan, C., and Daniell, J. 2005. Geomorphic Features of the Continental Margin of Australia. Geoscience Australia, Record 2003/30, 142 pp.

Harris, P.T., Heap, A., Marshall, J., Hemer, M., Daniell, J., Hancock, A., Buchanan, C., Brewer, D. and Heales, D. 2007. Submerged coral reefs and benthic habitats of the southern Gulf of Carpentaria: post survey report GA survey 276, RV Southern Surveyor, Record 2007/02, Geoscience Australia, Canberra.

Hart, A., Ferridge, R., Syers, C. and Kalinowski, P. 2017. Statewide Specimen Shell Resources Status Report 2017. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 204-206.

Hart, A., Bruce, C., Kalinowski, P. and Steele, A. 2018. Statewide Specimen Shell Resources Status Report 2018. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2017/18*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 204-206.

Hart, A., Murphy, D. and Steele, A. 2019. Sea Cucumber Resource Status Report 2019. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2018/19*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 173-175.

Hart, A., Murphy, D. and Steele, A. 2020a. Pearl Oyster Managed Fishery Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 165-169.

Hart, A., Bruce, C. and Steele, A. 2020b. Statewide Specimen Shell Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 253-255.

Hart, A., Murphy, D. and Wiberg, L. 2020c. West Coast Octopus Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 50-54.

Heck Jr., K.L., Hays, G. and Orth, R.J. 2003. Critical evaluation of the nursery role hypothesis for seagrass meadows. Marine Ecology Progress Series 253: 123-136.

Hedley, S.L., Bannister, J.L. and Dunlop, R.A. 2011. Abundance estimates of Breeding Stock 'D' humpback whales from aerial and land-based surveys off Shark Bay, Western Australia, 2008. Journal of Cetacean Research Management (special issue 3): 209–21.

Heyward, A.J., Halford, A.R., Smith, L.D. and Williams, D.M. 1997. Coral reefs of north west Australia: baseline monitoring of an oceanic reef ecosystem. In: Proceedings on 8th International Coral Reef Symposium 1: 289–294.

Heyward, A.J., Revill, A.T. and Sherwood, C.R. 2000. Review of Research and Data Relevant to Marine Environmental Management of Australia's North West Shelf', Produced for the Western Australian Department of Environmental Protection. (Unpublished report).123 pp.

Himmelman, J.H., Guderley, H.E. and Duncan, P.F. 2009. Responses of the saucer scallop *Amusium balloti* to potential predators. Journal of Experimental Marine Biology and Ecology 378(1–2): 58-61.

Holley, D.K., Lawler, I.R. and Gales, N.J. 2006. Summer survey of dugong distribution and abundance in Shark Bay reveals additional key habitat area. Wildlife Research 33: 243-250. https://doi.org/10.1071/WR05031

Holloway, P. and Nye, H.C. 1985. Leeuwin Current and wind distributions on the southern part of the Australian North West Shelf between January 1982 and July 1983. Australian Journal of Marine and Freshwater Research 36: 123-137.

Holloway, P. 2001. A regional model of the semidiurnal internal tide on the Australian North West Shelf. Journal of Geophysical Research 106: 19625-19638.

How, J. and Orme, L. 2020a. West Coast Deep Sea Crustacean Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 113-117.

How, J. and Orme, L. 2020b. South Coast Crustacean Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 189-194.

Howey-Jordan, L.A., Brooks, E.J., Abercrombie, D.L., Jordan, L.K., Brooks, A., Williams, S., Gospodarczyk, E. and Chapman, D.D. 2013. Complex movements, philopatry and expanded depth range of a severely threatened pelagic shark, the oceanic whitetip (*Carcharhinus longimanus*) in the western North Atlantic. PloS One 8:e56588. https://doi:10.1371/journal.pone.0056588

Hunt, T.N., Bejder, L., Allen, S.J., Rankin, R.W., Hanf, D. and Parra, G.J. 2017. Demographic characteristics of Australian humpback dolphins reveal important habitat toward the southwestern limit of their range. Endangered Species Research 32: 71-88. https://doi.org/10.3354/esr00784

Irvine, L.G., Thums, M., Hanson, C.E., McMahon, C.R. and Hindell, M.A. 2018. Evidence for a widely expanded humpback whale calving range along the Western Australian coast. Marine Mammal Science 34(2): 294-310. https://doi.org/10.1111/mms.12456

James, N.P., Bone, Y., Kyser, T.K., Dix, G.R. and Collins, L.B. 2004. The importance of changing oceanography in controlling late Quaternary carbonate sedimentation on a high-energy, tropical, oceanic ramp: north-western Australia. Sedimentology 51: 1179–1205.

Jefferson, T.A. and Rosenbaum, H.C. 2014. Taxonomic revision of the humpback dolphins (*Sousa* spp.), and description of a new species from Australia. Marine Mammal Science 30(4): 1494-1541.

Jenner, K., Jenner, M. and McCabe, K. 2001. Geographical and temporal movements of humpback whales in Western Australian waters. APPEA Journal 41: 692–707.

Jenner, C., Jenner, M., Burton, C., Sturrock, V., Salgado Kent, C., Morrice, M., Attard, C., Möller, L. and Double, M. 2008. Mark recapture analysis of pygmy blue whales from the Perth Canyon, Western Australia 2000-2005. Paper SC/60/SH16 presented to the Scientific Committee of the International Whaling Commission.

Johnston, D., Harris, D. and Blazeski, S. 2020. North Coast Crab Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 113-117.

Joyce, W., Campana, S., Natanson, L., Kohler, N., Pratt Jr., H. and Jensen, C. 2002. Analysis of stomach contents of the porbeagle shark (*Lamna nasus* Bonnaterre) in the northwest Atlantic. ICES Journal of Marine Science 53: 1263-1269.

Kangas, M., Sporer, E., Wilkin, S., Shanks, M., Cavalli, P., Pickles, L. and Oliver, R. 2018. North Coast Prawn Resource Status Report 2017. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 119-122.

Kangas, M., Wilkin, S., Shanks, M. and Brand-Gardner, S. 2019. North Coast Prawn Resource Status Report 2019. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 145-153.

Kangas, M., Wilkin, S., Shanks, M. and Brown, S. 2020a. North Coast Prawn Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 143-150.

Kangas, M., Wilkin, S., Breheny, N., Cavalli, P., Grounds, G. and Brown S. 2020b. Saucer Scallop Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 95-101.

Kirkwood, R., Pemberton, D. and Copson, G. 1992. The conservation and management of seals in Tasmania. Hobart: Department of Parks, Wildlife and Heritage. 48 pp.

Last, P., Lyne, V., Yearsley, G., Gledhill, D., Gommon, M., Rees, T. and White, W. 2005. Validation of national demersal fish datasets for the regionalisation of the Australian continental slope and outer shelf (>40 m depth). Australian Government Department of the Environment and Heritage and CSIRO Marine Research, Australia.

Last, P.R., and Stevens, J.D. 2009. Sharks and rays of Australia, 2nd edition, CSIRO Publishing, Melbourne.

Lewis, P. and Brand-Gardner, S. 2018. Statewide Large Pelagic Finfish Resource Status Report 2017. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 195-199.

Lewis, P., Blay, N. and Watt, M. 2020. Statewide Large Pelagic Finfish Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 241-247.

Limpus, C.J. 1992. Estimation of tag loss in marine turtle research. Wildlife Research 19: 457-469. https://doi.org/10.1071/WR9920457

Limpus, C.J. 2009. A biological review of Australian marine turtles. Environmental Protection Agency, Brisbane, QLD.

Limpus, C.J., Parmenter, C.J., Baker, V. and Fleay, A. 1983. The Flatback Turtle, *Chelonia depressa*, in Queensland: Post-Nesting Migration and Feeling Ground Distribution. Wildlife Research 10: 557-561. https://doi.org/10.1071/WR9830557

Liu, Q.Y., Feng, M., Wang, D. and Wijffels, S. 2015. Interannual variability of the Indonesian Throughflow transport: a revisit based on 30 year expendable bathythermograph data. Journal of Geophysical Research: Oceans 120: 8270-8282.

Lourie, S.A., Foster, S.J., Cooper, E.W.T. and Vincent, A.C.J. 2004. A guide to the identification of seahorses. Project Seahorse and TRAFFIC North America, University of British Columbia and World Wildlife Fund. Available from: https://cites.unia.es/cites/file.php/1/files/guide-seahorses.pdf [Accessed 22 Sep 2020]

Lourie, S.A., Vincent, A.C.J. and Hall, H.J. 1999. Seahorses: an identification guide to the world's species and their conservation. Project Seahorse, London, UK.

Lukoschek, V., Beger, M., Ceccarelli, D., Richards, Z. and Pratchett, M. 2013. Enigmatic declines of Australia's sea snakes from a biodiversity hotspot. Biological Conservation 166: 191e202.

Lulofs, H.M.A. and Sumner, N.R. 2002. Historical diving profiles for pearl oyster divers in Western Australia. Fisheries Research Report, 138.

Mackie, M., Gaughan, D.J. and Buckworth, R.C. 2003. Stock assessment of narrow-barred Spanish mackerel (*Scomberomorus commerson*) in Western Australia. FRDC Project No. 1999/151.

Mackie, M., Nardi, A., Lewis, P. and Newman, S. 2007. Small pelagic fishes of the north-west marine region. Department of Fisheries, Perth.

Marsh, H., Prince, R.I.T., Saafeld, W.K. and Shepherd, R. 1994. The distribution and abundance of the dugong in Shark Bay, Western Australia. Wildlife Research 21: 149-161. https://doi.org/10.1071/WR9940149

Marsh, H., Penrose, H., Eros C. and Hugues, J. 2002. Dugong Status Report and Action Plans for Countries and Territories. Early Warning Assessment Reports. United Nations Environment Programme, Nairobi.

Marsh, H., O'Shea, T.J. and Reynolds, J.R. 2011. The ecology and conservation of sirenia; dugongs and manatees. Cambridge University Press, London.

Marshall, A., Bennett, M., Kodja, G., Hinojosa-Alvarez, S., Galvan-Magana, F., Harding, M., Stevens, G. and Kashiwaga, T. 2011. *Manta birostris* (Chevron Manta Ray, Giant Manta Ray, Oceanic Manta Ray, Pacific Manta Ray, Pelagic Manta Ray) [WWW Document]. The IUCN Red List of Threatened Species. Accessed at http://www.iucnredlist.org/details/198921/0

Marshall, A.D., Compagno, L.J. and Bennett, M.B. 2009. Redescription of the genus *Manta* with resurrection of *Manta alfredi* (Krefft, 1868) (Chondrichthyes; Myliobatoidei; Mobulidae). Zootaxa 2301: 1–28.

Martin, R.A. 2007. A review of behavioural ecology of whale sharks. Fisheries Research 84: 10–16.

McAuley, R. 2004. Western Australian Grey Nurse Shark Pop Up Archival Tag Project. Final Report to Department of Environment and Heritage. Department of Fisheries, Western Australia. 49 pp.

McCauley, R.D. 2009. Sea Noise Logger Deployment Scott Reef: 2006–2008 – Whales, Fish and Seismic Survey. Report produced for Woodside Energy Ltd.

McCauley, R. 2011. Woodside Kimberley sea noise logger program, Sept-2006 to June-2009: Whales, Fish and Man-made Noise. Report produced for Woodside Energy Ltd.

McCauley, R. and 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, June 2010, Agadir, Morocco (unpublished). 9 pp.

McCauley, R. and Duncan, A. 2011. Sea noise logger deployment, Wheatstone and Onslow, April 2009 to November 2010 (Technical Report No. R2011-23). Centre for Marine Science and Technology, Curtin University of Technology, Perth.

McCauley, R., Jenner, C., Bannister, J., Cato, D. and Duncan, A. 2000. Blue whale calling in the Rottnest trench, Western Australia, and low frequency sea noise. Acoustics Australia / Australian Acoustical Society: 245-250.

McCauley, R., Salgado Kent, C., Gavrilov, A., Recalde-Salas, A., Burton, C. and Marley, S. 2004. Passive acoustic monitoring of baleen whales in Geographe Bay, Western Australia. Acoustics Australia Proceedings of Acoustics 2004 November Gold Coast.

McCauley, R.D., Gavrilov, A.N., Jolliffe, C.D., Ward, R. and Gill, P.C. 2018. Pygmy blue and Antarctic blue whale presence, distribution and population parameters in southern Australia based on passive acoustics. Deep-Sea Research Part II: Topical Studies in Oceanography 157-158: 154-168.

McClatchie, S., Middleton, J.F. and Ward, T.M. 2006. Water mass analysis and alongshore variation in upwelling intensity in the eastern Great Australian Bight. Journal of Geophysical Research, Oceans 111(C8). https://doi.org/10.1029/2004JC002699

McCosker, J. 1975. Feeding behavior of Indo-Australian hydrophiidae. The biology of sea snakes 1: 217-232.

Menezes, V.V., Phillips, H.E., Schiller, A., Domingues, C.M. and Bindoff, N.L. 2013. Salinity dominance on the Indian Ocean Eastern Gyral current. Geophysical Research Letters 40: 5716-5721.

MetOcean Engineers, 2005, Preliminary metocean conditions for the Browse Development (Prospective Production Facilities/Areas, Pipeline Routes/Shore Crossings and Flow-Lines/Seabed Manifolds), Scott Reef Vicinity to Shore. Report produced for Woodside Energy Limited.

Minton, S., Heatwole, H. and Dunson, W. 1975. Sea snakes from reefs of the Sahul Shelf. University of Maryland Press, 1: 141-144.

Miyazaki, S. and Stagg, H. 2013. Exmouth Plateau [WWW Document]. Geoscience Australia: National Geological Provinces Online Database. Available at: http://www.ga.gov.au/provexplorer/provinceDetails.do?eno=30351

Mollet, H., Cliff, G., Pratt Jr, H. and Stevens, J. 2000. Reproductive biology of the female shortfin mako, *Isurus oxyrinchus* Rafinesque, 1810, with comments on the embryonic development of lamnoids. Fishery Bulletin – National Oceanic and Atmospheric Administration 98(2): 299-318.

Molony, B., Lai, E., and Jones, R. 2015. Mackerel Managed Fishery Report: Statistics Only. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2014/15*: The State of the Fisheries eds. W.J. Fletcher and K. Santoro, Department of Fisheries, Western Australia, pp. 207-210.

Morrice, M.G., Gill, P.C., Hughes, J. and Levings, A.H. 2004. Summary of aerial surveys for the Santos Ltd EPP32 seismic survey, 2–13 December 2003. Report WEG-SO 02/2004 to Santos Ltd. Whale Ecology Group, Deakin University, Warrnambool.

Newman, S.J., Wakefield, C., Skepper, C., Boddington, D., Blay, N., Jones, R. and Dobson, P. 2015. North Coast Demersal Fisheries Status Report 2015. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2014/15*: The State of the Fisheries eds. W.J. Fletcher and K. Santoro, Department of Fisheries, Western Australia, pp. 189-206.

Newman, S.J., Wakefield, C., Skepper, C., Boddington, D. and Smith, E. 2018. North Coast Demersal Resource Status Report 2017. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 125-133.

Newman, S.J., Wakefield, C., Skepper, C., Boddington, D. and Blay, N. 2019. North Coast Demersal Fisheries Status Report 2019. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2018/19*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 159-168.

Newman, S., Wakefield, C., Skepper, C., Boddington D. and Steele, A. 2020a. North Coast Demersal Fisheries Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 156-165.

Newman, S., Bruce, C. and Wiberg, L. 2020b. Statewide Marine Aquarium Fish and Hermit Crab Resources Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 247-252.

Norriss, J. and Blazeski, S. 2020. South Coast Small Pelagic Scalefish Resource Status Report 2020. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2019/20*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 209-213.

Parra, G.J. 2006. Resource partitioning in sympatric delphinids: Space use and habitat preferences of Australian snubfin and Indo-Pacific humpback dolphins. Journal of Animal Ecology 75: 862-874.

Parra, G.J., Corkeron, P.J. and Marsh, H. 2002. The Indo-Pacific humpback dolphin, *Sousa chinensis* (Osbeck, 1765) in Australian waters: a summary of current knowledge and recommendations for their conservation. Unpublished Report to the Scientific Committee of the International Whaling Commission, SC/54/SM27.

Parra, G.J., Corkeron, P.J. and Marsh, H. 2006. Population sizes, site fidelity and residence patterns of Australian snubfin and Indo-Pacific humpback dolphins: implications for conservation. Biological Conservation 129: 167-180.

Patterson, H., Noriega, R., Georgeson, L., Larcombe, J. and Curtotti, R. 2017. Fishery status reports 2017, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0.

Patterson, S.H., Larcombe, J., Woodhams, J. and Curtotti, R. 2020. Fishery status reports 2020, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/5f447487e6749

Pearce, A., Buchan, S., Chiffings, T., D'Adamo, N., Fandry, C., Fearns, P., Mills, D., Phillips, R. and Simpson, C. 2003. A review of the oceanography of the Dampier Archipelago, Western Australia, in: Wells, F., Walker, D., Jones, D. (Eds.), The Marine Flora and Fauna of Dampier, Western Australia. Western Australian Museum, Perth, pp. 13–50.

Pendoley, K.L. 2005. Sea turtles and the environmental management of industrial activities in North West Western Australia. PhD thesis, Murdoch University.

Pendoley, K., Vitenbergs, A., Whittock, P. and Bell, C. 2016. Twenty years of turtle tracks: marine turtle nesting activity at remote locations in the Pilbara region, Western Australia. Australian Journal of Zoology 64. https://doi.org.10.1071/ZO16021

Pillans, R.D., Stevens, J.D., Peverell, S. and Edgar. S. 2008. Spatial distribution and habitat utilisation of the speartooth shark *Glyphis glyphis* in relation to fishing in Northern Australia. Department of the Environment, Water, Heritage and the Arts, Canberra. 47 pp.

Pillans, R.D., Stevens, J.D., Kyne, P.M. and Salini, J. 2009. Observations on the distribution, biology, short-term movements and habitat requirements of river sharks *Glyphis* spp. in northern Australia. Endangered Species Research 10: 321–332.

Pitman, R.L., Totterdell, J.A., Fearnbach, H., Ballance, L.T., Durban, J.W. and Kemps, H. 2015. Whale killers: Prevalence and ecological implications of killer whale predation on humpback whale calves off Western Australia. Marine Mammal Science 31(2): 629-657. https://doi.org/10.1111/mms.12182

Pogonoski, J.J., Pollard, D.A. and Paxton, J.R. 2002. Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes. Canberra, ACT: Environment Australia. Available from: http://www.environment.gov.au/coasts/publications/marine-fish-action/pubs/marine-fish.pdf

Preen, A. 2004. Distribution, abundance and conservation status of dugongs and dolphins in the southern and western Arabian Gulf. Biological Conservation 118(2): 205-218.

Preen, A., Marsh, H., Lawler, I., Prince, R. and Shepherd, R. 1997. Distribution and abundance of dugongs, turtles, dolphins and other megafauna in Shark Bay, Ningaloo Reef and Exmouth Gulf, Western Australia. Wildlife Research 24: 185–208.

Prieto, R., Janiger, D., Silva, M.A., Waring, G.T. and Gonçalves, J.M. 2012. The forgotten whale: a bibliometric analysis and literature review of the North Atlantic sei whale *Balaenoptera borealis.* Mammal Review 42: 235–272. https://doi.org.10.1111/j.1365-2907.2011.00195.x

Przeslawski, R., Daniell, J., Nichol, S., Anderson, T. and Barrie, J.V. 2011. Seabed Habitats and Hazards of the Joseph Bonaparte Gulf and Timor Sea, Northern Australia. Record 2011/040. Geoscience Australia, Canberra.

Przeslawski, R., Alvarez, B., Battershill, C. and Smith, T. 2014. Sponge biodiversity and ecology of the Van Diemen Rise and eastern Joseph Bonaparte Gulf, northern Australia. Hydrobiologia 730: 1-16.

Raudino, H., Hunt, T.N. and Waples, K.A. 2018. Records of Australian humpback dolphins (*Sousa sahulensis*) from an offshore island groups in Western Australia. Marine Biodiversity Records 11:14**-20**.

Reardon, M.B., Gerber, L. and Cavanagh, R.D. 2006. *Isurus paucus*. The IUCN Red List of Threatened Species 2006.

Reinhold, L. and Whiting, A. 2014. High-density Loggerhead Sea Turtle Nesting on Dirk Hartog Island, Western Australia. Marine Turtle Newsletter 141: 7-10.

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. 51 pp.

Rochester, W.A., Moeseneder, C.H., Miller, M.J., Milton, D.A., Fry, G.C., Griffiths, S.P, Pillans, R.D., Rothlisberg, P.C., Bustamante, R.H. and Butler, A.J. 2007. The North Marine Region marine bioregional plan: Information and analysis for the regional profile. Final report to the Department of the Environment and Water Resources. CSIRO Marine and Atmospheric Research.

Rosser, N.L. and Gilmour, J.P. 2008. New insights into patterns of coral spawning on Western Australian reefs. Coral Reefs 27: 345-349.

RPS 2016. Metocean Criteria Guidelines for MODU Mooring on Australia's North West Shelf.

Salgado Kent, C., Jenner, C., Jenner, M., Bouchet, P. and Rexstad, E. 2012. Southern Hemisphere breeding stock D humpback whale population estimates from North West Cape, Western Australia. Journal of Cetacean Research and Management 12(1): 29–38.

Saunders, R., Royer, F. and Clarke, M. 2011. Winter migration and diving behaviour of Porbeagle shark, *Lamna nasus*, in the Northeast Atlantic. ICES Journal of Marine Science 68(1): 166-174.

Schroeder, T., Lyne, V., Dekker, A.G. and Rathbone, C. 2009. Regional MODIS Satellite Data Study: Scott Reef. CSIRO report produced for Woodside Energy Ltd. CSIRO.

Sheppard, J., Preen, A.R., Marsh, H., Lawler, I.R., Whiting S. and Jones, R.E. 2006. Movement heterogeneity of dugongs, *Dugong dugon* (Muller) over large spatial scales. Journal of Experimental Marine Biology and Ecology 334: 64-83.

Simpson, C.J., Cary, J.L. and Masini, R.J. 1993. Destruction of corals and other reef animals by coral spawn slicks on Ningaloo Reef, Western Australia. Coral Reefs 12: 185–191. https://doi.org/10.1007/BF00334478

Sleeman, J.C., Meekan, M.G., Wilson, S.G., Jenner, K.C.S., Jenner, M.N., Boggs, G. and Bradshaw, C.J.A. 2007. Biophysical correlates of relative abundances of marine megafauna at Ningaloo Reef, Western Australia. Marine and Freshwater Research 58: 608-623.

Smale, M.J. 2005. The diet of the ragged-tooth shark *Carcharias Taurus* Rafinesque 1810 in the Eastern Cape, South Africa. African Journal of Marine Science 27: 331–335. https://doi:10.2989/18142320509504091

Sporer, E., Kangas, M., Shanks, M. and Blay, N. 2015. North Coast Prawn Managed Fisheries Status Report. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia*

2014/15:The State of the Fisheries eds. Fletcher, W.J. and Santoro, K., Department of Fisheries, Western Australia, pp. 173-188.

Stevens, J.D., Pillans, R.D. and Salini, J.P. 2005. Conservation assessment of *Glyphis glyphis* (speartooth shark), *Glyphis garicki* (northern river shark), *Pristis microdon* (freshwater sawfish) and *Pristis zijsron* (green sawfish). Report to Department of Environment and Heritage. Canberra. Australia. 84 pp.

Stevens, J., McAuley, R., Simpfendorfer, C. and Pillans, R. 2008. Spatial distribution and habitat utilisation of sawfish (*Pristis* spp.) in relation to fishing in northern Australia. CSIRO Marine and Atmospheric Research, Hobart.

Stevens, J.D., Bradford, R.W. and West, G.J. 2010. Satellite tagging of blue sharks (*Prionace glauca*) and other pelagic sharks off eastern Australia: depth behaviour, temperature experience and movements. Marine Biology 157: 575–591.

Strahan, R. 1983. The Australian Museum Complete Book of Australian Mammals. London, United Kingdom: Angus and Robertson.

Strain, L., Brown, J. and Walters, S. 2018. West Coast Roe's Abalone Resource Status Report 2017. In: *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2016/17*: The State of the Fisheries eds. D.J. Gaughan and K. Santoro. Department of Primary Industries and Regional Development, Western Australia. pp. 36–40.

Surman, C.A. 2019. Houtman Abrolhos – A Natural History. Halfmoon Biosciences. 192 pp.

Surman, C.A., Nicholson, L.W. and Philipps, R.A. 2018. Distribution and patterns of migration of a tropical seabird community in the Eastern Indian Ocean. Journal of Ornithology 158: 867-877.

Sutton, A.L., Jenner, K.C.S. and Jenner, M-N.M. 2019. Habitat associations of cetaceans and seabirds in the tropical eastern Indian Ocean. Deep Sea Research Part II: Topical Studies in Oceanography 166: 171-186.

Thiele, D. and Gill P.C. 1999. Cetacean observations during a winter voyage into Antarctic sea ice south of Australia. Antarctic Science 11(1): 48-53.

Thorburn, D.C. 2006. Biology, ecology and trophic interactions of elasmobranchs and other fishes in riverine waters of northern Australia. PhD Thesis, Murdoch University, Perth, Western Australia.

Thorburn, D.C. and Morgan, D.L. 2004. The northern river shark *Glyphis sp. C.* (Carcharhinidae) discovered in Western Australia. Zootaxa 685: 1–8.

Thorburn, D.C., Peverell, S.C., Stevens, J.D., Last, P.R. and Rowland, A.J. 2003. Status of freshwater and estuarine elasmobranchs in Northern Australia. Final Report to the Natural Heritage Trust, pp. 1–75.

Thorburn, D.C., Morgan, D.L., Rowland, A.J., Gill, H.S. and Paling, E. 2008. Life history notes of the critically endangered dwarf sawfish, *Pristis clavata*, Garman 1906 from the Kimberley region of Western Australia. Environmental Biology of Fishes 83: 139–145.

Threatened Species Scientific Committee 2009. Commonwealth Listing Advice on *Galeorhinus galeus*. Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/68453-listing-advice.pdf

Threatened Species Scientific Committee 2010. Commonwealth Listing Advice on *Thunnus maccoyii* (Southern Bluefin Tuna). Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/69402-listing-advice.pdf

Threatened Species Scientific Committee 2013. Commonwealth Listing Advice on *Centrophorus zeehaani* (southern dogfish). Department of Sustainability, Environment, Water, Population and

Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/82679-listing-advice.pdf

Threatened Species Scientific Committee 2014. Listing Advice *Isurus oxyrinchus* shortfin mako shark. 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/79073-listing-advice.pdf

Threatened Species Scientific Committee 2015a. Conservation Advice *Balaenoptera borealis* sei whale. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/34-conservation-advice-01102015.pdf

Threatened Species Scientific Committee 2015b. Conservation Advice *Megaptera novaeangliae* humpback whale. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/38-conservation-advice-10102015.pdf

Threatened Species Scientific Committee 2015c. Conservation Advice *Balaenoptera physalus* fin whale. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/37-conservation-advice-01102015.pdf

Threatened Species Scientific Committee 2015d. Conservation Advice *Rhincodon typus* whale shark. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66680-conservation-advice-01102015.pdf

Threatened Species Scientific Committee 2015e. Conservation Advice *Anous tenuirostris melanops* Australian lesser noddy. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/26000-conservation-advice-01102015.pdf

Threatened Species Scientific Committee 2015f. Conservation Advice *Pterodroma mollis* soft-plumaged petrel. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1036-conservation-advice-01102015.pdf

Threatened Species Scientific Committee 2016a. Conservation Advice *Calidris tenuirostriss* Great knot. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/862-conservation-advice-05052016.pdf

Threatened Species Scientific Committee 2016b. Conservation Advice *Calidris canutus* Red knot. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservation-advice-05052016.pdf

Threatened Species Scientific Committee 2016c. Conservation Advice *Limosa lapponica menzbieri* Bar-tailed godwit (northern Siberian). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/86432-conservation-advice-05052016.pdf

Threatened Species Scientific Committee 2016d. Conservation Advice *Charadrius leschenaultii* Greater sand plover. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/877-conservation-advice-05052016.pdf

Threatened Species Scientific Committee 2016e. Conservation Advice *Charadrius mongolus* Lesser sand plover. Canberra: Department of the Environment. Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/879-conservation-advice-05052016.pdf

Threatened Species Scientific Committee 2018. Listing Advice *Sphyrna lewini* scalloped hammerhead. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/85267-listing-advice-15032018.pdf

Threatened Species Scientific Committee 2020a. Conservation Advice *Neophoca cinerea* Australian Sea Lion. Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/22-conservation-advice-23122020.pdf

Threatened Species Scientific Committee 2020b. Conservation Advice for the Abbott's Booby - *Papasula abbotti*. Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/59297-conservation-advice-19102020.pdf

Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whaleships. Zoologica 19: 3–50.

Udyawer, V., Read, M., Hamann, M., Heupel, M.R., and Simpfendorfer, C.A. 2016. Importance of shallow tidal habitats as refugia from trawl fishing for sea snakes. Journal of Herpetology 50: 527–533. https://doi.org.10.1670/15-026

Udyawer, V., Somaweera, R., Nitschke, C., d'Anastasi, B., Sanders, K., Webber, B.L., Hourston, M. and Heupel, M.R. 2020. Prioritising search effort to locate previously unknown populations of endangered marine reptiles. Global Ecology and Conservation 22. https://doi.org/10.1016/j.gecco.2020.e01013

Vincent, A.C.J. 1996. The international trade in seahorses. TRAFFIC International, Cambridge, UK. Available from: http://www.traffic.org/publication/96_International_Trade_Seahorse.pdf [Accessed 22 Sep 2020].

Voris, H.K. 1972. The role of sea snakes (Hydrophiidae) in the trophic structure of coastal ocean communities. Journal of the Marine Biological Association of India 14(2): 429- 442.

Voris, H.K. and Voris, H.H. 1983. Feeding strategies in marine snakes: an analysis of evolutionary, morphological, behavioral and ecological relationships. American Zoology 23: 411–425. https://doi.org.10.1093/icb/23.2.411

Waayers, D., Smith, L. and Malseed, B. 2011. Internesting distribution of green turtles (*Chelonia mydas*) and flatback turtles (*Natator depressus*) at the Lacepede Islands, Western Australia. Journal of the Royal Society of Western Australia 94: 359–364.

Weller, D.R and Lee, C.V. 2017. Migratory shorebird conservation action plan. BirdLife Australia, unpublished report, September 2017.

Whiting, S.D. 2000. The foraging ecology of juvenile green and hawksbill sea turtles in north-western Australia. PhD thesis, Northern Territory University, Darwin, NT.

Whiting, A.U., Thomson, A., Chaloupka, M. and Limpus, C.J. 2008. Seasonality, abundance and breeding biology of one of the largest populations of nesting flatback turtles: Cape Domett. Western Australia. Australian Journal of Zoology 56: 297-303.

Whitty, J.M., Phillips, N.M., Morgan, D.L., Chaplin, J.A., Thorburn, D.C. and Peverell, S.C. 2008. Habitat associations of Freshwater Sawfish (*Pristis microdon*) and Northern River Sharks (*Glyphis garricki*): including genetic analysis of freshwater sawfish across northern Australia. Report to Australian Government, Department of the Environment, Water, Heritage and the Arts. Murdoch University Centre for Fish and Fisheries Research. Perth, Western Australia. 75 pp.

Wijeratne, S. Pattiaratchi, C. and Proctor, R. 2018. Estimates of surface and subsurface boundary current transport around Australia. Journal of Geophysical Research: Oceans 123: 3444-3466.

Williamson, P.C., Sumner, N.R. and Malseed, B.E. 2006. A 12-month survey of recreational fishing in the Pilbara region of Western Australia during 1999-2000, Fisheries Research Report No. 153, Department of Fisheries, Western Australia. 61 pp.

Wilson, B.R. 2013. The biogeography of the Australian North West Shelf: Environmental Change and Life's Response. Western Australian Museum, Perth, Australia. 415 pp.

Wilson, S., Carleton, J. and Meekan, M. 2003. Spatial and temporal patterns in the distribution and abundance of macrozooplankton on the southern North West Shelf, Western Australia. Estuarine, Coastal and Shelf Science 56: 897–908.

Wilson, S.K., Depczynski, M. and Fisher, R. 2010. Habitat associations of juvenile fish at Ningaloo Reef, Western Australia: the importance of coral and algae. PLoS ONE 5(12): e15185. https://doi.org/10.1371/journal.pone.0015185

Woodside 2012. Eastern Flank – Preliminary Metocean Design and Operating Criteria. Controlled reference number A9650RT7964290. Woodside Energy Limited, Perth, Western Australia.

Woodside 2016. Vincent – basic design data specification sheet – metocean (No. V0000ST9650826). Woodside Energy Limited, Perth, Western Australia.

Woodside 2019. Proposed Browse to NWS Project Draft EIS/ERD. EPA Assessment No. 2191, EPBC 2018/8319. December 2019. 1986 pp.

Woodside 2020. Scarborough Offshore Project Proposal, Revision 5 Submission, February 2020. Woodside Energy Ltd. 806 pp.

Wynen. L., Larson, H., Thorburn, D., Peverell, S., Morgan, D., Field, I. and Gibb, K. 2009. Mitochondrial DNA supports the identification of two endangered river sharks (*Glyphis glyphis* and *Glyphis garricki*) across northern Australia. Marine and Freshwater Research 60: 554–562.

APPENDIX A. PROTECTED MATTER SEARCH REPORTS FOR NWMR, SWMR AND NMR

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.

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This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

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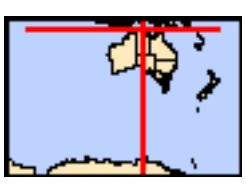

Summary

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:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	33
Listed Migratory Species:	70

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:	127
Whales and Other Cetaceans:	25
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	15

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	1
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	8

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
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

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
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 mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-	Vulnerable	Species or species

Name	Status	Type of Presence
tailed Godwit [86380]		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
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may 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	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Notomys aquilo Northern Hopping-mouse, Woorrentinta [123]	Endangered	Species or species habitat may occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Cryptoblepharus gurrmul Arafura Snake-eyed Skink [83106]	Endangered	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Congregation or aggregation known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat known to occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat 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	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]		Foraging, feeding or related behaviour known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known 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 may occur within area

Name	Threatened	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Congregation or aggregation known to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to 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 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 likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat 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	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding 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		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
Actitis hypoleucos Common Sandpiper [59309]		Species or species 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 likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
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 mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	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
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat likely 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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		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]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat 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 likely to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		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

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		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Foraging, feeding or related behaviour known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely 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 likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 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 mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	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
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 known to 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 likely 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 daurica Red-rumped Swallow [59480]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat likely 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

Name	Threatened	Type of Presence
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		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]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat 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 may occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding likely to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		

Name	Threatened	Type of Presence
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		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 suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		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
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Cosmocampus maxweberi Maxweber's Pipefish [66209]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		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 macrorhynchus Whiskered Pipefish, Ornate Pipefish [66222]		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 cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys parvicarinatus Short-keel Pipefish, Short-keeled Pipefish [66230]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippichthys spicifer Belly-barred Pipefish, Banded Freshwater Pipefish [66232]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Hippocampus zebra Zebra Seahorse [66241]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Microphis brachyurus Short-tail Pipefish, Short-tailed River Pipefish [66257]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to 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	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Congregation or aggregation known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis caerulescens Dwarf Seasnake [1103]		Species or species habitat may occur within area
Hydrophis coggeri Slender-necked Seasnake [25925]		Species or species habitat may 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 gracilis Slender Seasnake [1106]		Species or species habitat may occur within area
Hydrophis inornatus Plain Seasnake [1107]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis melanosoma Black-banded Robust Seasnake [1109]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [1112]		Species or species habitat may occur within area
Hydrophis vorisi a seasnake [25927]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Laticauda colubrina a sea krait [1092]		Species or species habitat may occur within area
Laticauda laticaudata a sea krait [1093]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Parahydrophis mertoni Northern Mangrove Seasnake [1090]		Species or species habitat may 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 borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding 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
Arafura	Multiple Use Zone (IUCN VI)
Arafura	Special Purpose Zone (Trawl) (IUCN VI)
Arnhem	Special Purpose Zone (IUCN VI)
Gulf of Carpentaria	National Park Zone (IUCN II)
Gulf of Carpentaria	Special Purpose Zone (Trawl) (IUCN VI)
Joseph Bonaparte Gulf	Multiple Use Zone (IUCN VI)

Name	Label
Joseph Bonaparte Gulf	Special Purpose Zone (IUCN VI)
Limmen	Habitat Protection Zone (IUCN IV)
Oceanic Shoals	Multiple Use Zone (IUCN VI)
Oceanic Shoals	Special Purpose Zone (Trawl) (IUCN VI)
Wessel	Habitat Protection Zone (IUCN IV)
Wessel	Special Purpose Zone (Trawl) (IUCN VI)
West Cape York	Habitat Protection Zone (IUCN IV)
West Cape York	National Park Zone (IUCN II)
West Cape York	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Anindilyakwa	NT
Marthakal	NT

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
Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Southern Gulf Aggregation	QLD

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
Carbonate bank and terrace system of the Van	North
Gulf of Carpentaria basin	North
Gulf of Carpentaria coastal zone	North
Pinnacles of the Bonaparte Basin	North
Plateaux and saddle north-west of the Wellesley	North
Shelf break and slope of the Arafura Shelf	North
Submerged coral reefs of the Gulf of Carpentaria	North
Tributary Canyons of the Arafura Depression	North

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

-14.758882 129.178077,-13.960657 128.826514,-13.768665 128.606788,-12.484784 128.496924,-11.183724 127.563087,-10.460737 128.233253,-9.746889 129.518653,-9.660256 130.254737,-9.779371 130.935889,-9.280976 132.528907,-8.901286 133.385841,-9.411062 134.858008,-9.129149 135.473243,-10.363488 138.582374,-11.129831 139.395362,-10.190527 141.339942,-10.806262 141.317969,-10.817053 141.922217,-11.10827 142.087012,-12.527687 141.559669,-13.330764 141.515723,-13.960657 141.40586,-15.045535 141.570655,-15.945419 141.317969,-17.22994 140.823585,-17.513041 140.53794,-17.659661 140.032569,-17.429205 139.593116,-16.630864 139.966651,-16.409675 139.812842,-16.177683 139.208594,-16.820251 138.966895,-15.924291 137.165137,-15.575354 137.132178,-15.458909 136.934424,-15.289418 136.11045,-14.822615 135.45127,-14.269641 135.846778,-14.418655 136.97837,-13.608551 137.011329,-12.784952 136.780616,-12.388227 137.055274,-10.957305 136.76963,-10.957305 136.703712,-11.399198 136.407081,-11.679068 135.824805,-11.904912 135.616065,-11.947909 134.473487,-11.679068 133.869239,-11.700585 133.50669,-11.431505 133.528663,-11.442273 133.363868,-11.64679 133.254005,-11.313028 132.979346,-11.04358 133.067237,-10.90337 132.583839,-11.151389 131.221534,-11.3238 130.782081,-11.054363 130.287696,-11.474575 130.111915,-11.765126 129.958106,-11.947909 130.067969,-11.894162 130.760108,-12.119827 130.913917,-12.441874 130.474464,-12.870649 130.100928,-13.939333 129.584571,-13.971319 129.419776,-14.47185 129.28794,-14.631358 129.507667,-14.843856 129.452735,-14.769505 129.178077,-14.758882 129.178077

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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.

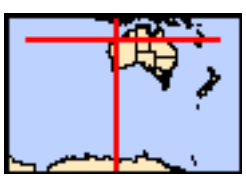
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 10/05/21 13:07:00

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 1.0Km



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:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	70
Listed Migratory Species:	84

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:	1
Listed Marine Species:	149
Whales and Other Cetaceans:	34
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	17

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	10
Regional Forest Agreements:	None
Invasive Species:	23
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	5

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
The West Kimberley	WA	Listed place
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place
Historic		
Dirk Hartog Landing Site 1616 - Cape Inscription Area	WA	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Eighty-mile beach	Within Ramsar site
Ord river floodplain	Within 10km of Ramsar

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Ecological Communities [Resource Information]

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.

Name	Status	Type of Presence
Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Foraging, feeding or related behaviour 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

Name	Status	Type of Presence
		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
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area
Geophaps smithii blaauwi Partridge Pigeon (western) [66501]	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 baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may 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

Name	Status	Type of Presence
		area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	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
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely 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 likely to occur within area
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat likely to occur within area
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat may 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 known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Isoodon auratus auratus Golden Bandicoot (mainland) [66665]	Vulnerable	Species or species habitat likely to occur within area
Lagostrophus fasciatus fasciatus Banded Hare-wallaby, Merrnine, Marnine, Munning [66664]	Vulnerable	Translocated population known to occur within area
Leporillus conditor Wopilkara, Greater Stick-nest Rat [137]	Vulnerable	Translocated population known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat known to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
Perameles bougainville bougainville Western Barred Bandicoot (Shark Bay) [66631]	Endangered	Translocated population known to occur within area
Petrogale concinna monastria Nabarlek (Kimberley) [87607]	Endangered	Species or species habitat known to occur within area
Phascogale tapoatafa kimberleyensis Kimberley brush-tailed phascogale, Brush-tailed Phascogale (Kimberley) [88453]	Vulnerable	Species or species habitat likely to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat likely 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 likely to occur

Name	Status	Type of Presence
		within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area
Lerista nevinae Nevin's Slider [85296]	Endangered	Species or species habitat known to occur within area
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Breeding known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may 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 likely to 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 lepturus White-tailed Tropicbird [1014]		Foraging, feeding or related behaviour likely to occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		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

Name	Threatened	Type of Presence
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely 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
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
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to 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

Name	Threatened	Type of Presence
		within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat 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	Breeding known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding 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]		Breeding 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	
Cecropis daurica Red-rumped Swallow [80610]	Species or species habitat may occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]	Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]	Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]	Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]	Species or species habitat likely to occur within area

Migratory Wetlands Species	
Acrocephalus orientalis Oriental Reed-Warbler [59570]	Species or species habitat may occur within area
Actitis hypoleucos Common Sandpiper [59309]	Species or species habitat known to 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 known to 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
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

Name	Threatened	Type of Presence
		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 Heritage Places		[Resource Information]
Name	State	Status
Natural		
Ningaloo Marine Area - Commonwealth Waters	WA	Listed place

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Acrocephalus orientalis		
Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
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	Foraging, feeding or related behaviour known to occur within area
Anseranas semipalmata		
Magpie Goose [978]		Species or species habitat may 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
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba		
Sanderling [875]		Species or species

Name	Threatened	Type of Presence
		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 known to 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 known 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 likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may 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 likely to 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

Name	Threatened	Type of Presence
		within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo daurica Red-rumped Swallow [59480]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour 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 likely 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
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Foraging, feeding or related behaviour likely to 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

Name	Threatened	Type of Presence
		related behaviour known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
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 albifrons Little Tern [813]		Breeding known 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 likely 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
Sula leucogaster Brown Booby [1022]		Breeding known to occur within area
Sula sula Red-footed Booby [1023]		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

Name	Threatened	Type of Presence
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 larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		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 amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		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
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		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 dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		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 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 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
Micrognathus micronotopterus Tidepool Pipefish [66255]		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
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
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Breeding known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat likely 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
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely 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 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
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis coggeri Slender-necked Seasnake [25925]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 inornatus Plain Seasnake [1107]		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
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to 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 Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within

Name	Status	Type of Presence
		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
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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to 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
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding 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

Name	Status	Type of Presence
		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	Special Purpose Zone (IUCN VI)
Argo-Rowley Terrace	Multiple Use Zone (IUCN VI)
Argo-Rowley Terrace	National Park Zone (IUCN II)
Dampier	Habitat Protection Zone (IUCN IV)
Dampier	Multiple Use Zone (IUCN VI)
Eighty Mile Beach	Multiple Use Zone (IUCN VI)
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Gascoyne	National Park Zone (IUCN II)
Joseph Bonaparte Gulf	Multiple Use Zone (IUCN VI)
Kimberley	Multiple Use Zone (IUCN VI)
Ningaloo	Recreational Use Zone (IUCN IV)
Oceanic Shoals	Multiple Use Zone (IUCN VI)
Roebuck	Multiple Use Zone (IUCN VI)
Shark Bay	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Bardi Jawi	WA
Dambimangari	WA
Dambimangari	WA
Dirk Hartog Island	WA
Faure Island	WA
Little Rocky Island	WA
Tent Island	WA
Unnamed WA36913	WA
Unnamed WA36915	WA
Uunguu	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
Passer montanus Eurasian Tree Sparrow [406]		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
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may 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 asinus Donkey, Ass [4]		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
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat may 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
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Exmouth Gulf East	WA
Hamelin Pool	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
Carbonate bank and terrace system of the Sahul	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Pinnacles of the Bonaparte Basin	North-west
Wallaby Saddle	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

-11.269933 127.440005,-12.516962 128.274966,-13.416271 128.362857,-13.854015 128.406802,-14.652617 128.879214,-14.833236 128.956119,-14.737633 128.439761,-14.280288 127.769595,-13.864681 127.385074,-13.864681 127.143375,-13.67261 126.934634,-13.875347 126.418277,-13.843348 126.242496,-13.896678 125.967837,-14.077907 125.934878,-14.34416 125.836001,-14.216398 125.649234,-14.461212 125.099918,-14.641988 125.044986,-14.88633 125.143863,-14.971254 124.990054,-15.257624 124.649478,-15.268222 124.231998,-15.416549 124.16608,-15.490673 124.407779,-16.293713 124.286929,-16.072142 123.616763,-16.219884 123.429996,-16.567693 123.408023,-16.778181 123.561832,-16.914874 123.704654,-17.114478 123.397037,-16.546631 123.034488,-16.251529 123.078433,-16.704537 122.540103,-17.135476 122.144595,-17.502564 122.056705,-18.244939 122.078677,-18.432649 121.738101,-18.76585 121.551334,-19.45099 121.100894,-19.999097 119.584781,-19.906155 119.101382,-20.236365 118.727847,-20.308506 118.112613,-20.648142 117.321597,-20.555589 116.948062,-20.360014 117.01398,-20.318809 116.816226,-20.802273 116.26691,-20.822812 116.113101,-21.468342 115.377017,-21.754335 114.629947,-22.344932 114.355289,-22.202601 114.146548,-21.67268 114.245425,-21.886924 113.849918,-22.669716 113.586246,-23.003846 113.751041,-23.458145 113.696109,-24.031352 113.300601,-24.51208 113.311587,-25.893759 114.135562,-26.258875 114.003726,-25.953045 113.926822,-25.398562 113.45441,-25.686027 113.366519,-26.249022 113.641177,-26.229314 113.509341,-25.378711 112.949039,-25.557248 112.839175,-26.485263 113.256656,-27.161748 113.816959,-27.571531 114.036685,-27.552052 113.113834,-27.151972 112.981998,-25.368784 112.278873,-26.022173 110.389224,-25.893759 110.323306,-25.804776 109.872867,-25.537424 109.587222,-25.626608 109.23566,-24.582033 109.389468,-23.306884 109.872867,-22.882439 110.026675,-21.621623 110.169498,-20.945986 110.510074,-20.030065 110.949527,-19.025706 112.092105,-17.816621 112.981998,-17.271909 113.773013,-16.935895 115.442935,-15.681156 116.014224,-14.790751 116.89313,-14.056594 118.266421,-13.266614 118.42023,-13.949995 120.046207,-13.234532 121.825992,-12.838516 122.529117,-12.15205 122.51813,-11.883411 122.726871,-11.786636 123.067447,-11.926411 123.440982,-12.248693 123.583804,-11.63603 125.737125,-11.334573 126.539126,-11.280707 127.440005,-11.269933 127.440005

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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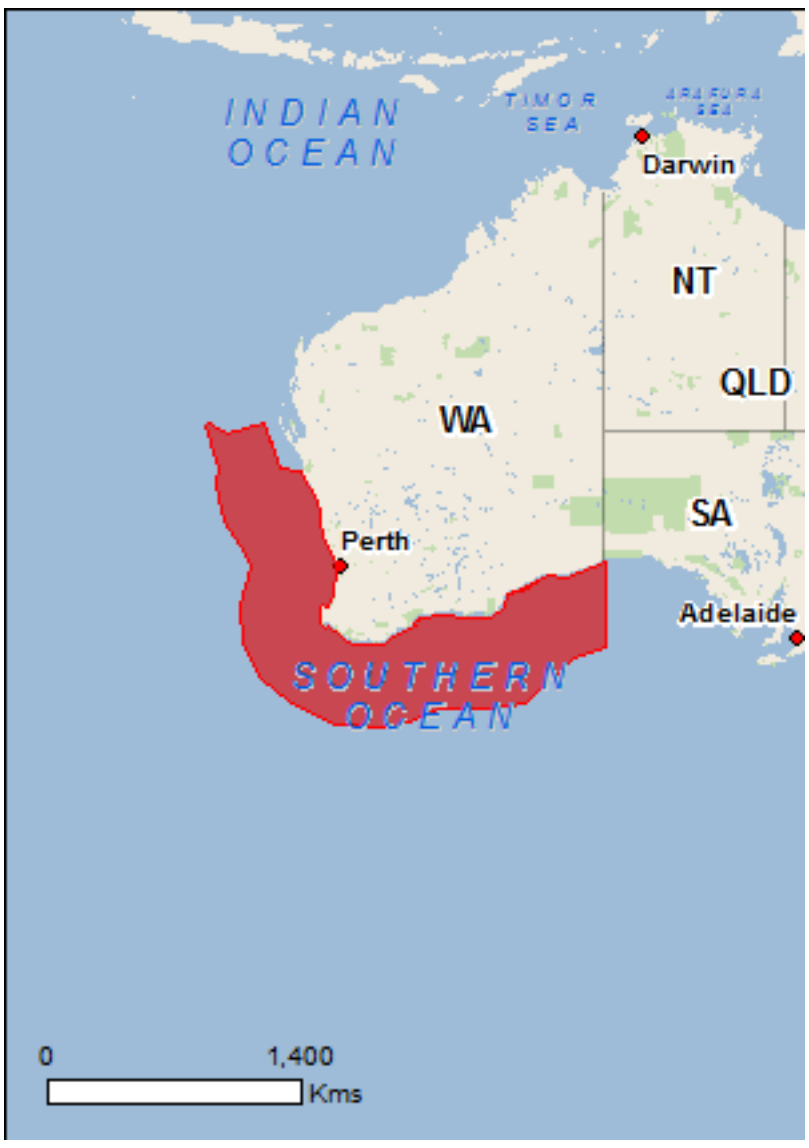
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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.

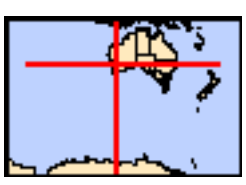
Report created: 10/05/21 12:51:00



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 1.0Km



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:	1
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	65
Listed Migratory Species:	67

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:	2
Commonwealth Heritage Places:	1
Listed Marine Species:	106
Whales and Other Cetaceans:	40
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	21

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	10
Regional Forest Agreements:	None
Invasive Species:	42
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	8

Details

Matters of National Environmental Significance

National Heritage Properties [Resource Information]

Name	State	Status
Indigenous		
Cheetup Rock Shelter	WA	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Becher point wetlands	Within 10km of Ramsar
Forrestdale and thomsons lakes	Within 10km of Ramsar
Peel-yalgorup system	Within 10km of Ramsar
Vasse-wonnerup system	Within 10km of Ramsar

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
South-west

Listed Threatened Ecological Communities [Resource Information]

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.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community may occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Atrichornis clamosus		
Noisy Scrub-bird, Tjimiluk [654]	Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Breeding 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 mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	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 antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may 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	Endangered	Species or species

Name	Status	Type of Presence
[1060]		habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pezoporus flaviventris Western Ground Parrot, Kyloring [84650]	Critically Endangered	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour 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	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	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
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 penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Breeding known to occur within area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat known to occur within area
Petrogale lateralis hacketti Recherche Rock-wallaby [66849]	Vulnerable	Species or species habitat known to occur within area
Potorous gilbertii Gilbert's Potoroo, Ngilkat [66642]	Critically Endangered	Translocated population known to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat may occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat known to occur within area
Plants		
Caladenia elegans Elegant Spider-orchid [56775]	Endangered	Species or species habitat may occur within area
Caladenia granitora [65292]	Endangered	Species or species habitat may occur within area
Caladenia hoffmanii Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Drummondita ericoides Morseby Range Drummondita [9193]	Endangered	Species or species habitat likely to occur within area
Eucalyptus insularis Twin Peak Island Mallee [3057]	Endangered	Species or species habitat likely to occur within area
Isopogon uncinatus Albany Cone Bush, Hook-leaf Isopogon [20871]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
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 may occur within area
Liopholis pulchra longicauda		
Jurien Bay Skink, Jurien Bay Rock-skink [83162]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour 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
Rhincodon typus		
Whale Shark [66680]	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 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]		Breeding known to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat may occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Ardenna tenuirostris		
Short-tailed Shearwater [82652]		Breeding known to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to 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
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within 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	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	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		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known 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

Name	Threatened	Type of Presence
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
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may 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	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour 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
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to 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	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Foraging, feeding or related behaviour known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely 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 likely to 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 mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - HMAS STIRLING-ROCKINGHAM ;HMAS STIRLING - GARDEN ISLAND

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Garden Island	WA	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may 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 likely to occur within area
Calidris alba		
Sanderling [875]		Species or species

Name	Threatened	Type of Presence
		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 likely to 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
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Breeding 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 mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		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 antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area

Name	Threatened	Type of Presence
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		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
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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma macroptera Great-winged Petrel [1035]		Breeding known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Breeding known to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Sterna anaethetus Bridled Tern [814]		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
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	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
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		

Name	Threatened	Type of Presence
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		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 subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		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
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		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
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
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Breeding known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Breeding known to occur within area
Reptiles		
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
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour 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 area

Name	Threatened	Type of Presence
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
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour 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
Berardius arnuxii		
Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known 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

Name	Status	Type of Presence
		area
Hyperoodon planifrons Southern Bottlenose Whale [71]		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
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour 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 hectori Hector's Beaked Whale [76]		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
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Foraging, feeding or related behaviour known to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tasmacetus shepherdi Shepherd's Beaked Whale, Tasman Beaked Whale [55]		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 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	Special Purpose Zone (IUCN VI)
Bremer	National Park Zone (IUCN II)
Bremer	Special Purpose Zone (Mining
Eastern Recherche	National Park Zone (IUCN II)
Eastern Recherche	Special Purpose Zone (IUCN VI)
Geographe	Habitat Protection Zone (IUCN IV)
Geographe	Multiple Use Zone (IUCN VI)
Geographe	National Park Zone (IUCN II)
Geographe	Special Purpose Zone (Mining
Great Australian Bight	Special Purpose Zone (Mining
Jurien	Special Purpose Zone (IUCN VI)
South-west Corner	Habitat Protection Zone (IUCN IV)
South-west Corner	Multiple Use Zone (IUCN VI)
South-west Corner	National Park Zone (IUCN II)
South-west Corner	Special Purpose Zone (IUCN VI)
South-west Corner	Special Purpose Zone (Mining
Twilight	National Park Zone (IUCN II)
Twilight	Special Purpose Zone (Mining
Two Rocks	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Bald Island	WA
Boullanger, Whitlock, Favourite, Tern And Osprey Islands	WA
Eclipse Island	WA
Escape Island	WA
Flinders Bay	WA
Penguin Island	WA
Recherche Archipelago	WA
St Alouarn Island	WA
Unnamed WA44682	WA
Unnamed WA48968	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		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		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
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82654]		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
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		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 norvegicus Brown Rat, Norway Rat [83]		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
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		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

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 90-120m depth	South-west
Commonwealth marine environment surrounding	South-west
Commonwealth marine environment within and	South-west
Commonwealth marine environment within and	South-west
Diamantina Fracture Zone	South-west
Naturaliste Plateau	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

-25.765206 109.237891,-25.725623 109.501563,-25.992551 109.732276,-25.992551 109.875098,-26.071525 110.182716,-26.229314 110.325538,-25.656321 112.127296,-27.717513 112.984229,-27.814726 114.02793,-28.202708 114.159766,-28.483117 114.445411,-28.695347 114.577247,-28.974447 114.599219,-29.147305 114.818946,-29.530391 114.950782,-29.921554 114.89585,-30.746498 115.082618,-31.517621 115.533057,-31.863505 115.730811,-32.523601 115.67588,-32.634692 115.544044,-33.16049 115.620948,-33.619137 115.302344,-33.49096 114.994727,-33.737988 114.928809,-34.275319 114.972755,-34.46575 115.126563,-34.366055 115.269385,-34.818257 115.917579,-34.908402 116.060401,-35.106373 116.598731,-35.11536 117.389747,-35.169263 117.774268,-35.169263 118.081885,-34.980447 118.312598,-34.402321 119.663917,-34.30255 119.56504,-34.029844 119.883643,-33.938746 120.960303,-33.911398 121.399757,-34.011632 121.949073,-34.102652 122.476417,-34.038948 123.432227,-33.591687 124.091407,-33.10529 124.212257,-32.902593 125.014258,-32.319576 126.134864,-32.375265 127.123633,-31.760809 129.035255,-35.294897 129.068214,-35.634921 127.541114,-37.453004 125.157081,-37.696807 123.058692,-37.688114 120.817481,-38.46644 118.664161,-38.337294 115.697852,-37.418109 113.368751,-36.584603 112.028419,-34.998448 111.061622,-33.545916 110.973731,-31.984725 111.512061,-31.414542 111.270362,-30.026241 110.182716,-28.396173 109.798194,-27.756409 109.875098,-25.765206 109.237891,-25.765206 109.237891

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX B. SUPPORTING FIGURES FOR SECTION 2.3 METEOROLOGY AND OCEANOGRAPHY

Browse

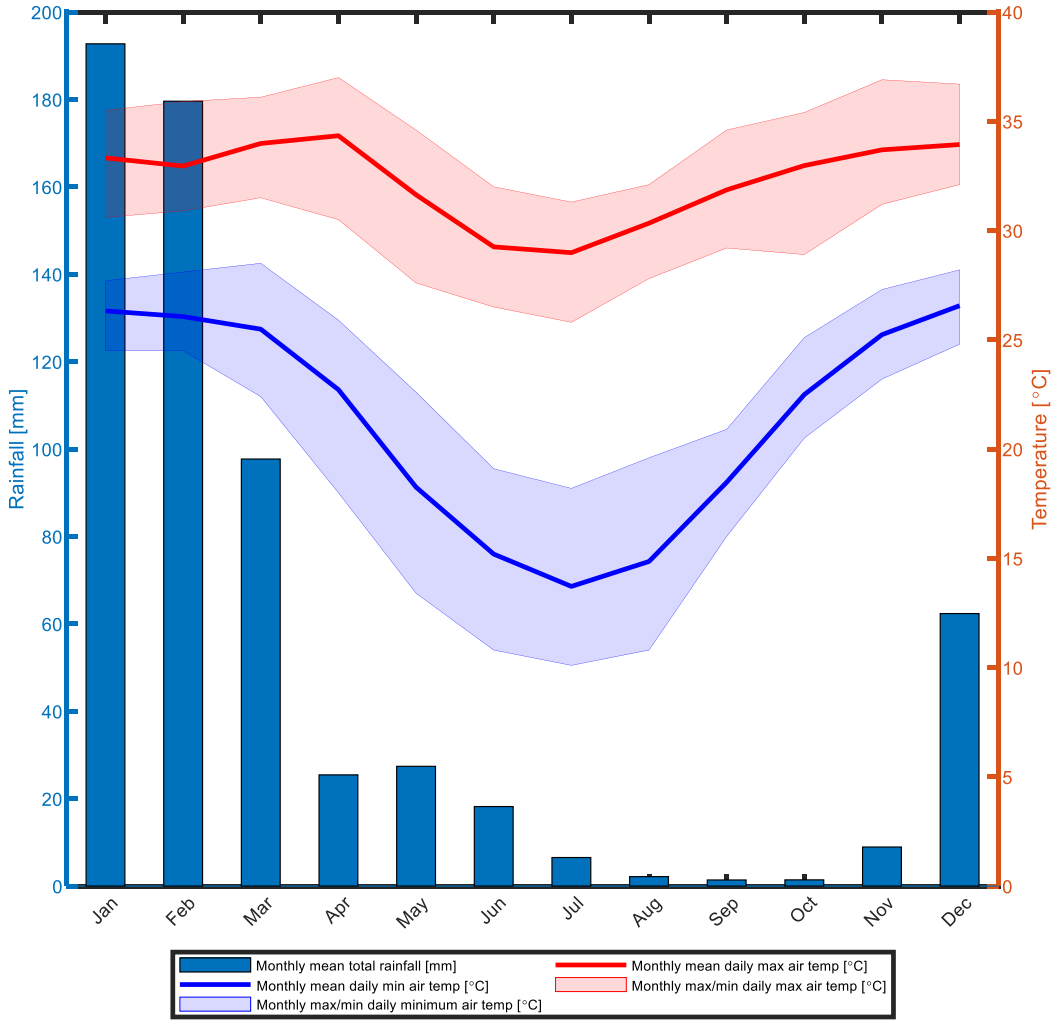


Figure 1. Monthly average total rainfall [mm] and air temperature [°C], calculated based on observations at the Broome Airport weather station from 1939-2020 (Bureau of Meteorology 2020). Bars show the monthly average total rainfall values, and thick blue and red lines denote monthly average daily minimum and maximum air temperatures, respectively. Shaded blue and red areas denote monthly recorded extremes of daily minimum and maximum air temperature, respectively.

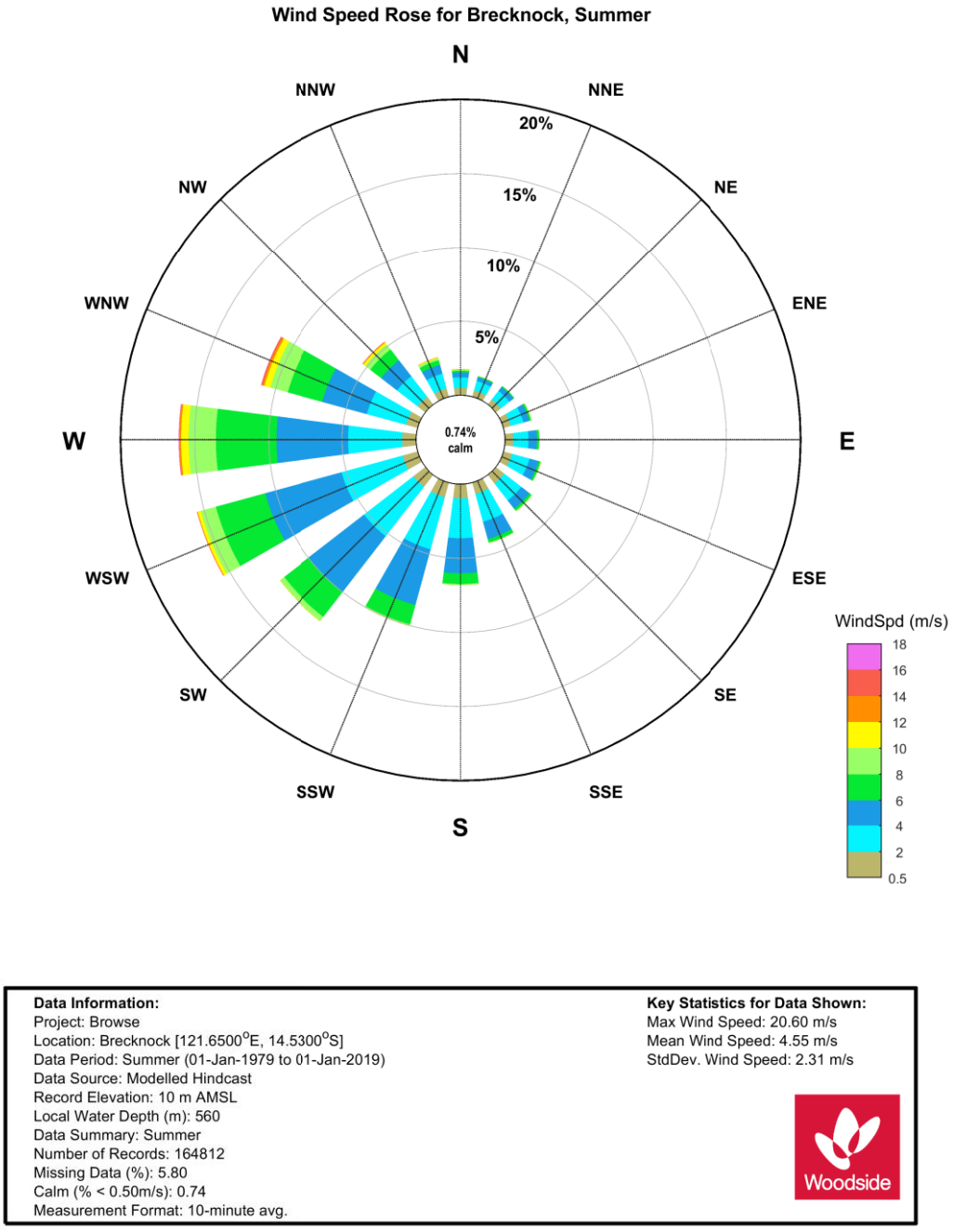
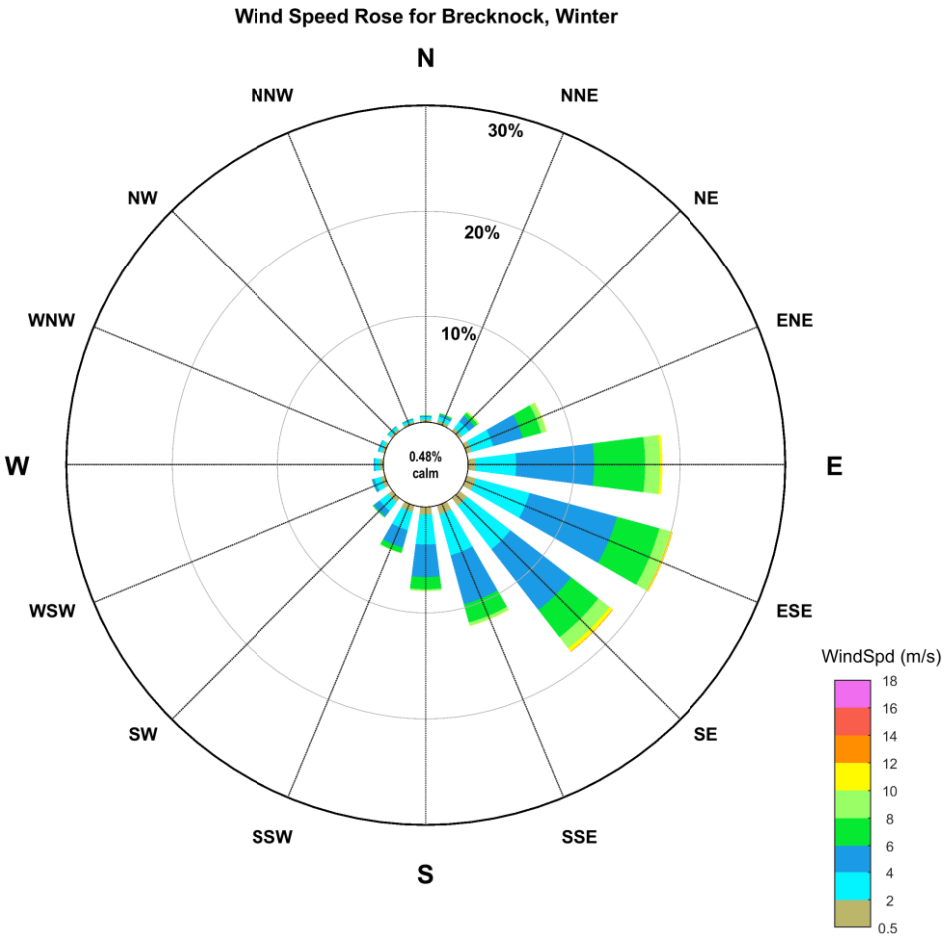


Figure 2. Summer distributions of 10-minute average wind speeds by 22.5° directional sectors at the Brecknock site (Metocean Solutions Ltd, 2019). Note tropical cyclone events were not included in this distribution. Winds at Brecknock in summer are predominantly from the WNW to SW due to the North West Monsoon (WEL, 2019).



Data Information:
Project: Browse
Location: Brecknock [121.6500°E, 14.5300°S]
Data Period: Winter (01-Apr-1979 to 30-Sep-2018)
Data Source: Modelled Hindcast
Record Elevation: 10 m AMSL
Local Water Depth (m): 560
Data Summary: Winter
Number of Records: 173751
Missing Data (%): 1.10
Calm (% < 0.50m/s): 0.48
Measurement Format: 10-minute avg.

Key Statistics for Data Shown:
Max Wind Speed: 14.34 m/s
Mean Wind Speed: 4.71 m/s
StdDev. Wind Speed: 2.01 m/s

Woodside

Figure 3. Winter distributions of 10-minute average wind speeds by 22.5° directional sectors at the Brecknock site (Metocean Solutions Ltd, 2019). Note tropical cyclone events were not included in this distribution. Winds at Brecknock in winter are predominantly from the E to SE due to the South East Trade Winds coming from the Australian mainland (WEL, 2019).

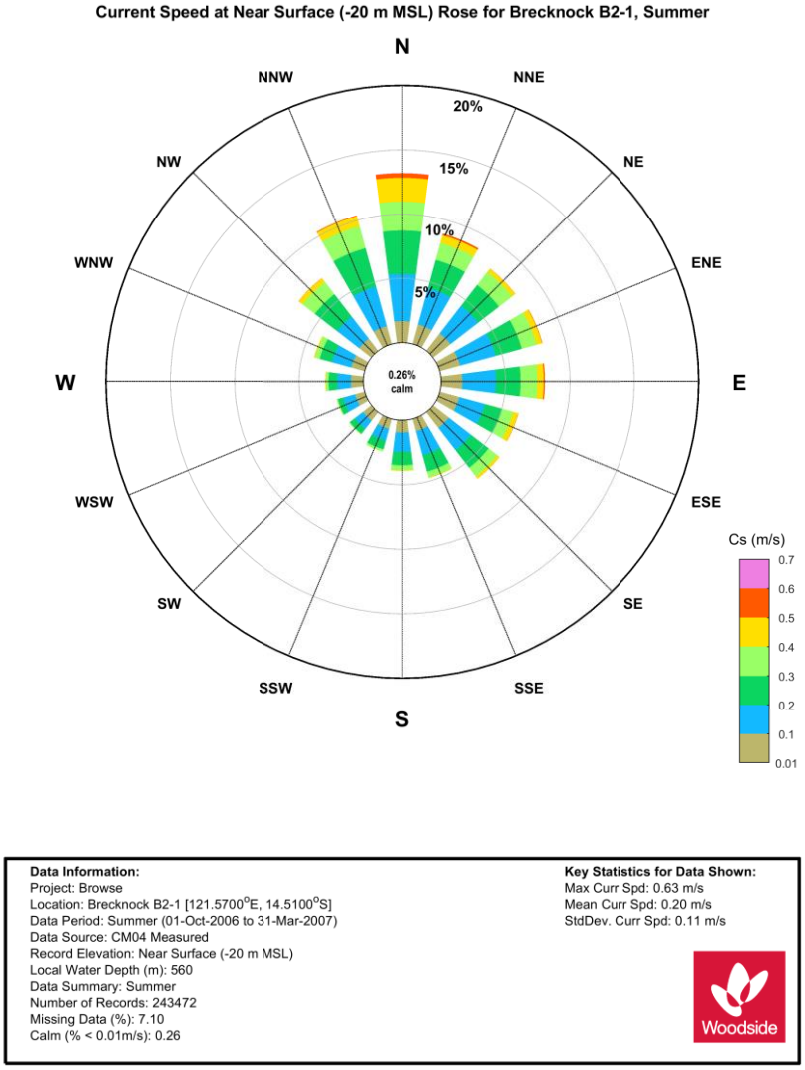
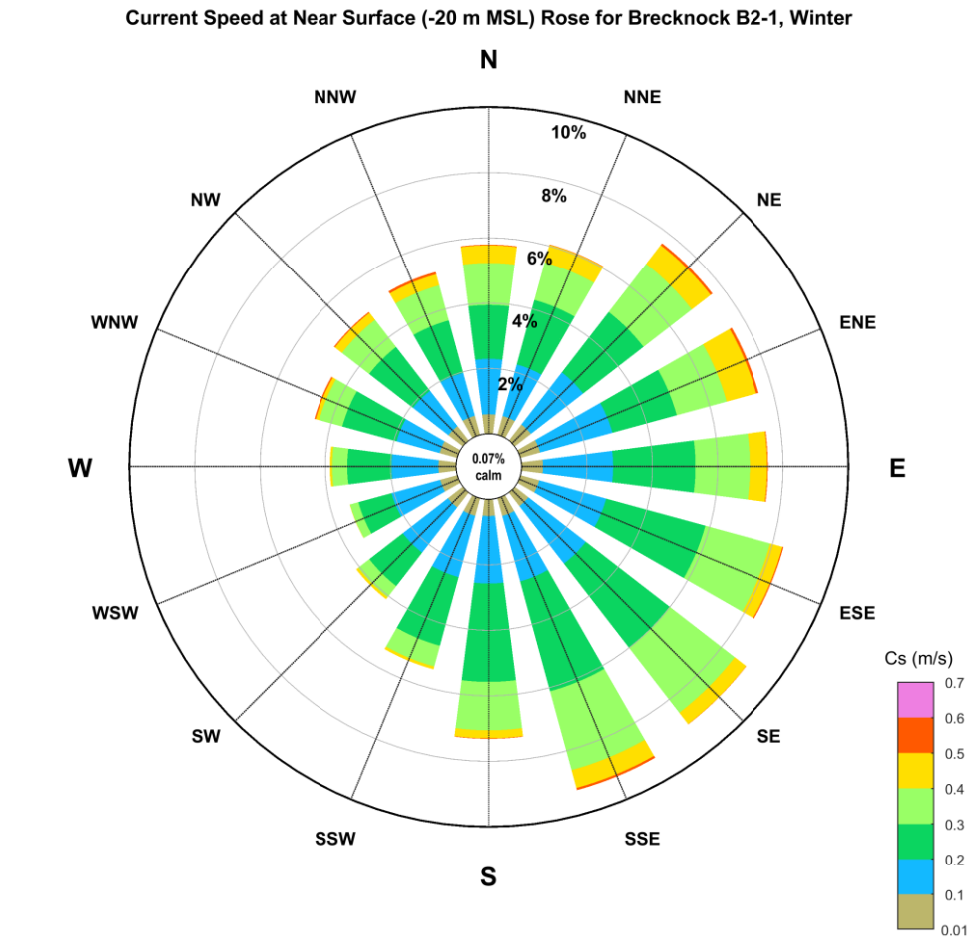


Figure 4. Summer (Nov-Apr) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at Brecknock B2-1 location (cyclones removed) (RPS Metocean Ltd. 2008).



Data Information:
Project: Browse
Location: Brecknock B2-1 [121.5700°E, 14.5100°S]
Data Period: Winter (17-Sep-2006 to 08-Sep-2007)
Data Source: CM04 Measured
Record Elevation: Near Surface (-20 m MSL)
Local Water Depth (m): 560
Data Summary: Winter
Number of Records: 246184
Missing Data (%): 1.46
Calm (% < 0.01m/s): 0.07

Key Statistics for Data Shown:
Max Curr Spd: 0.62 m/s
Mean Curr Spd: 0.24 m/s
StdDev. Curr Spd: 0.10 m/s

Woodside

Figure 5. Winter (May-Sep) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at Brecknock B2-1 location (cyclones removed) (RPS Metocean Ltd. 2008).

North-west Shelf/Scarborough

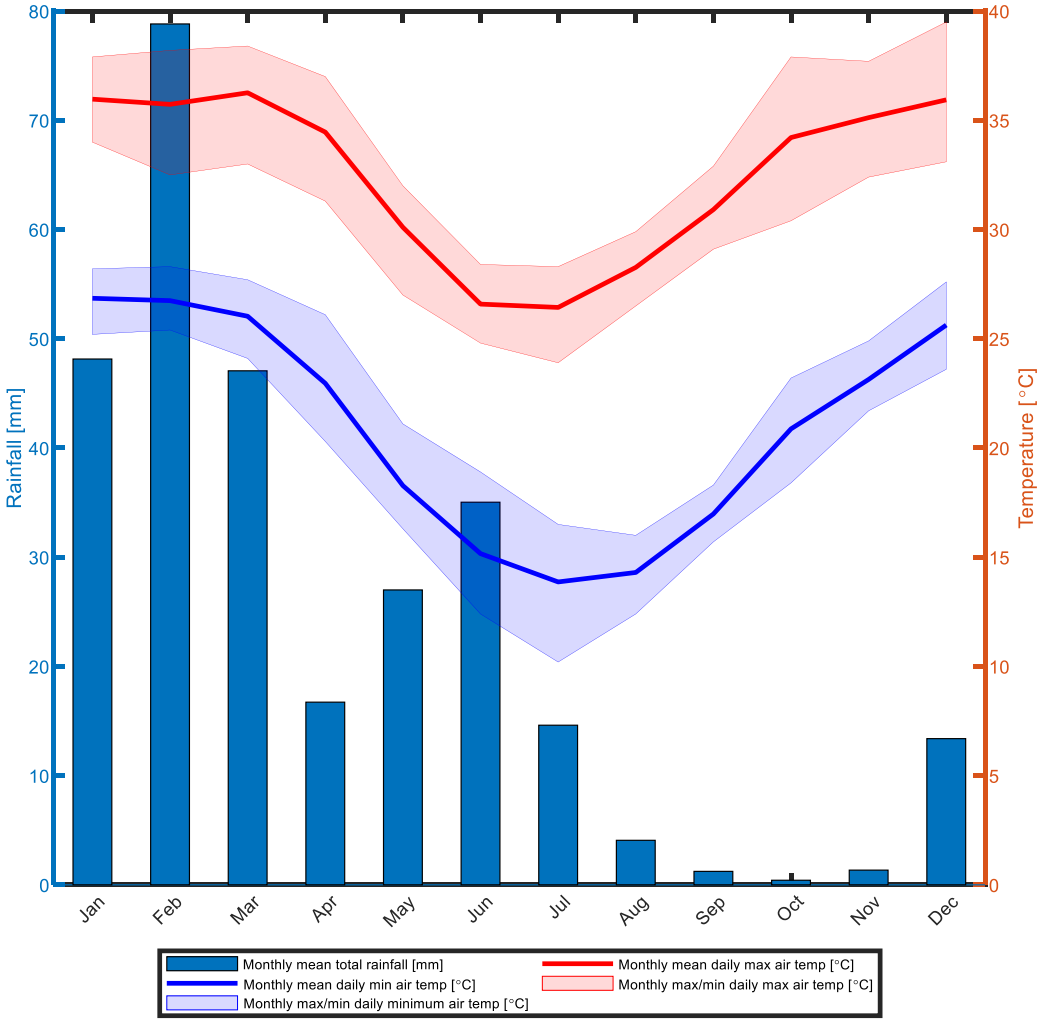
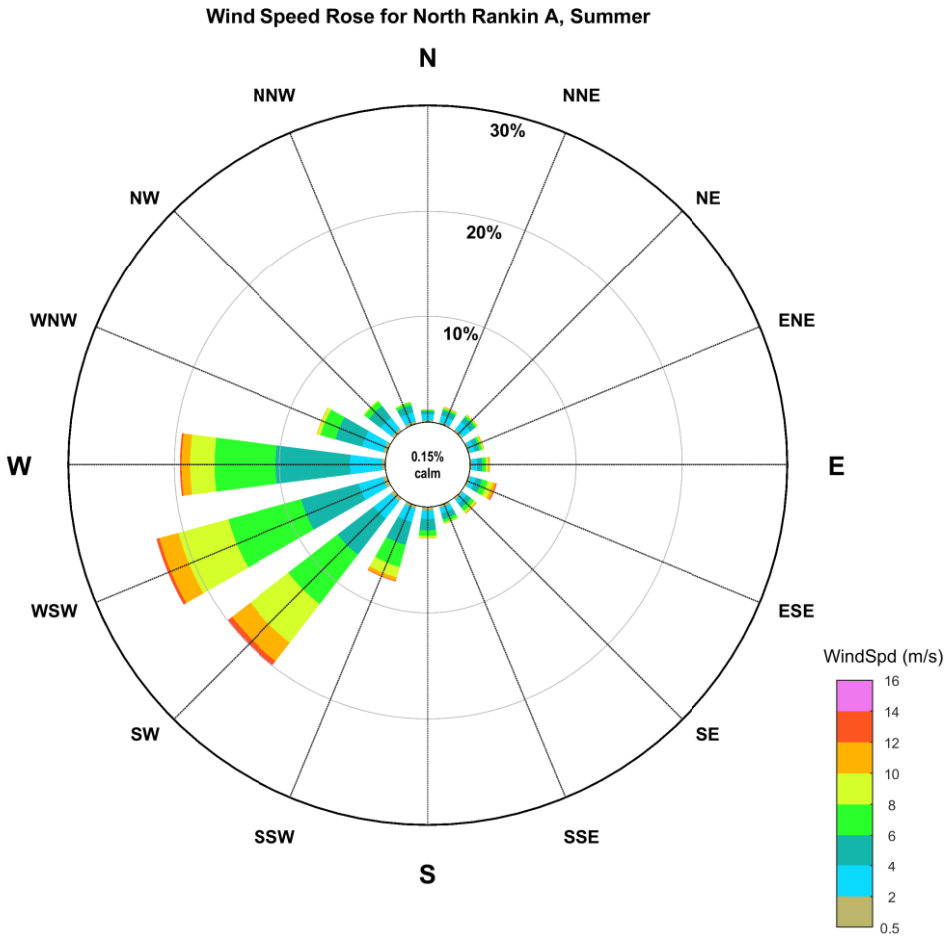


Figure 1. Monthly average total rainfall [mm] and air temperature [°C], calculated based on observations at the Karratha Aero weather station from 1972-2020 and 1993-2020 respectively (Bureau of Meteorology 2020). Bars show the monthly average total rainfall values, and thick blue and red lines denote monthly average daily minimum and maximum air temperatures, respectively. Shaded blue and red areas denote monthly recorded extremes of daily minimum and maximum air temperature, respectively.

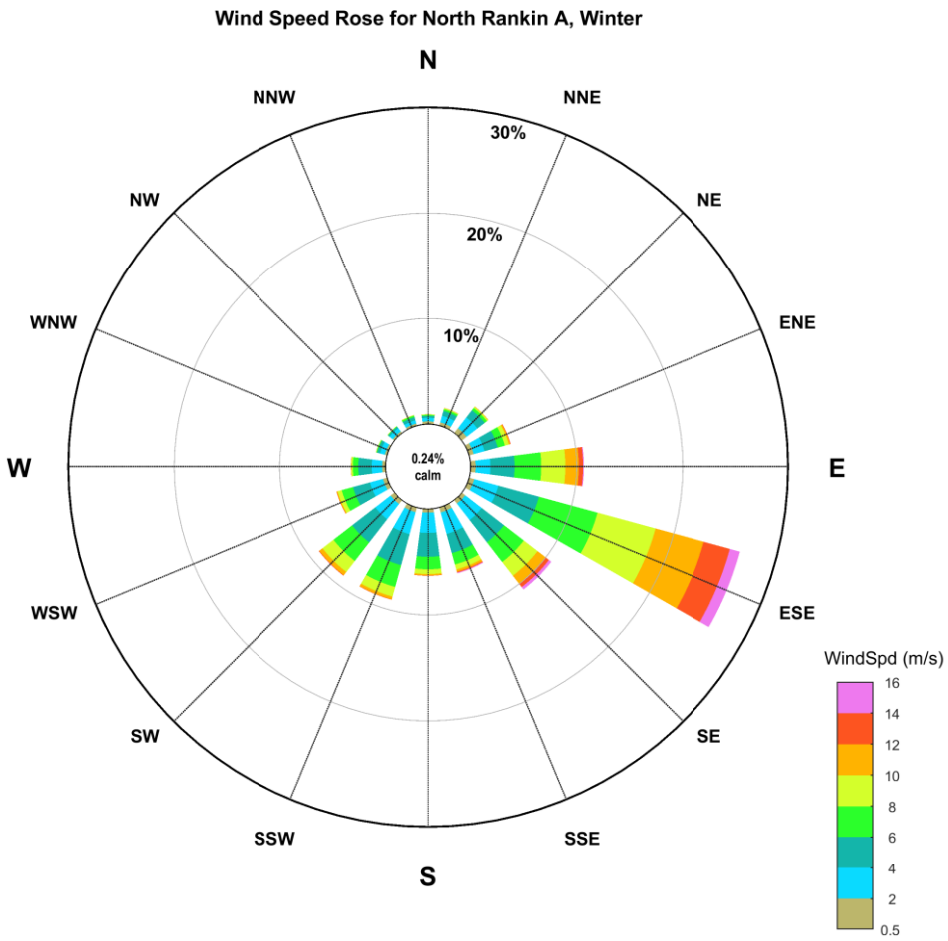


Data Information:
Project: North West Shelf
Location: North Rankin A [116.1200°E, 19.6100°S]
Data Period: Summer (01-Oct-1995 to 30-Nov-2015)
Data Source: Measured Winds
Record Elevation: 10 m AMSL
Local Water Depth (m): 125
Data Summary: Summer
Number of Records: 674659
Missing Data (%): 7.24
Calm (% < 0.50m/s): 0.15
Measurement Format: 10-minute avg.

Key Statistics for Data Shown:
Max Wind Speed: 18.50 m/s
Mean Wind Speed: 6.04 m/s
StdDev. Wind Speed: 2.55 m/s

Woodside

Figure 2. Summer distributions of 10-minute average wind speeds by 22.5° directional sectors at the North Rankin A site (WEL, 2015). Note tropical cyclone events were not included in this distribution. Winds at North Rankin A in summer are characterised by W to SW driven by the North West Monsoon (RPS, 2016).



Data Information:
Project: North West Shelf
Location: North Rankin A [116.1200°E, 19.6100°S]
Data Period: Winter (22-Jun-1995 to 30-Sep-2015)
Data Source: Measured Winds
Record Elevation: 10 m AMSL
Local Water Depth (m): 125
Data Summary: Winter
Number of Records: 673213
Missing Data (%): 4.43
Calm (% < 0.50m/s): 0.24
Measurement Format: 10-minute avg.

Key Statistics for Data Shown:
Max Wind Speed: 24.23 m/s
Mean Wind Speed: 6.25 m/s
StdDev. Wind Speed: 3.16 m/s

Woodside

Figure 3. Winter distributions of 10-minute average wind speeds by 22.5° directional sectors at the North Rankin A site (WEL, 2015). Note tropical cyclone events were not included in this distribution. Winds at North Rankin in winter are predominantly influenced by the South East Trade Winds over Australia (RPS, 2016).

Scarborough

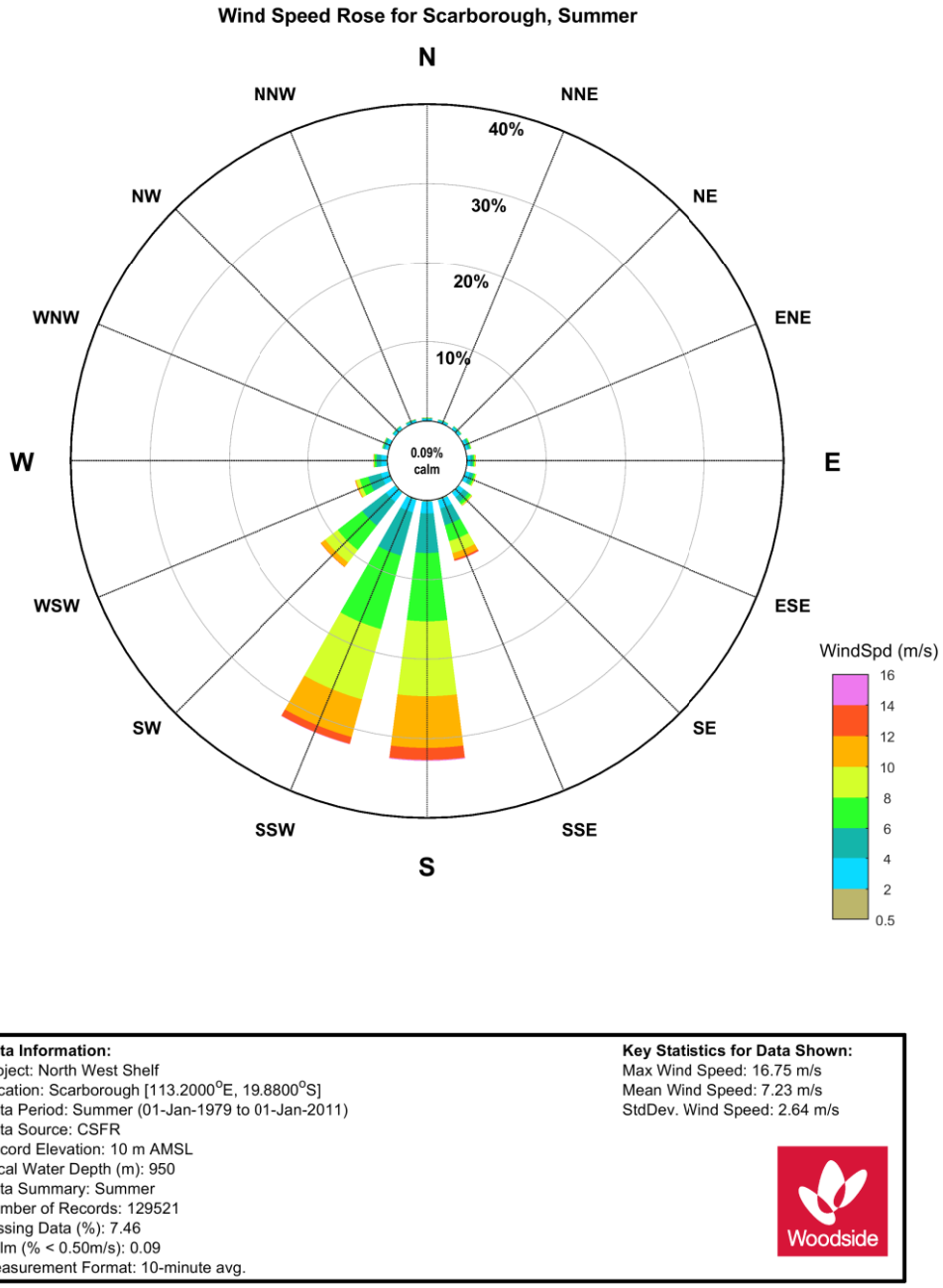
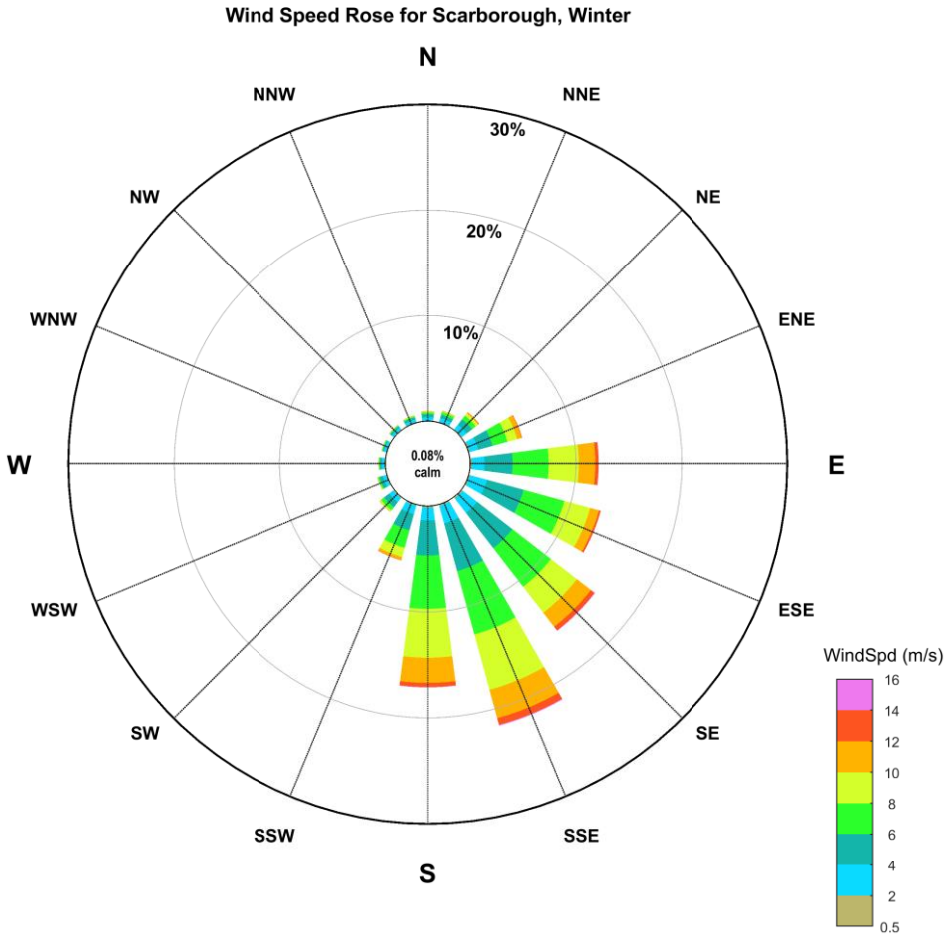


Figure 4. Summer distributions of wind speeds (10-minute at 10m ASL) by 22.5° directional sectors at the Scarborough site (WEL, 2018). Note tropical cyclone events were not included in this distribution. Winds at Scarborough in summer are predominantly from the S to SSW due to a Pilbara Heat Low forming over the northwest coast of Western Australia [R8] SW winds are also experienced at this site due to the monsoon trough.



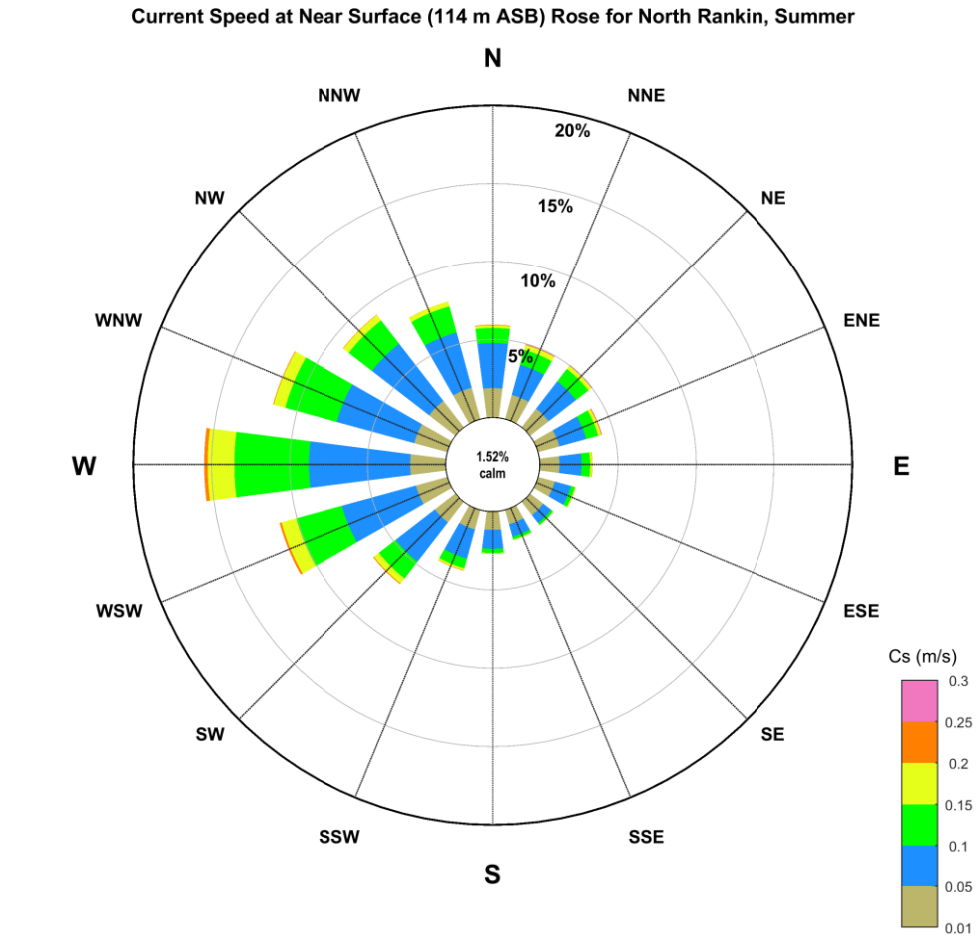
Data Information:
Project: North West Shelf
Location: Scarborough [113.2000°E, 19.8800°S]
Data Period: Winter (01-Apr-1979 to 30-Sep-2010)
Data Source: CSFR
Record Elevation: 10 m AMSL
Local Water Depth (m): 950
Data Summary: Winter
Number of Records: 138863
Missing Data (%): 1.20
Calm (% < 0.50m/s): 0.08
Measurement Format: 10-minute avg.

Key Statistics for Data Shown:
Max Wind Speed: 19.15 m/s
Mean Wind Speed: 6.90 m/s
StdDev. Wind Speed: 2.57 m/s

Woodside

Figure 5. Winter distributions of wind speeds (10-minute at 10 m ASL) by 22.5° directional sectors at the Scarborough site (WEL, 2018). Note tropical cyclone events were not included in this distribution. Winds at Scarborough in winter are predominantly from the S to E driven by the South East Trade Winds over Australia (RPS, 2016).

North-west Shelf

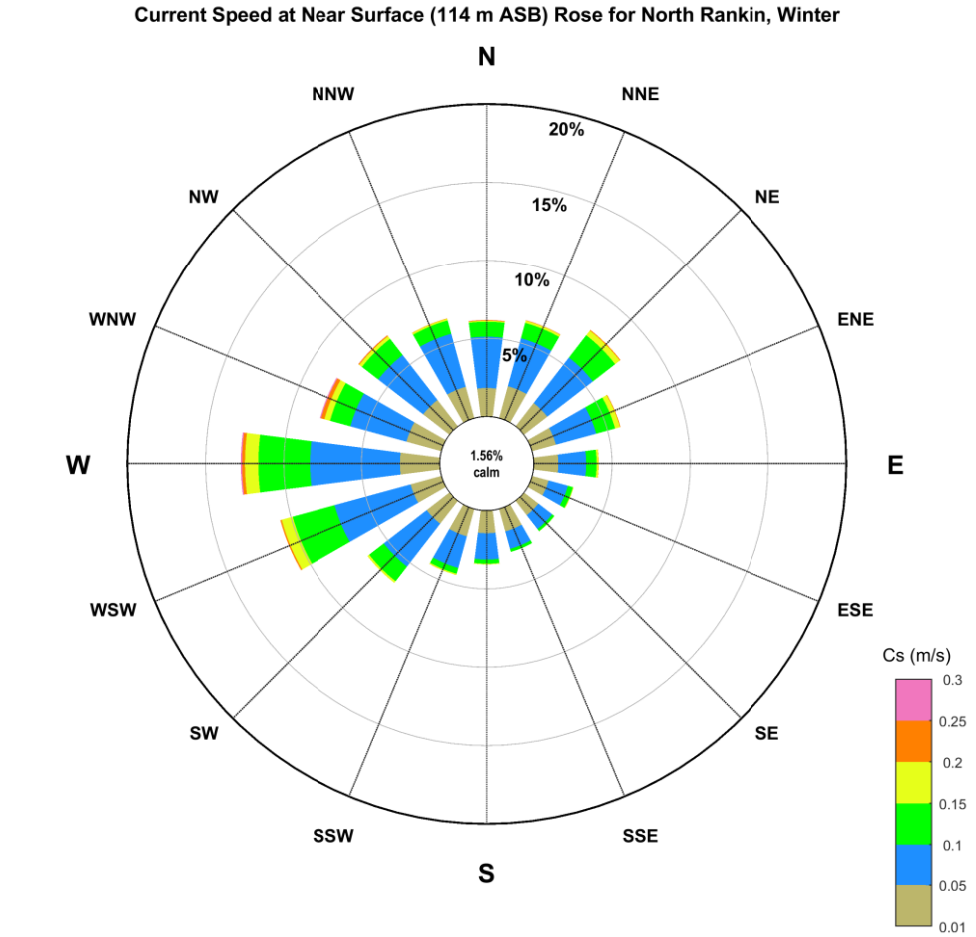


Data Information:
Project: North West Shelf
Location: North Rankin [116.1400°E, 19.5800°S]
Data Period: Summer (01-Oct-2004 to 31-Mar-2009)
Data Source: Measured Data
Record Elevation: Near Surface (114 m ASB)
Local Water Depth (m): 124.5
Data Summary: Summer
Number of Records: 496705
Missing Data (%): 6.63
Calm (% < 0.01m/s): 1.52

Key Statistics for Data Shown:
Max Curr Spd: 0.49 m/s
Mean Curr Spd: 0.08 m/s
StdDev. Curr Spd: 0.04 m/s

Woodside

Figure 6. Summer (Nov-Apr) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at the North Rankin location (cyclones removed) (WEL, 2011).



Data Information:
Project: North West Shelf
Location: North Rankin [116.1400°E, 19.5800°S]
Data Period: Winter (21-Sep-2004 to 08-May-2009)
Data Source: Measured Data
Record Elevation: Near Surface (114 m ASB)
Local Water Depth (m): 124.5
Data Summary: Winter
Number of Records: 337723
Missing Data (%): 0.88
Calm (% < 0.01m/s): 1.56

Key Statistics for Data Shown:
Max Curr Spd: 0.32 m/s
Mean Curr Spd: 0.07 m/s
StdDev. Curr Spd: 0.04 m/s

Woodside

Figure 7. Winter (May-Sep) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at the North Rankin location (cyclones removed) (WEL, 2011).

Scarborough

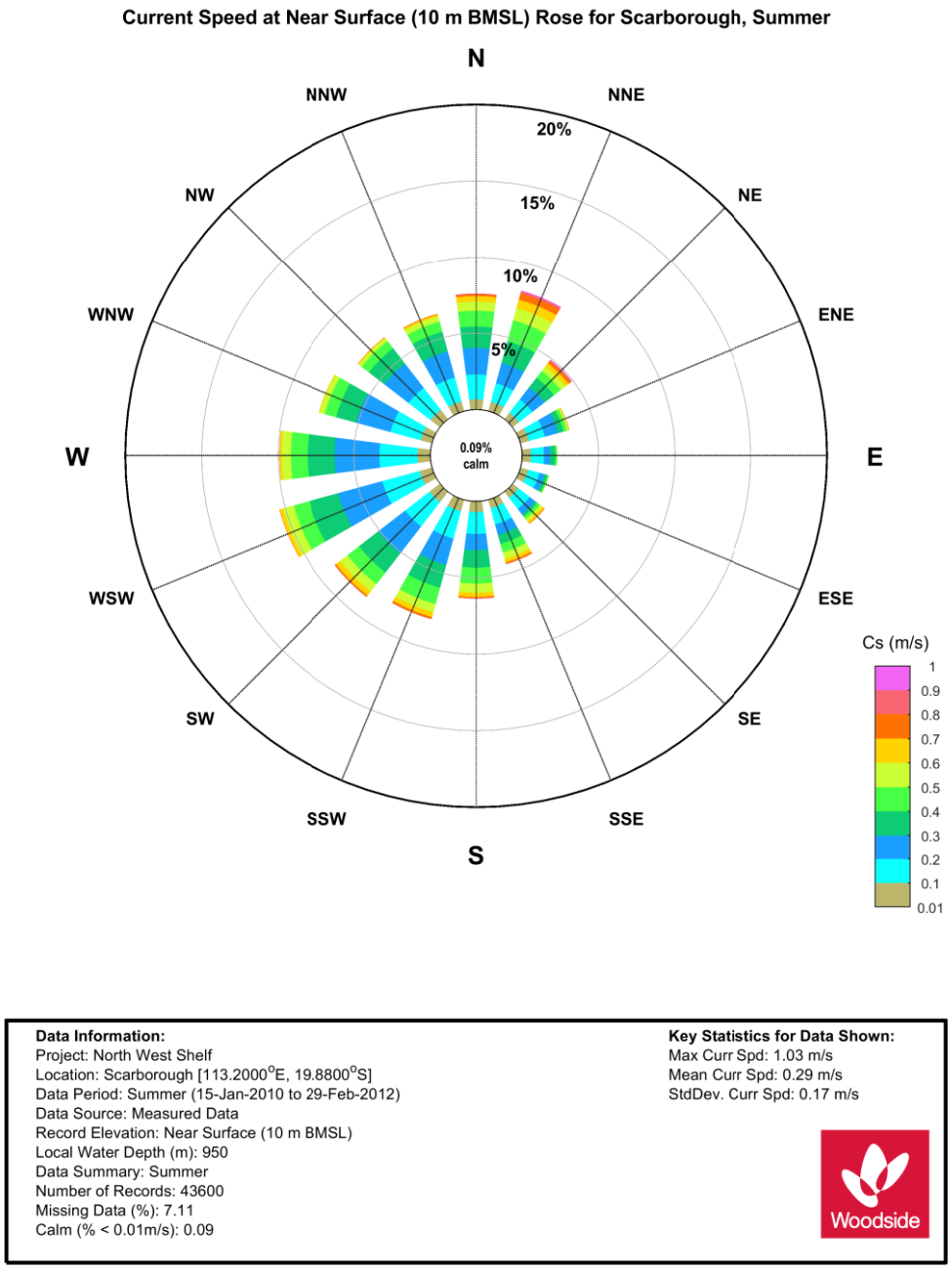


Figure 8. Summer (Nov - April) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at the Scarborough location (cyclones removed) (WEL, 2018).

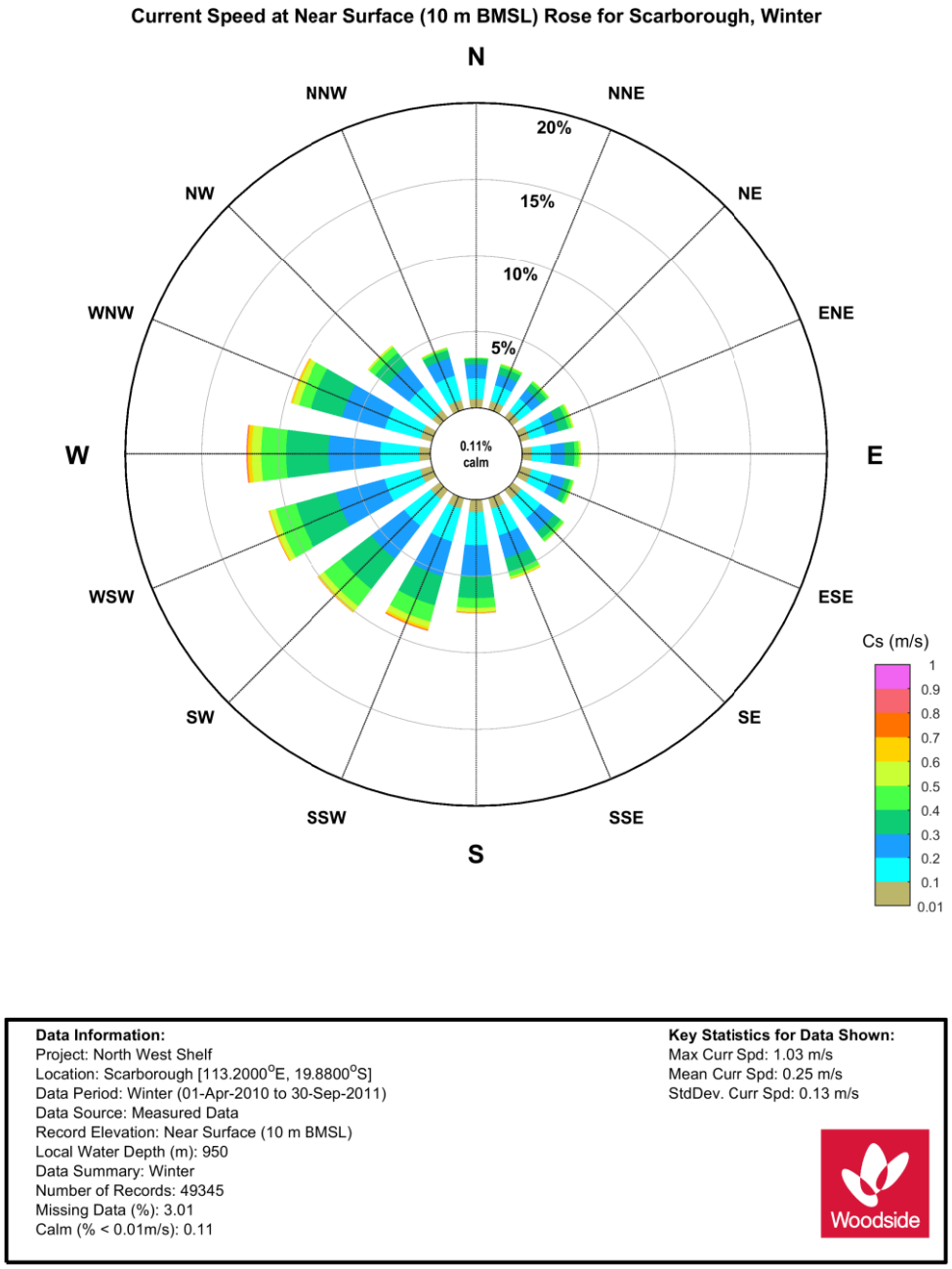


Figure 9. Winter (May-Sep) near surface combined frequency of 1-min mean current speed and direction (towards) measured at the Scarborough location (cyclones removed) (WEL, 2018).

North-west Cape

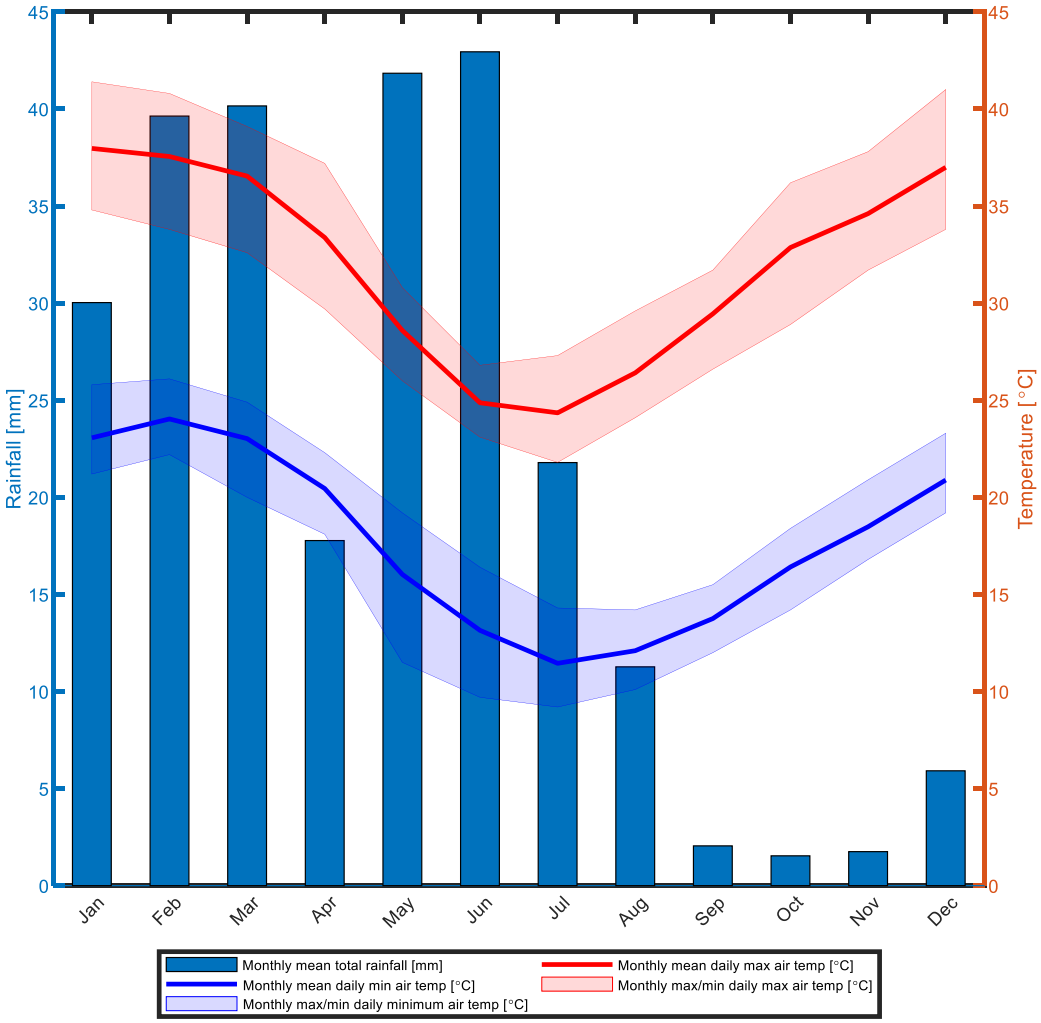


Figure 1. Monthly average total rainfall [mm] and air temperature [°C], calculated based on observations at the Learmonth Airport weather station from 1945-2020 and 1975-2020 respectively (Bureau of Meteorology 2020). Bars show the monthly average total rainfall values, and thick blue and red lines denote monthly average daily minimum and maximum air temperatures, respectively. Shaded blue and red areas denote monthly recorded extremes of daily minimum and maximum air temperature, respectively.

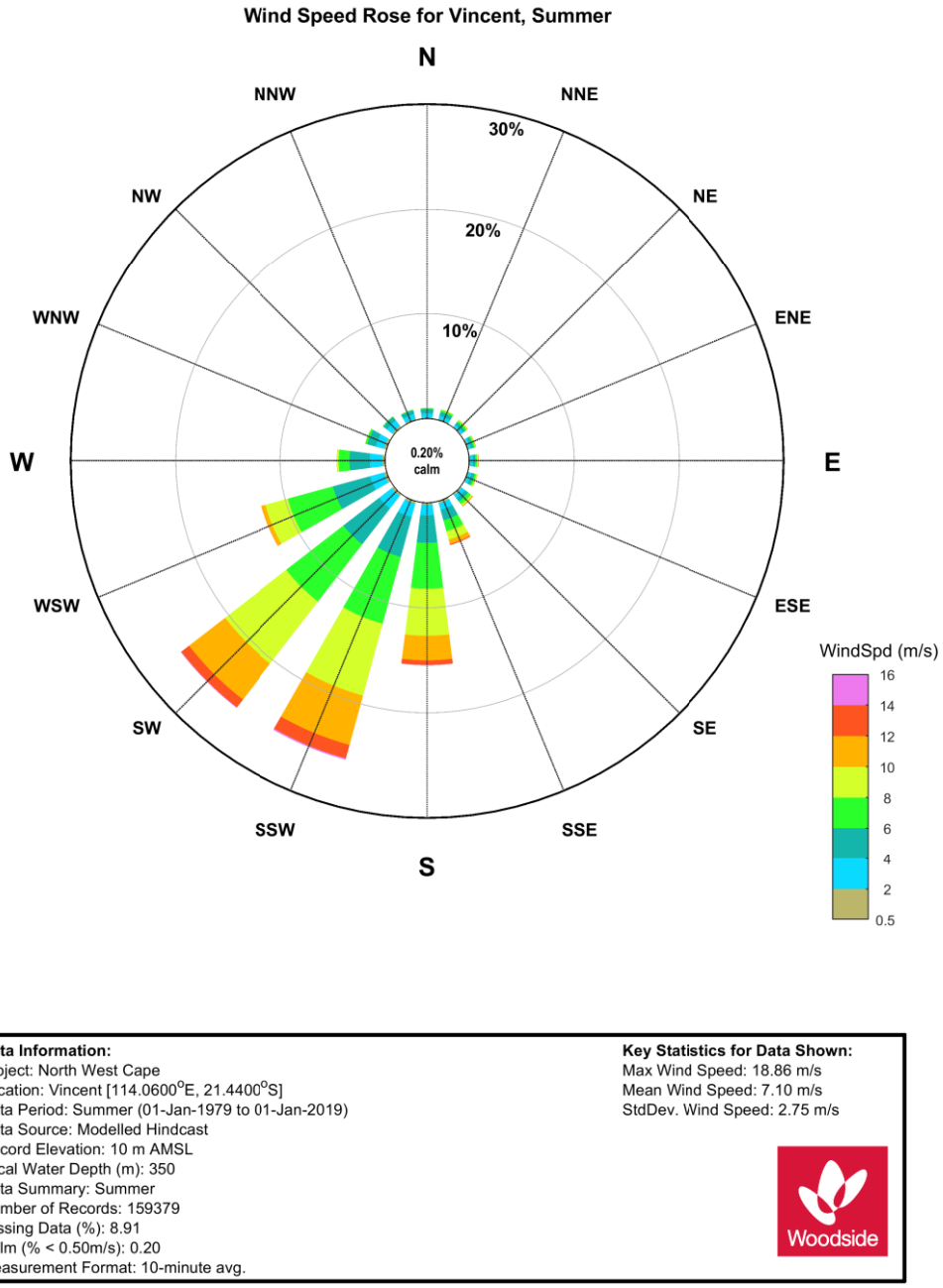
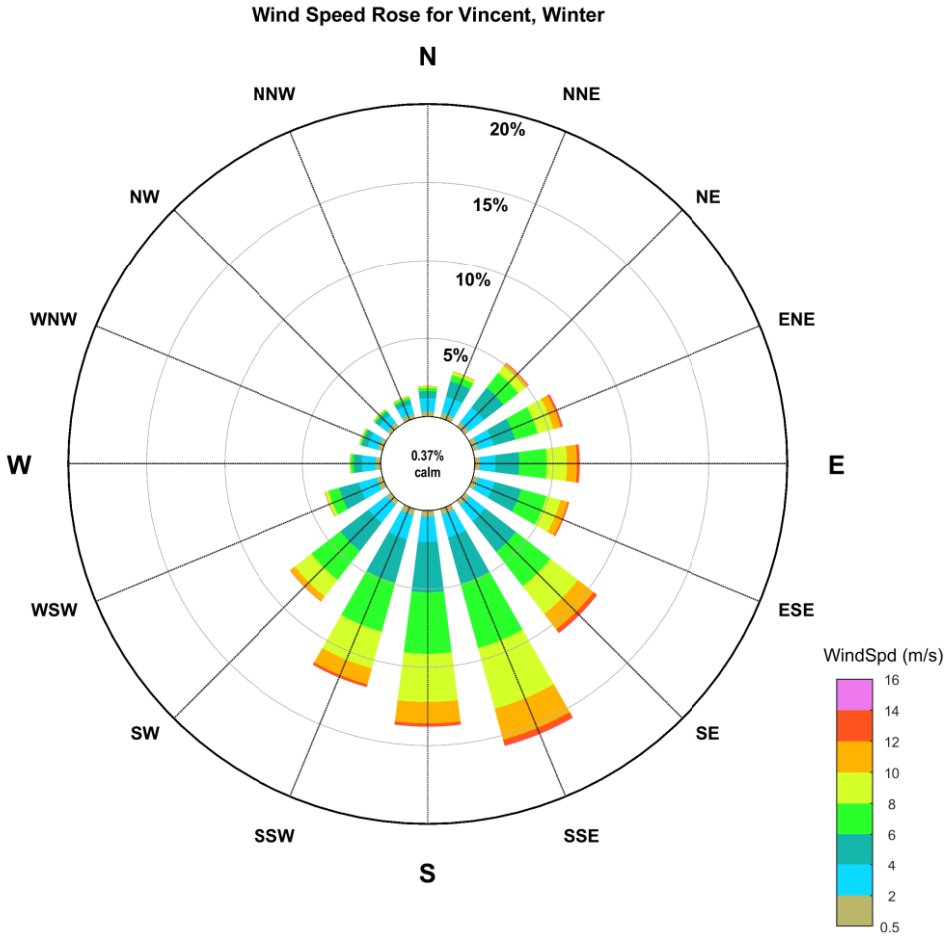


Figure 2. Summer distributions of wind speeds (10-minute at 10 m ASL) by 22.5° directional sectors at the Vincent site (Vincent Metocean). Note tropical cyclone events were not included in this distribution. Winds at Vincent in summer are predominantly from the SW to SSW in summer due to the presence of the Pilbara Heat Low (MetOcean Engineers, 2005).

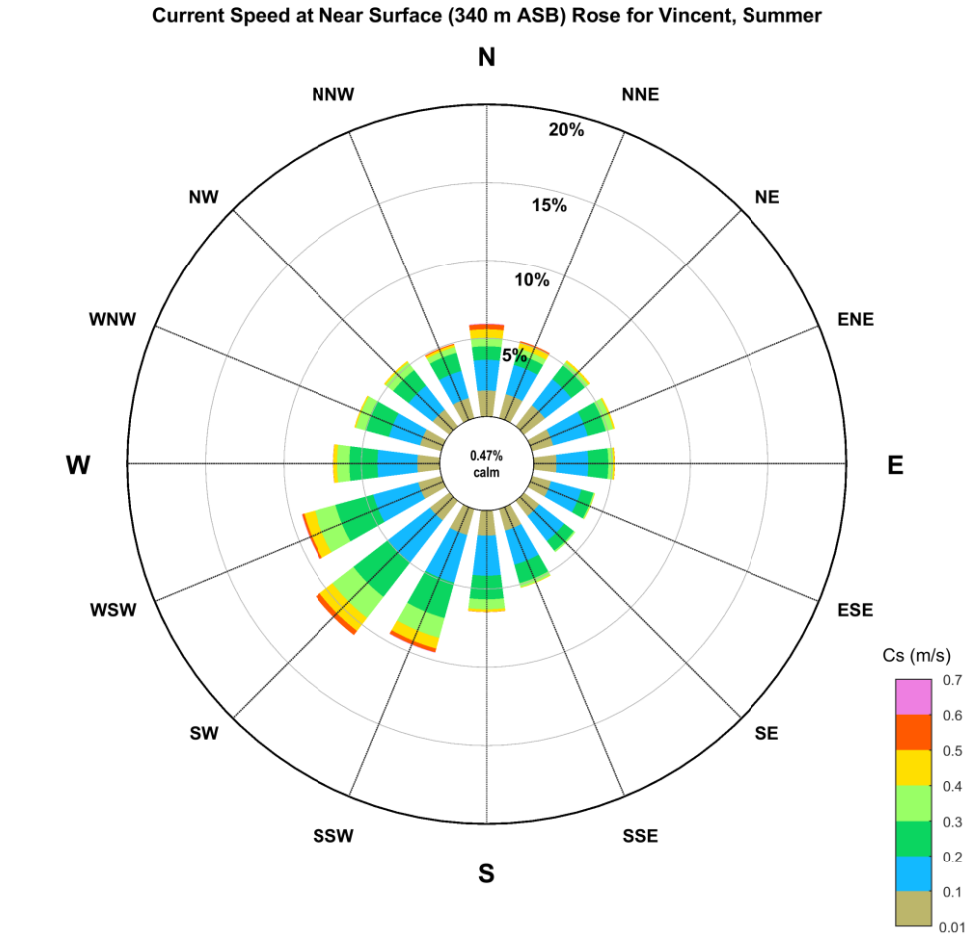


Data Information:
Project: North West Cape
Location: Vincent [114.0600°E, 21.4400°S]
Data Period: Winter (01-Apr-1979 to 30-Sep-2018)
Data Source: Modelled Hindcast
Record Elevation: 10 m AMSL
Local Water Depth (m): 350
Data Summary: Winter
Number of Records: 173626
Missing Data (%): 1.17
Calm (% < 0.50m/s): 0.37
Measurement Format: 10-minute avg.

Key Statistics for Data Shown:
Max Wind Speed: 19.39 m/s
Mean Wind Speed: 6.23 m/s
StdDev. Wind Speed: 2.78 m/s

Woodside

Figure 3. Winter distributions of wind speeds (10-minute at 10 m ASL) 22.5° directional sectors at the Vincent site (Vincent Metocean). Note tropical cyclone events were not included in this distribution. In winter, winds at are predominantly from the S to SE, associated with the South East Trades. Easterly gales are experienced at the Vincent location due to high pressure systems generating from the Great Australian Bight area to the site (MetOcean Engineers, 2005).

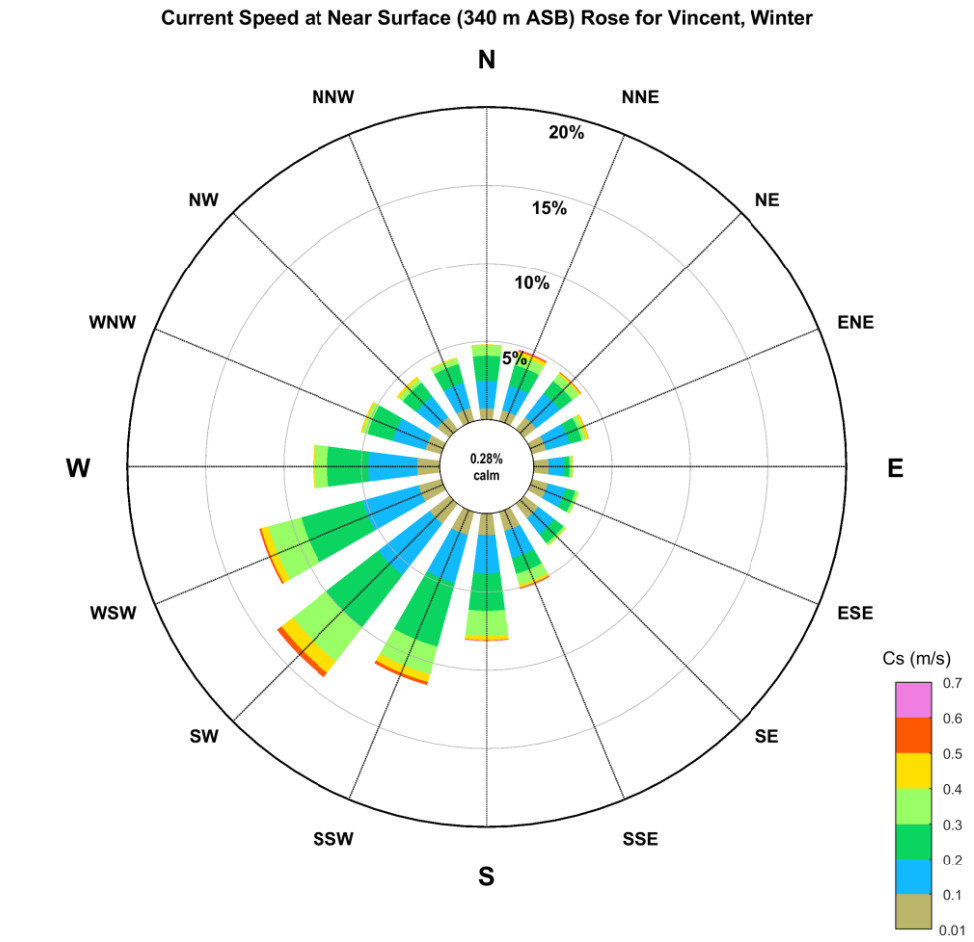


Data Information:
Project: North West Cape
Location: Vincent [114.0600°E, 21.4400°S]
Data Period: Summer (21-Nov-2000 to 13-Dec-2001)
Data Source: Measured Data
Record Elevation: Near Surface (340 m ASB)
Local Water Depth (m): 350
Data Summary: Summer
Number of Records: 144668
Missing Data (%): 1.59
Calm (% < 0.01m/s): 0.47

Key Statistics for Data Shown:
Max Curr Spd: 0.75 m/s
Mean Curr Spd: 0.19 m/s
StdDev. Curr Spd: 0.11 m/s

Woodside

Figure 4. Summer (May – Sep) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at the Vincent location (cyclones removed) (WEL, 2016).



Data Information:
Project: North West Cape
Location: Vincent [114.0600°E, 21.4400°S]
Data Period: Winter (01-Apr-2001 to 30-Sep-2001)
Data Source: Measured Data
Record Elevation: Near Surface (340 m ASB)
Local Water Depth (m): 350
Data Summary: Winter
Number of Records: 126313
Missing Data (%): 4.13
Calm (% < 0.01m/s): 0.28

Key Statistics for Data Shown:
Max Curr Spd: 0.64 m/s
Mean Curr Spd: 0.20 m/s
StdDev. Curr Spd: 0.11 m/s

Woodside

Figure 5. Winter (Nov – Apr) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at the Vincent location (cyclones removed) (WEL, 2016).

REFERENCES

AFMA 2021. Southern Blue Fin Tuna. Accessed 3 June 2021 www.afma.gov.au/fisheries-management/species/southern-bluefin-tuna

Bureau of Meteorology 2020. Climate Statistics for Australian Locations, Summary Statistics Broome Airport Accessed 1 October 2020 <http://www.bom.gov.au/climate/averages/tables/cw_003003.shtml>.

MetOcean Engineers 2005. Vincent Development Metocean Criteria Report No. R1276.

Metocean Solutions Ltd 2019. “Australia North-West Shelf wave hindcast: Description and

Validation of SWAN ST6 Wave Model”, DRIMS 1401150817.

RPS 2016. Metocean Criteria Guidelines for Modu Mooring on Australia’s North West Shellf, DRIMS 1400522719.

RPS Metocean Pty Ltd 2008. “Browse LNG Development - Offshore MetOcean Measurement

Programme: September 2006 to February 2008 Final Data Report.” CRN: JB0020RT0019.

Vincent Metocean – 40 Year Non-Cyclonic Metocean Database for Design Studies CRN: VAOOOORT1400067309.

WEL 2011. Greater Western Flank Detailed Metocean Design Criteria, Rev 2. CRN: A3000RG5492827.

WEL 2016. Vincent – Basic Design Data Specification sheet – Metocean CRN: VA0000RT1400067309.

WEL 2015. Winds Measured at North Rankin A 1995-2015.

WEL 2018. Scarborough Development - Non-Cyclonic and Operational Metocean Design Criteria – Spreadsheet, Revision A, CRN: SA0009CT1400722569.

WEL 2019. “Browse Development – Metocean Design Basis” CRN: JJ0013ST1400274448.