Calthorpe-1 Wellhead Decommissioning Environment Plan

Decommissioning

June 2022

Revision 2

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1. INTRODUCTION

1.1 Overview

Woodside Energy Ltd (Woodside), as Titleholder under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Commonwealth) (referred to as the Environment Regulations), proposes to undertake the following petroleum activities within Permit Area WA-59-L:

- permanently decommission the Calthorpe-1 wellhead *in situ*.

This activity will hereafter be referred to as the Petroleum Activities Program and forms the scope of this Environment Plan (EP). A detailed description of the activities is provided in **Section 4**. This EP has been prepared as part of the requirements under the Environment Regulations, as administered by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

1.2 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 performed in a manner consistent with the principles of ecologically sustainable development (ESD) as defined in Section 3A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

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

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

1.3 Scope of the Environment Plan

The scope of this EP covers the activities that define the Petroleum Activities Program, as described in **Section 4**. The spatial boundary of the Petroleum Activities Program has been described and assessed based on the environment that may be affected (EMBA). The EMBA defines the spatial boundary of the Petroleum Activities Program and is further described in **Section 4.4**.

1.4 Environment Plan Summary

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

Table 1-1: Environment Plan summary

EP Summary material requirement	Relevant section of this EP containing EP Summary material
The location of the activity	**Section 4**, starting at page 57
A description of the receiving environment	**Section 5**, starting at page 64
A description of the activity	**Section 4**, starting at page 57
Details of the environmental impacts and risks	**Section 7**, starting at page 112
The control measures for the activity	**Section 7.3**, starting at page 114
The arrangements for ongoing monitoring of the titleholder's environmental performance	**Section 8**, starting at page 143
Response arrangements in the oil pollution emergency plan	Not applicable, as there is no credible spill scenario associated with the petroleum activities program
Consultation already undertaken and plans for ongoing consultation	**Section 6**, starting at page 78
Details of the titleholder's nominated liaison person for the activity	**Section 1.7.1**, starting at page 10

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 10A(a): *is appropriate for the nature and scale of the activity*	Regulation 13: *Environmental Assessment* Regulation 14: *Implementation strategy for the environment plan* Regulation 16: *Other information in the environment plan*	The principle of 'nature and scale' applies throughout the EP	**Section 2** **Section 4** **Section 5** **Section 6** **Section 7** **Section 8**
Regulation 10A(b): *demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable* Regulation 10A(c): *demonstrates that the environmental impacts and risks of the activity will be of an acceptable level*	Regulation 13(1) to 13(7): *13(1) Description of the activity* *13(2)(3) Description of the environment* *13(4) Requirements* *13(5)(6) Evaluation of environmental impacts and risks* *13(7) Environmental performance outcomes and standards* *Regulation 16(a) to 16(c):* *A statement of the titleholder's corporate environmental policy* *A report on all consultations between the titleholder and any relevant person*	Set the context (activity and existing environment) Define 'acceptable' (the requirements, the corporate policy, relevant persons) Detail the impacts and risks Evaluate the nature and scale Detail the control measures – ALARP and acceptable	**Section 1** **Section 2** **Section 4** **Section 5** **Section 6** **Section 7** **Section 8**
Regulation 10A(d): *provides for appropriate environmental performance*	Regulation 13(7): *Environmental performance outcomes and standards*	Environmental Performance Outcomes Environmental Performance Standards	**Section 7**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
outcomes, environmental performance standards and measurement criteria		Measurement Criteria	
Regulation 10A(e): *includes an appropriate implementation strategy and monitoring, recording and reporting arrangements*	Regulation 14: *Implementation strategy for the environment plan*	Implementation strategy, including: • systems, practices and procedures • performance monitoring • Oil Pollution Emergency Plan (OPEP) and scientific monitoring • ongoing consultation.	**Section 8**
Regulation 10A(f): *does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property within the meaning of the EPBC Act*	Regulation 13(1) to 13(3): *13(1) Description of the activity* *13(2) Description of the environment* *13(3) Without limiting [Regulation 13(2)(b)], particular relevant values and sensitivities may include any of the following:* *(a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act;* *(b) the national heritage values of a National Heritage place within the meaning of that Act;* *(c) the ecological character of a declared Ramsar wetland within the meaning of that Act;* *(d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act;* *(e) the presence of a listed migratory species within the meaning of that Act;* *(f) any values and sensitivities that exist in, or in relation to, part or all of:* *(i) a Commonwealth marine area within the meaning of that Act; or* *(ii) Commonwealth land within the meaning of that Act.*	No activity, or part of the activity, undertaken in any part of a declared World Heritage property	**Section 4** **Section 5** **Section 7**
Regulation 10A(g): *(i) the titleholder has carried out the consultations required by Division 2.2A* *(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the*	Regulation 11A: *Consultation with relevant authorities, persons and organisations, etc.* Regulation 16(b): *A report on all consultations between the titleholder and any relevant person*	Consultation in preparation of the EP	**Section 6**

Criteria for acceptance	Content requirements/relevant regulations	Elements	Section of EP
consultations are appropriate			
Regulation 10A(h): *complies with the Act and the regulations*	Regulation 15: *Details of the Titleholder and liaison person* Regulation 16(c): *Details of all reportable incidents in relation to the proposed activity.*	All contents of the EP must comply with the *Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act 2006* and the Environment Regulations	**Section 1.6** **Section 8.8**

1.6 Description of the Titleholder

Woodside is the Titleholder for this activity, on behalf of Woodside and Mitsui E & P Australia Pty Ltd (Mitsui).

1.7 Details of Titleholder, Liaison Person and Public Affairs Contact

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

1.7.1 Titleholder

Woodside Energy Ltd.

11 Mount Street

Perth, Western Australia

T: 08 9348 4000

ACN: 63 005 482 986

1.7.2 Nominated Liaison Person

Shannen Wilkinson

Senior Corporate Affairs Adviser

11 Mount Street

Perth, Western Australia

Telephone: 08 9348 4000

Email: feedback@woodside.com.au

1.7.3 Arrangements for Notifying Change

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

1.8 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 7** are drawn from the WMS documentation, which comprises

four elements: compass and policies, expectations, processes and procedures, and guidelines, as outlined below (and illustrated in **Figure 1-1**):

- **Compass and Policies:** Set the enterprise-wide direction for Woodside by governing our behaviours, actions and business decisions and ensuring wet meet its 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 perform an activity or a process.
- **Guidelines:** Provide recommended practice and advice about how to perform the steps defined in Procedures, together with supporting information and associated tools. Guidelines provide advice about how activities or tasks may be performed, information that may be taken into consideration, or how to use tools and systems.

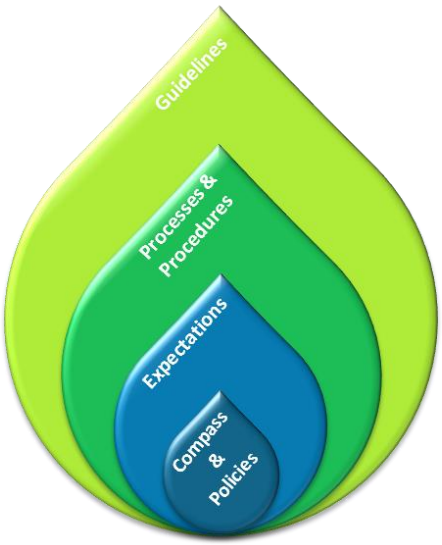


Figure 1-1: The four major elements of the Woodside Management System seed

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

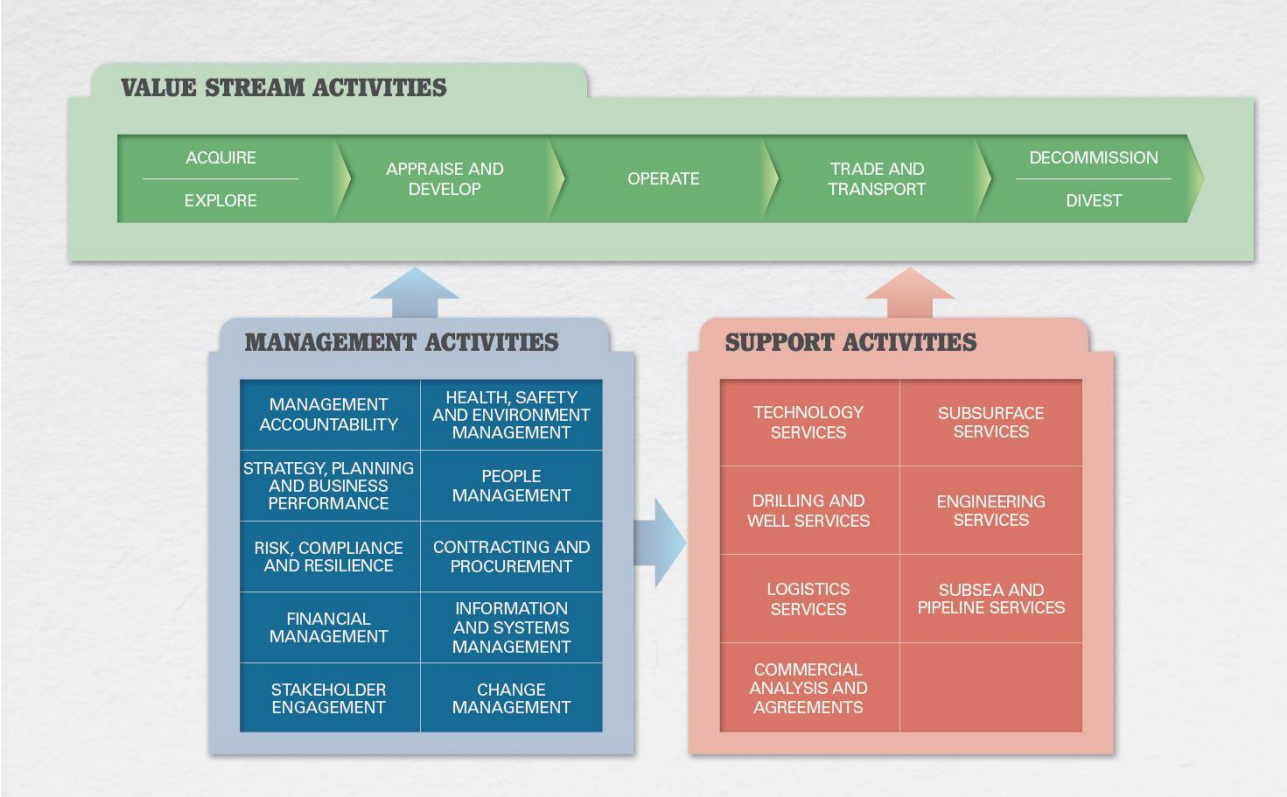


Figure 1-2: The Woodside Management System business process hierarchy

1.8.1 Health, Safety and Environment Policy

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

1.9 Description of Relevant Requirements

In accordance with Regulation 13(4) of the Environment Regulations, a description of requirements, including legislative requirements, that apply to the activity and are relevant to managing risks and impacts of the Petroleum Activities Program are detailed in **Appendix B**. This EP will not be assessed under the Western Australia (WA) *Environment Protection Act 1986* as the activity does not occur on State land or within State waters.

1.9.1 Applicable Environmental Legislation

1.9.1.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006

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

Under subsection 572(3) of the OPGGS Act, 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. Under subsection 572(7), property removal requirements are subject to any other provision of the OPGGS Act, the regulations, directions given by NOPSEMA or the responsible Commonwealth Minister, and any other law. Under subsection 270(3) of the OPGGS Act, before title surrender, all property brought into the surrender area must be removed to the satisfaction of NOPSEMA, or arrangements that are satisfactory to NOPSEMA must be made relating to the property.

Table 1-3 is intended to inform requirements under subsection 270(3)(c), (e) and (f) and 572(2), (3) and (7) in relation to the Calthorpe-1 exploration wellhead, to enable consent to be granted for application to surrender the title once all petroleum activities have ceased in the future.

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

Section Number	Relevant Requirement	Relevant Section of the EP
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.	Not applicable – well has been approved for abandonment (**Section 4.6**)
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.	Refer to allowances under Section 270(3)
7	This section has effect subject to: (a) any other provision of this Act; and (b) the regulations; and (c) a direction given by NOPSEMA or the responsible Commonwealth Minister under: (i) Chapter 3; or (ii) this Chapter; and (d) any other law.	**Section 3.4** and **Section 7** (PS 1.1)
Section 270 – Consent to surrender title[1]		
3	The Joint Authority may consent to the surrender sought by the application only if the registered holder of the permit, lease or licence:	
	c) has: (i) to the satisfaction of NOPSEMA, removed or caused to be removed from the surrender area (defined by subsection (7)) all property brought into the surrender area by any person engaged or concerned in the operations authorised by the permit, lease or licence; or (i) arrangements that are satisfactory to NOPSEMA in relation to that property; and	**Section 3** and **Section 4**
	e) has provided, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the surrender area; and	**Section 7.6.1, 7.6.2, 7.6.3,** and **7.7.1**
	f) has, to the satisfaction of NOPSEMA, made good any damage to the seabed or subsoil in the surrender area caused by any person engaged or concerned in the operations authorised by the permit, lease or licence;	

[1] *WA-59-L also includes infrastructure covered under the approved Ngujima Yin Operations EP. This EP is intended to inform the requirements under s270(3) in relation to the Calthorpe-1 wellhead to enable consent to be granted for application to surrender the title once all petroleum activities have ceased for all petroleum activities in the future.*

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

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

The objective of the Environment Regulations is to ensure petroleum activities are performed in a manner:

- consistent with the principles of ecological sustainable development
- 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.

1.9.1.3 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places in Australia. These are defined in the EPBC Act as matters of national environmental significance (MNES). In respect to offshore petroleum activities in Commonwealth waters, these requirements are implemented by NOPSEMA through the Streamlining Offshore Petroleum Environmental Approvals Program (the Program). The Program provides for the protection of the environment by requiring all offshore petroleum activities authorised by the OPGGS Act to be conducted in accordance with an accepted EP, consistent with the principles of ESD. Impacts on the environment include those matters protected under Part 3 of the EPBC Act. The definition of 'environment' in the Program is consistent with that used in the EPBC Act, which enables the Program to encompass all matters protected under Part 3 of the EPBC Act.

1.9.1.3.1 Recovery Plans and Threat Abatement Plans

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

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

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

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

1.9.1.3.2 Australian Marine Parks

Under the EPBC Act, Australian Marine Parks (AMPs), formally known as Commonwealth Marine Reserves, are recognised for conserving marine habitats and the species that live and rely on these habitats. The Director of National Parks (DNP) is responsible for managing AMPs (supported by Parks Australia) and is required to publish management plans for them. Other parts of the Australian Government must not perform functions or exercise powers relating to these parks that are inconsistent with management plans (s362 of the EPBC Act). Given no AMPs overlap the EMBA, there are no requirements for managing the marine parks that are relevant to this EP.

1.9.1.3.3 World Heritage Properties

Australian World Heritage management principles are prescribed in Schedule 5 of the EPBC Regulations 2000. Given no World Heritage Properties overlap the EMBA, there are no management principles that are considered relevant to the scope of this EP.

2. ENVIRONMENT PLAN PROCESS

2.1 Overview

This section outlines the process Woodside follows to prepare the EP once an activity has been defined as a petroleum activity (refer **Section 1.2**). This includes a description of the environmental risk management methodology that is used to identify, analyse and evaluate risks to meet ALARP and acceptability requirements and to develop EPOs and EPSs. This section also describes Woodside's risk management methodologies applicable to implementation strategies applied during the activity.

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

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

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

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

2.2 Environmental Risk Management Methodology

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

The environmental risk management methodology used in this EP is based on Woodside's Risk Management Procedure. This procedure aligns to industry standards such as international standard ISO 31000:2009. The WMS risk management procedure, guidelines and tools provide guidance on specific techniques for managing risk, tailored for particular areas of risk within certain business processes. Procedures applied for environmental risk management include:

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

The risk management methodology provides a framework to demonstrate that the risks and impacts are continually identified, reduced to ALARP and assessed to be at an acceptable level, as required by the Environment Regulations. The key steps of Woodside's Risk Management Process are shown in **Figure 2-1**. Each step and how they are applied to the scopes of this activity are described in **Sections 2.3** to **2.11**.

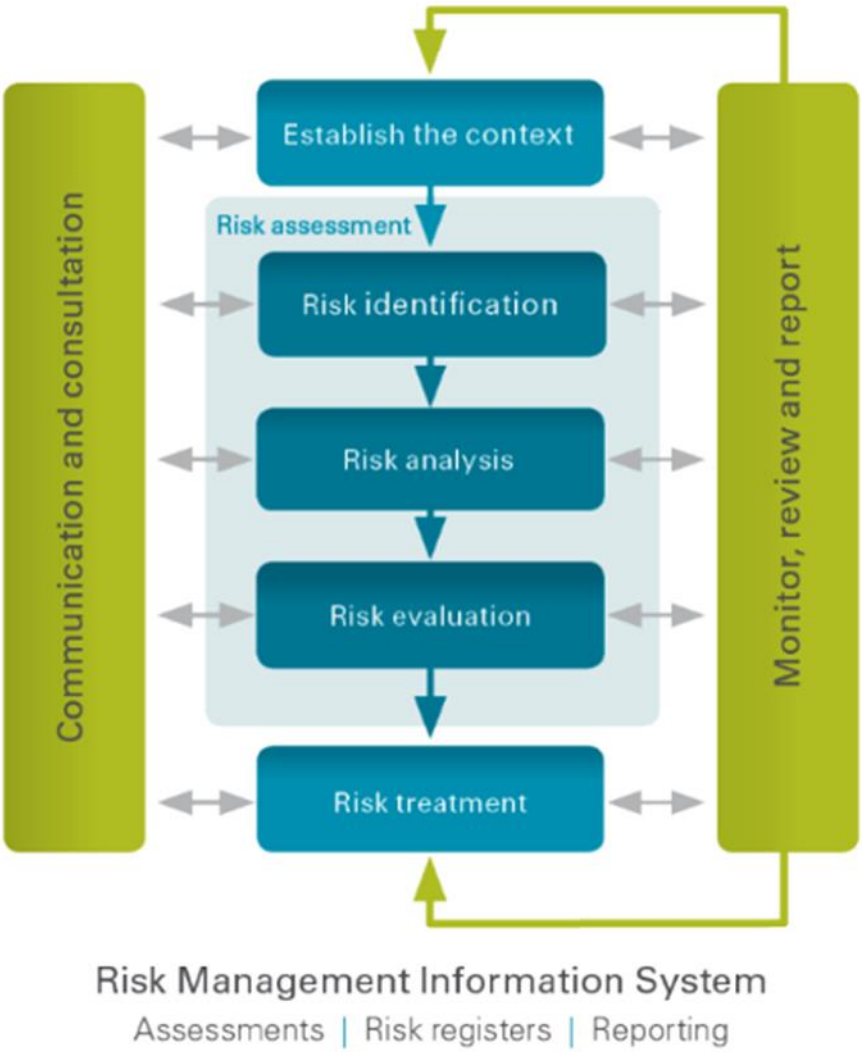


Figure 2-1: Woodside's risk management process

2.2.1 Health, Safety and Environment Management Procedure

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

2.2.2 Impact Assessment Procedure

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

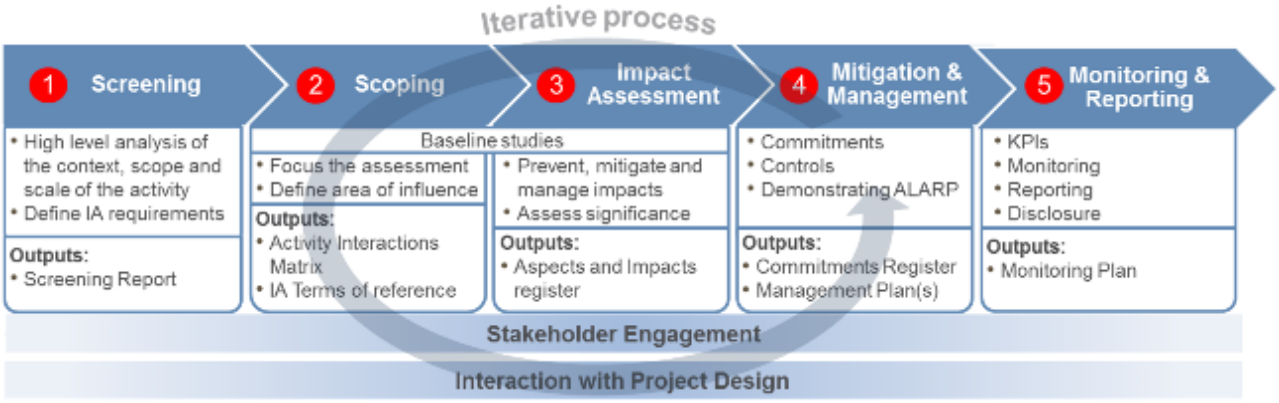


Figure 2-2: Woodside's impact assessment process

2.3 Environment Plan Process

Figure 2-3 illustrates the EP development process. Each element of this process is discussed further in **Sections 2.3** to **2.11**.

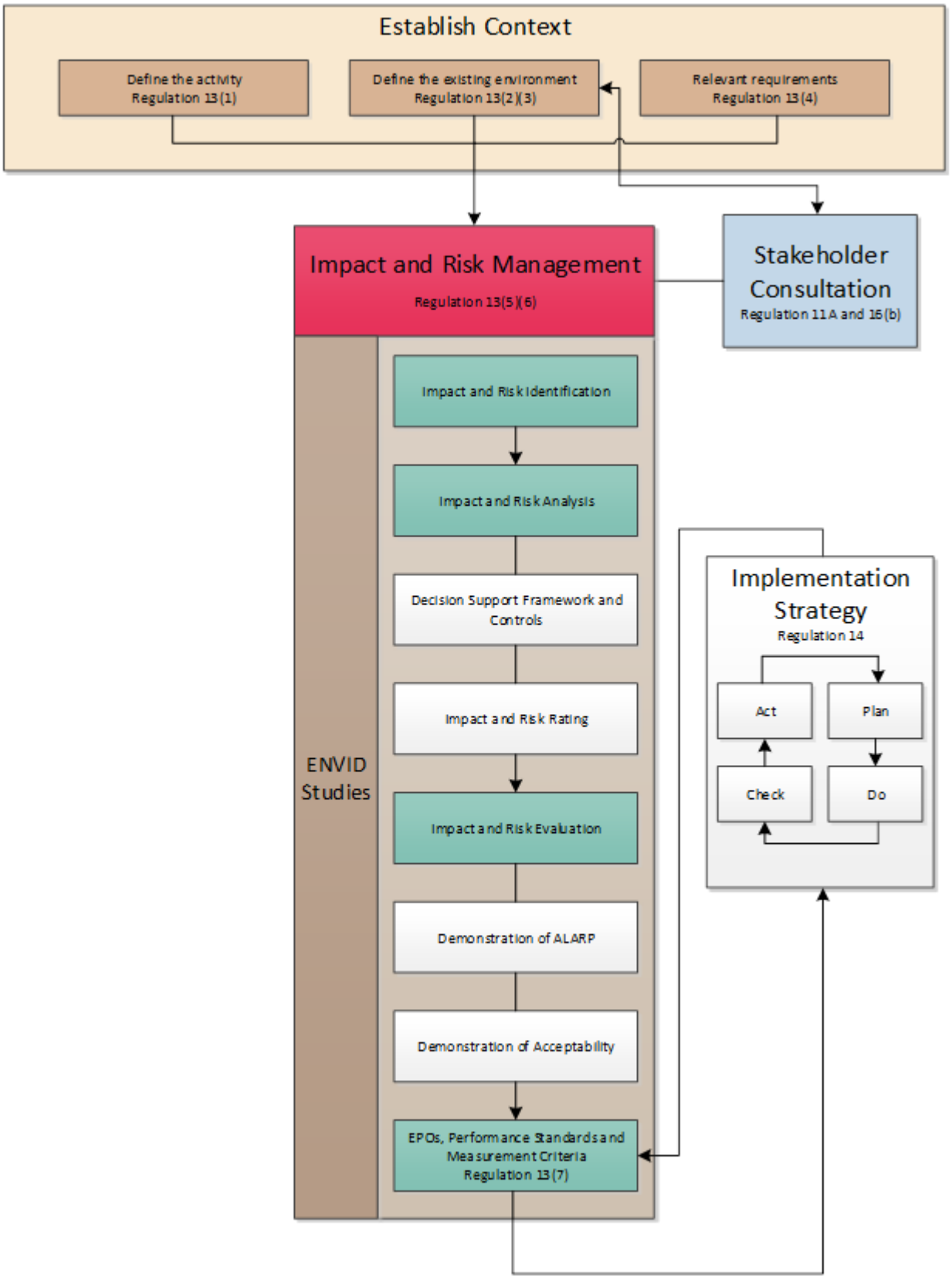


Figure 2-3: Environment Plan development process

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 then described in relation to:

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

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

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

2.4.2 Define the Existing Environment

The context of the existing environment is described and determined by considering the nature and scale of the activity (size, type, timing, duration, complexity, and intensity of the activity), as described in **Section 3**. The purpose is to describe the existing environment that may be impacted by the activity, directly or indirectly, by planned or unplanned events.

The existing environment section (**Section 4**) is structured to define the physical, biological, socioeconomic and cultural attributes of the area of interest, in accordance with the definition of 'environment' in Regulation 4(a) of the Environment Regulations. These sub-sections make particular reference to:

- The environmental, and social and cultural consequences as defined by Woodside (refer to **Table 2-1**), which address key physical and biological attributes, as well as social and cultural values of the existing environment. These consequence definitions are applied to the impact and risk analysis (refer **Section 2.6.2**) and rated for all planned and unplanned activities. Additional detail is provided for evaluating unplanned hydrocarbon spill risk.
- EPBC Act Matters of National Environmental Significance (MNES), including listed threatened species and ecological communities and listed migratory species. Defining the spatial extent of the existing environment is guided by the nature and scale of the Petroleum Activities Program and associated sources of environmental risk. This considers the EMBA, as defined in **Section 2.4.2**. MNES, as defined within the EPBC Act, are addressed through Woodside's impact and risk assessment (**Section 7**).
- Relevant values and sensitivities, which may include world or national Heritage Listed areas, Ramsar wetlands, listed threatened species or ecological communities, listed migratory species, and sensitive values that exist in or in relation to Commonwealth marine area or land.
- In categorising the environmental values potentially impacted by the Petroleum Activities Program (as presented in **Table 2-1**), there is standardisation of information relevant to understanding the receiving environment. Potential impacts to these environmental values are evaluated in the risk analysis (refer **Section 2.7**), and risk-rated for all planned and unplanned activities. This provides a robust approach to the overall environmental risk evaluation and its documentation in the EP.

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

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

Table 2-1: Environmental values potentially impacted by the Petroleum Activities Program which are assessed within the Environment Plan

Environmental Value Potentially Impacted (Regulations 13(2)(3))					
Marine Sediment	Water Quality	Air Quality	Ecosystems/Habitats	Species	Socioeconomic

2.4.3 Relevant Requirements

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

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

2.5 Impact and Risk Identification

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

The environmental impact and risk assessment presented in this EP has been informed by recent and historical hazard identification studies and workshops (for example, Environmental Hazard Identification [ENVID]), Process Safety Risk Assessment processes, reviews and associated desktop studies associated with the Petroleum Activities Program. Risks are identified based on planned and potential interaction with the activity (based on the description in **Section 4**), the existing environment (**Section 5**) and the outcomes of Woodside's stakeholder engagement process (**Section 6**). The environmental outputs of applicable risk and impact workshops and associated studies are referred to as 'ENVID' hereafter in this EP.

An ENVID workshop was conducted for the permanent plugging activities on 2 October 2019. Participants included project environmental advisors, environmental engineers, the development coordinator, subsea engineer and drilling engineers. The participants' breadth of knowledge, training and experience was sufficient to reasonably assure that the hazards which may arise in connection with the Petroleum Activities Program in this EP were identified.

Impacts and risks are identified during an ENVID for both planned (routine and non-routine) activities and unplanned (accidents, incidents and emergency conditions) events.

During this process, risks that are identified as not applicable (not credible) are removed from the assessment. This is done by defining the activity and identifying that an aspect is not applicable.

The impact and risk information is then classified, evaluated and tabulated for each planned activity and unplanned event. Environmental impacts and risk are recorded in an environmental impacts and risk register. The output of the ENVID is used to present the risk assessment and forms the basis to develop environmental performance outcomes (EPOs), environmental performance standards (EPS) and measurement criteria (MC). This information is presented in **Section 7**, using the format presented in **Table 2-2**.

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

Impact Evaluation Summary														
Source of Impact	***Time Horizon (refer Section 3.6)***	***Environmental Value Potentially Impacted***						***Evaluation***						
		Marine Sediment	***Water Quality***	***Air Quality (incl Odour)***	***Ecosystems/Habitat***	***Species***	***Socioeconomic***	***Decision Type***	***Consequence/Impact***	***Likelihood***	***Risk Rating***	***ALARP Tools***	***Acceptability***	***Outcome***
Summary of source of impact/risk														

2.6 Impact and Risk Analysis

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

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

- identify the decision type in accordance with the decision support framework
- identify appropriate control measures (preventative and mitigative) aligned with the decision type
- assess the risk rating or impact.

2.6.1 Decision Support Framework

To support the risk assessment process and Woodside's determination of acceptability (**Section 2.7.2**), Woodside's HSE risk management procedures include using a decision support framework based on principles set out in the Guidance on Risk-Related Decision Making (Oil and Gas UK, 2014) (**Figure 2-4**). This concept was applied during the ENVID, or equivalent preceding processes during historical design decisions, to determine the level of supporting evidence that may be required to make sound conclusions about risk level and whether the risk is ALARP and acceptable. This was to confirm:

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

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

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

2.6.1.1 Decision Type A

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

2.6.1.2 Decision Type B

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

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

2.6.1.3 Decision Type C

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

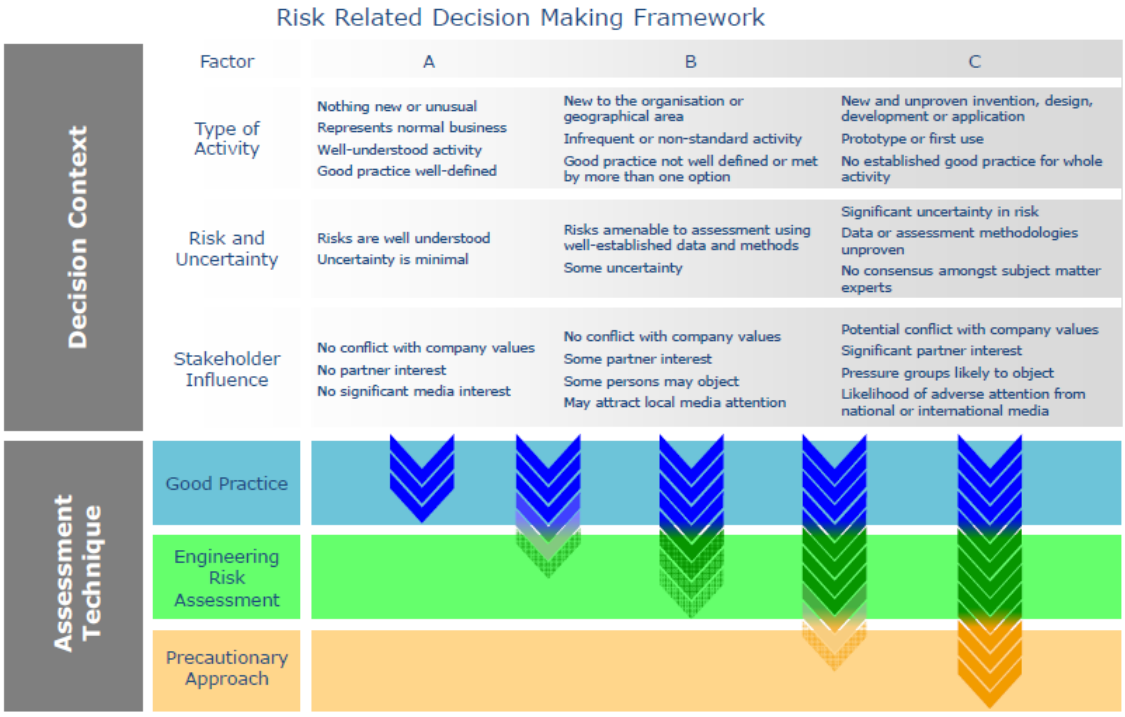


Figure 2-4: Risk-related decision-making framework (Oil and Gas UK, 2014)

2.6.2 Decision Support Framework Tools

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

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

2.6.3 Decision Calibration

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

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

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

2.6.3.1 Control Measures (Hierarchy of Controls)

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

- **Elimination** of the risk by removing the hazard.
- **Substitution** of a hazard with a less hazardous one.
- **Engineering Controls** include design measures to prevent or reduce the frequency of the risk event, or detect or control the risk event (limiting the magnitude, intensity and duration), such as:
  - Prevention: design measures that reduce the likelihood of a hazardous event occurring.

  - Detection: design measures that facilitate early detection of a hazardous event.
  - Control: design measures that limit the extent/escalation potential of a hazardous event.
  - Mitigation: design measures that protect the environment if a hazardous event occurs.
  - Response Equipment: design measures or safeguards that enable clean up/response after a hazardous event occurs.
- **Procedures and Administration** include 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 (for example, protection barriers deployed near the sensitive receptor).

2.6.4 Impact and Risk Classification

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

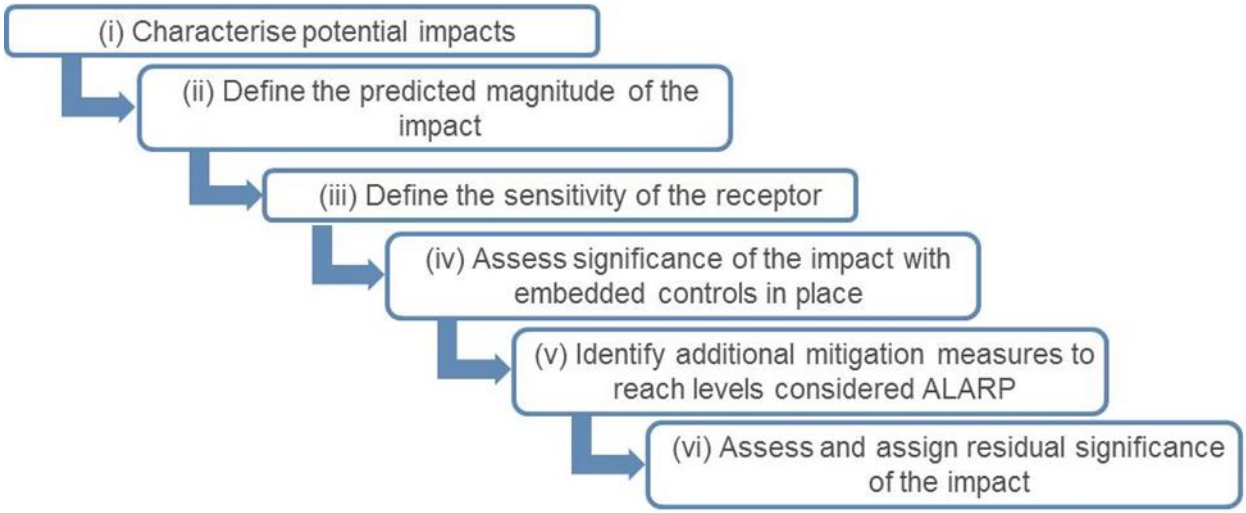


Figure 2-5: Environmental impact and risk analysis

Impacts are classified in accordance with the consequence (**Section 2.4**) outlined in the Woodside Risk Management Procedure and Risk Matrix.

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

The impact and risk information is summarised, including classification, and evaluation information, as shown in the example in **Table 2-2**, evaluated for each planned activity and unplanned event.

Table 2-3: Woodside risk matrix (environment and social and cultural) consequence descriptions

Environment	Social and Cultural	Consequence Level
Catastrophic, long-term impact (more than 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes	Catastrophic, long-term impact (more than 20 years) to a community, social infrastructure or highly valued areas/items of international cultural significance	A
Major, long-term impact (ten to 50 years) on highly valued ecosystems, species, habitat or physical or biological attributes	Major, long-term impact (five to 20 years) to a community, social infrastructure or highly valued areas/items of national cultural significance	B
Moderate, medium-term impact (two to ten years) on ecosystems, species, habitat or physical or biological attributes	Moderate, medium term impact (two to five years) to a community, social infrastructure or highly valued areas/items of national cultural significance	C
Minor, short-term impact (one to two years) on species, habitat (but not affecting ecosystems function), physical or biological attributes	Minor, short-term impact (one to two years) to a community or highly valued areas/items of cultural significance	D
Slight, short-term impact (less than one year) on species, habitat (but not affecting ecosystems function), physical or biological attributes	Slight, short-term impact (less than one year) to a community or areas/items of cultural significance	E
No lasting effect (less than one month); localised impact not significant to environmental receptors	No lasting effect (less than one month); localised impact not significant to areas/items of cultural significance	F

2.6.5 Risk Rating Process

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

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

The risk rating process is performed using the following steps:

2.6.5.1 Select the Consequence Level

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

2.6.5.2 Select the Likelihood Level

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

Table 2-4: Woodside risk matrix likelihood levels

Likelihood Description						
Frequency	1 in 100,000 to 1,000,000 years	1 in 10,000 to 100,000 years	1 in 1000 to 10,000 years	1 in 100 to 1,000 years	1 in 10 to 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

2.6.5.3 Calculate the Risk Rating

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

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

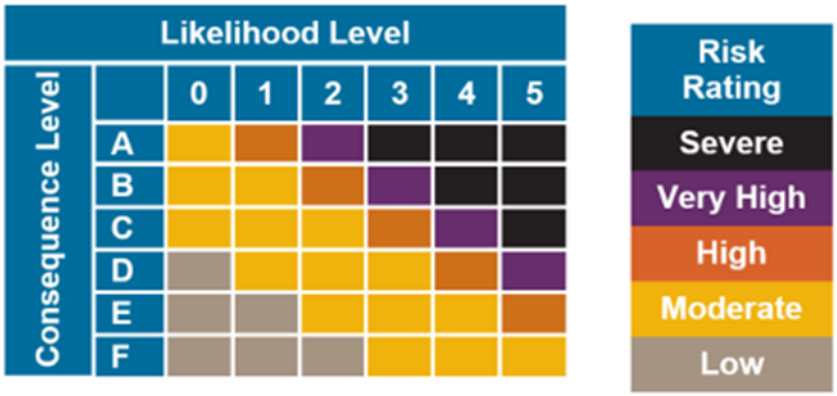


Figure 2-6: Woodside risk matrix – risk level

To support ongoing risk management (a key component of Woodside's Process Safety Management Framework – refer to Implementation Strategy (in **Section 8**), Woodside uses the concept of 'current risk' and applies a current risk rating to indicate the current or 'live' level of risk, considering the controls that are currently in place and regularly effective. Current risk rating is effective in articulating potential divergence from baseline risk, such as if certain controls fail or could potentially be compromised. Current risk ratings aid in the communication and visibility of the risk events, and ensure risk is continually managed to ALARP by identifying risk reduction measures and assessing acceptability.

2.7 Impact and Risk Evaluation

Environmental impacts and risks cover a wider range of issues, differing species, persistence, reversibility, resilience, cumulative effects, and variability in severity than safety risks. Determining the degree of environmental risk, and the corresponding threshold for whether a risk or impact has

been reduced to ALARP and is acceptable, is evaluated to a level appropriate to the nature and scale of each impact or risk. Evaluation includes considering the:

- decision type
- principles of ESD – as defined under the EPBC Act
- internal context – ensuring the proposed controls and risk level are consistent with Woodside policies, procedures and standards (**Section 8** and **Appendix A**)
- external context – the environment consequence (**Section 7**) and stakeholder acceptability (**Section 6**)
- other requirements – ensuring the proposed controls and risk level are consistent with national and international standards, laws and policies.

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

2.7.1 Demonstration of As Low As Reasonably Practicable

Descriptions have been provided in **Table 2-5** to articulate how Woodside demonstrates that different risks, impacts and decision types identified within the EP are ALARP.

Table 2-5: Summary of Woodside's criteria for 'as low as reasonably practicable' demonstration

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

2.7.2 Demonstration of Acceptability

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

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

Risk	Impact	Decision type
Low and moderate	***Negligible, slight, or minor (D, E or F)***	***A***
Woodside demonstrates these lower order risks, impacts and decision types are of a level that is 'Broadly Acceptable' if they meet: • legislative requirements • industry codes and standards • applicable company requirements and where further effort towards reducing risk (beyond employing opportunistic measures) is not reasonably practicable without sacrifices grossly disproportionate to the benefit gained.		
High, very high or severe	***Moderate and above (A, B or C)***	***B and C***
Woodside demonstrates these higher order risks, impacts and decision types are of an 'Acceptable' if it can be demonstrated that the predicted levels of impact and/or residual risk are: • managed to ALARP (as described in **Section 2.6.1**), and • meet the following criteria, appropriate to the nature and scale of each impact and risk: – Impact/risk does not contravene relevant principles of ESD, as defined under the EPBC Act. – Internal context – the proposed controls and consequence/risk level are consistent with Woodside policies, procedures and standards. – External context – stakeholder expectations and feedback have been considered (**Section 6**). – Other requirements – the proposed controls and consequence/risk level are consistent with national and international industry standards, laws and policies, and applicable plans for management and conservation advices, conventions, and significant impact guidelines (e.g. for MNES) have been considered. Where there are significant complexities in assessing and managing impacts to different receptors and for demonstrating how these impacts are acceptable (e.g. significant stakeholder concern for specific receptors, lack of consensus of appropriate controls or standards), acceptability may be demonstrated separately for key receptors. This is not applicable for risks given the consequence of an unplanned risk event occurring may not be acceptable and, therefore, acceptability is demonstrated in the context of the residual likelihood of an event occurring.		

2.8 Recovery Plan and Threat Abatement Plan Assessment

To support the demonstration of acceptability, a separate assessment is undertaken to demonstrate that the EP is not inconsistent with any relevant recovery plans or threat abatement plans (refer to **Section 1.9**). The steps in this process are:

- Identify relevant listed threatened species and ecological communities (**Section 5.6**).
- Identify relevant recovery plans and threat abatement plans (**Appendix C**, **Section 7.8**).
- 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 7.8**).
- For those objectives/action areas applicable to the Petroleum Activities Program, identify the relevant actions of each plan and evaluate whether impacts and risks resulting from the activity are clearly not inconsistent with that action (**Section 7.8**).

2.9 Environmental Performance Objectives/Outcomes, Standards and Measurement Criteria

EPOs, EPSs and MC have been defined to address the potential environmental impacts and risks and are presented in **Section 7**.

2.10 Implementation, Monitoring, Review and Reporting

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

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

The implementation strategy is presented in **Section 8**.

2.11 Stakeholder Consultation

A stakeholder assessment is performed to identify relevant persons (as defined under Regulation 11A of the Environment Regulations). An activity update is issued electronically to relevant persons to provide a reasonable consultation period. Further details and information are provided to any relevant person if requested.

Each relevant person's response is summarised and assessed and a response, where appropriate, is provided by Woodside.

The consultation, along with the process for ongoing engagement and consultation throughout the activity, is presented in **Section 6**. A copy of the full text correspondence with relevant people is provided in **Appendix D**.

3. DECOMMISSIONING OPTIONS ASSESSMENT

3.1 Overview

A Decommissioning Options Assessment was performed for the Calthorpe-1 wellhead to determine whether there were any suitable arrangements, as set out in s572(7) and 270(3), as an alternative to removal outlined in Section 572(3) of the OPGGS Act (**Table 1-3**). A description of the wellheads and associated infrastructure considered through the options assessment is described in **Section 4.6**. An options screening assessment determined the feasible decommissioning options to be included in this assessment as removal and leave *in situ*.

The Offshore Petroleum Decommissioning Guidelines proposed by the Department of Industry Science Energy and resources (DISER, 2022) and the NOPSEMA policy on Section 572 (NOPSEMA, 2020) suggests that alternative decommissioning options can be considered if the environmental outcomes are equal or better than removal and the environmental impacts and risks are ALARP and acceptable. This section outlines the assessment Woodside has performed to determine whether the arrangement to leave *in situ* complies with the OPGGS Act as well as aligning with DISER and NOPSEMA's concept of equal or better environmental outcomes when compared to removal.

The options assessment process Woodside performed has found the leave *in situ* option meets legislative requirements, is technically feasible, provides equal environmental outcomes, and has fewer health and safety risks when compared to removal. On this basis, Woodside is proposing *in situ* decommissioning as an arrangement that is consistent with the OPGGS Act.

Additional options associated with leave *in situ*, such as augmentation or installation of over-trawlable structures, are assessed in **Section 7** for each relevant impact or risk.

3.2 Options Assessment Process

The key steps in evaluating the decommissioning options were:

- Options screening – Identify the potentially feasible decommissioning options for the wellhead and the activities associated with the decommissioning options.
- Relevant legislation requirements – evaluate options based on compliance with relevant legislation and guidelines.
- Review the engineering and scientific studies, either in scientific literature or commissioned by Woodside, to understand the existing environment of the EMBA and how the wellhead may interact with the marine environment if removed or left *in situ*.
- Technical feasibility – assess the practicability of each option from a technical perspective.
- Health and safety risk – assess the practicability of each option from a health and safety risk perspective.
- Environmental impacts and risks – assess the environmental impacts and risks associated with the activities required to implement each decommissioning option.

Once completed, a further evaluation was undertaken to determine if the preferred leave *in situ* decommissioning option had equal or better outcomes when compared to removal. The assessment also incorporated relevant stakeholder feedback and an assessment against the Principles of ESD (**Table 3-8**). **Section 7** demonstrates impacts and risks associated with the recommended option are ALARP and acceptable.

3.3 Relevant Studies

To understand the environmental outcomes of the decommissioning options being considered, a number of scientific studies of wellheads in the marine environment were reviewed. Two of these

studies have assessed fish and habitats found on wellheads on the North West Shelf (NWS), and one assesses the potential for decommissioned oil and gas infrastructure to cause snag risks for commercial fishers. Each of these studies is summarised in **Table 3-1**.

The fish habitat studies observed a diverse range of reef dependent and transient pelagic species associating with the wellhead structures, including commercially fished species (Pradella *et al*., 2014; McLean *et al*., 2018a, 2018b). Although these studies conclude that the wellheads are used as a habitat for fish, including commercial targeted species, McLean *et al*. (2018a), found that species richness and abundance declined with water depth, most notably beyond 350 m, with only individual recorded at 825 m, similar to the water depths of the Calthorpe-1 wellhead (824 m).

McLean *et al*. (2018a) also states that there are a number of variables in addition to water depth that would likely influence fish and invertebrate assemblages but due to lack of replication in the study it is not possible to statistically test all variables. No specific fish or habitat assessments have been undertaken on the Calthorpe-1 wellhead; however, based on its water depth (824 m) it is unlikely it supports fish populations. Woodside has therefore, conservatively evaluated that the wellhead provides limited habitat value.

When assessing the potential for snag risks to arise from decommissioning the wellhead *in situ*, the outcomes of an overview of incidents in the United Kingdom (UK) from commercial fishers interacting with oil and gas infrastructure (Rouse, 2020) were considered. Rouse (2020) included wellheads in the study; however, it found that the majority of historic snag incidents have occurred with marine debris and pipelines. Over time, the number of snag incidents have decreased, despite oil and gas operations and commercial fishing efforts increasing over the same period (Rouse, 2020), potentially indicating improved communication, operation and coexistence between the two industries. Rouse (2020) does not describe the depths at which snag incidents occur, or whether water depth influences the likelihood of snagging occurring or the severity of the consequence.

In, addition to using Rouse (2020), Woodside engaged the Australian Maritime College (AMC) to undertake an independent study on the potential impacts of leaving the Calthorpe-1 wellhead *in situ* (AMC, 2022) to conservatively inform the risk for commercial fishers (**Section 3.8.1**). The study found that from a range of set and towed fishing gear used in the vicinity of the wellhead, the current and future risk was confined to the Western Deepwater Trawl Fishery (WDTF).

The study found current impacts to these fishers were low based on:

- The wellhead is located in deep water (824 m). Whilst demersal trawling at such depth is possible, it necessitates having vessel/equipment specifications (horsepower and winch capacity) typically found on medium sized vessels (30 – 40 m in length) only one of which is currently registered to the WDTF. Smaller vessels would have difficulty meeting the necessary requirements.
- Overall effort across the fishery has been low, supported by historical WDTF logbook data (2010-2021) suggesting on average approximately 17 days per annum are spent trawling in the fishery. Further, effort by the fishery has been focused on the area offshore and slightly south of Shark Bay in more recent years (Patterson *et al*. 2021)
- Oceanographic data for the region indicates there are generally southward moving surface waters with a northward moving subsurface current (DEWHA, 2007) which would make demersal trawling at the depth of the wellhead challenging in terms of maintaining gear symmetry and stability. Additionally, peak wind and wave conditions registered through summer would make trawling difficult for smaller vessels.
- The trawlers are equipped with modern wheelhouse electronics including GPS plotters. GPS plotters accurately show the vessel position relative to marked seabed obstacles, such as the wellhead, and enable operators to safely navigate around these obstacles.
- Trawl operators have numerous risk mitigation options available to them which either reduce interaction probability or harm level (e.g. modern wheelhouse electronics, vessel safety

management systems, AMSA trawler hook-up safety procedures/guidelines, winch tension release mechanisms, hydroacoustic trawl monitoring systems, appropriate breaking load components on trawl gear).

Whilst fishing effort in the WDTF is currently low, there is a potential for this to increase in the future. The AMC study considered a tenfold increase in activity when considering the future outlook; however, found that the potential for interaction remained low.

To understand the consequence of snagging, the AMC study also created a simulation 'interaction event' with scale models of the wellhead and trawl net in a flume tank facility. The results of the study identified that the most credible outcome should a trawl net interact with the Calthorpe-1 wellhead is minor to moderate gear damage and subsequent catch loss. This result was based on wellheads relatively smooth shape, not having a permanent guide base (PGB) or other protrusions, allowing the skipper to work the net clear of the obstacle with minor damage to the equipment. Should the base of the wellhead sit above the seabed creating a gap the net may catch resulting in more moderate damage and catch loss. Provided the skipper adheres to hook-up guidelines issued by AMSA, the risk of harm to the vessel and crew would remain very low.

The study was conservative and did not take into consideration the distribution of target species when assessing the interaction probability for current or future trawl fishers (e.g. depth); however this has been factored in to the impact assessment in this EP (**Section 5.9.2** and **7.6.1**).

Table 3-1: Summary of scientific studies

Date	Title	Study Aim	Key Findings
2014	*Fish assemblages associated with oil industry structures on the continental shelf of north-western Australia* Pradella *et al.* (2014)	Assessment of fish associations with oil and gas structures located in deep water on Australia's north-west continental shelf	The aims of this study were to: • identify fish species associated with wellheads on the NWS, particularly commercially important species • determine any differences in assemblages among wellheads, and thereby assess the variability of assemblages on these structures. Three wellheads were surveyed located at a variety of depths (Wanaea 84 m, Goodwyn 133 m and Echo 175 m) and provided complex habitats, with high vertical relief and numerous holes and overhangs of a range of sizes. Fishes from 14 families and 31 species were observed associating with the structures, which included reef-dependant species and transient pelagic species. Ten commercially fished species were observed, of which three are major target species. The most abundant species was snapper (*Lutjanus argentimaculatus*), with an estimated biomass for the two deepest structures (Goodwyn and Echo) of 109 kg.

Date	Title	Study Aim	Key Findings
2018a	*Fish and habitats on wellhead infrastructure on the north west shelf of Western Australia Continental Shelf Research* 164: 10–27. McLean *et al.* (2018a)	Assessment of fish assemblages and habitats formed by colonising invertebrates on 25 oil and gas wellheads and associated infrastructure in depths of 78 to 825 m on the NWS of WA	Fish assemblages and colonising invertebrate habitats present on wellheads and associated infrastructure were strongly influenced by depth, age and height of the structures. Older, taller wellheads in depths less than 135 m, such as the Yodel/Capella wells, possessed greater abundances of groupers, snappers, site-attached reef species and transient pelagic fish species. Beyond 350 m depth, the number of species and total fish abundance declined markedly, as did the per cent cover of ascidians, black/octocorals, sponges and basket stars (*Gorgonocephalida*) observed growing on the infrastructure. The wellhead at 825 m that was included in the study has significantly less abundance, with only one individual recorded during the study (belonging to the family Mordae [cod-like fish]). Commercially-important snapper (Lutjanid*)* and grouper (Epinephelid) species were common and most abundant on well infrastructure to depths of 135 m, but were absent in depths more than 350 m. Two speckled swellsharks (*Cephaloscyllium speccum*), believed to be endemic to north-west Australia, were observed for the first time *in situ*. Numerous fish species were observed at depths beyond their known limits and two IUCN vulnerable species were recorded: the grey nurse shark (*Carcharias taurus*; 135 m depth) and the round ribbon tail ray (*Taeniura meyeni*; 78 m depth).
2020	*Commercial fisheries losses arising from interactions with offshore pipelines and other oil and gas infrastructure and activities* Rouse *et al.* (2020)	Analysis of interactions between commercial fishers and oil and gas infrastructure in the UK between 1989 and 2016 to understand the risks and consequences of interactions between commercial fishing and oil and gas infrastructure	Between the years 1989 and 2016, there were 1590 recorded incidents of interactions between commercial fishers and oil and gas infrastructure in the UK. The consequences of these incidents included financial loss, vessel abandonment or an injury or fatality. When categorised by the type of oil and gas infrastructure involved in the interaction, the highest percentage of interactions were with debris from the oil and gas industry, which is defined as including scaffolding poles, safety equipment and metal frameworks. The second highest category of recorded interactions was with ‘unknown’ hazards. However, in 63.9% of cases where the hazard was unknown, the nearest known hazard was pipelines, therefore, it is assumed the cause of the interaction was the pipelines. Production infrastructure, which includes wellheads, accounted for 4% of the interactions. The study also found that over time, the number of recorded interactions has declined, despite the oil & gas industry activities increasing over the same period of time. This reduction in interaction numbers is thought to be a result of: • improvements in communication between commercial fishers and the oil and gas industry • improved mapping of the location of oil and gas infrastructure locations • advances in vessel GPS technologies.

3.4 Relevant Legislation and Guidelines

Table 3-2 provides an assessment of the decommissioning options against identified relevant legislation and guidelines.

Table 3-2: Assessment of relevant legislation and guidelines

Legislation/ Guideline	Relevant clause/requirement	Option 1	Option 2
		Removal	***Leave in situ***
OPGGS Act 2006	Section 572 requires titleholders to remove structures, equipment and property that are no longer being used in connection with operations authorised by the title. Section 270 requires titleholders to remove all infrastructure before the title can be surrendered or to make alternative arrangements that are satisfactory to NOPSEMA in relation to that infrastructure.	Removal meets requirements under the Act for removal from the title area.	The case for leaving the infrastructure *in situ* needs to be to the satisfaction of NOPSEMA and approved through acceptance of an EP.
Offshore Petroleum Decommissioning Guideline (DISER, 2022)	The Offshore Petroleum Decommissioning Guideline (DISER, 2022) (the Decommissioning Guidelines) proposes that removal of infrastructure is the default decommissioning requirement under the OPGGS Act, this notwithstanding, decommissioning options other than removal may be considered; however, the titleholder must demonstrate in permissioning documents that the alternative approach delivers equal or better environmental, safety and well integrity outcomes compared to removal.	Removal meets default decommissioning requirement under the Guideline for removal from the title area.	Leaving infrastructure *in situ* is an alternative decommissioning option to removal and therefore, in order to be consistent with the Offshore Petroleum Decommissioning Guidelines, it needs to be demonstrated that leave *in situ* has equal or better environmental outcomes to removal in the relevant permissioning documents (e.g. an EP).
NOPSEMA Policy on s572 (NOPSEMA, 2020)	NOPSEMA's policy on s572 (NOPSEMA, 2020) proposes that a deviation from the base case of full removal can be sought via an EP where the titleholder demonstrates that the arrangements for the alternative approach are acceptable and provide equal or better environmental outcomes when compared to removal, as outlined in the Offshore Petroleum Decommissioning Guideline.	Removal meets 'base case' requirements for decommissioning under the Policy for removal from the title area.	Leaving infrastructure *in situ* is an alternative decommissioning option and therefore, in order to fall within NOPSEMA's Policy on s572, it needs to be demonstrated in and EP that arrangements for leave *in situ* are acceptable and provide equal or better environmental outcomes compared to removal.

Legislation/ Guideline	Relevant clause/requirement	Option 1	Option 2
		Removal	***Leave in situ***
Environment Protection (Sea Dumping) Act 1981	Section 10A of the *Environment Protection (Sea Dumping) Act 1981* requires a permit to be obtained for dumping controlled material into Australian waters. 'Controlled material' is defined in the *Environment Protection (Sea Dumping) Act 1981* as 'waste or other material (within the meaning of the Protocol [meaning the London Protocol])' The London Protocol states that sea dumping does not include 'the abandonment in the sea of matter (such as cables, pipelines and marine research devices) placed for a purpose other than the mere disposal thereof'.	Removal of infrastructure does not trigger any requirements under the *Environment Protection (Sea Dumping) Act 1981*, considering infrastructure will be removed from the marine environment.	A permit may be required under the *Environment Protection (Sea Dumping) Act 1981.*

Legislation/ Guideline	Relevant clause/requirement	Option 1	Option 2
		Removal	***Leave in situ***
International Maritime Organisation (IMO) Resolution A.672(16) - Guidelines and standards for the Removal of Offshore Installations and Structures on the Continental Shelf and the Exclusive Economic Zone adopted 1989[1]	Relevant paragraphs of IMO Resolution A.672(16) contain the following requirements: • Infrastructure within specified water depths (above 75 and 100 m) should be completely removed (paragraphs 3.1 and 3.2). • Infrastructure left *in situ* should not cause unjustifiable interference with other uses of the sea (paragraph 3.4.2). • Structures left *in situ* should be marked on navigational charts (paragraph 3.8). • Structures left *in situ* should remain on location and not move (paragraph 3.9). • Structures left *in situ* should be monitored, as necessary, for compliance against these guidelines (paragraph 3.10). • Responsibility for maintenance and liability for future damages from structures left *in situ* should be clearly established (paragraph 3.11).	Meets requirements for removal of abandoned or disused installations or structures.	Leaving the Calthorpe-1 wellhead meets all the relevant requirements of IMO Resolution A.672(16). as follows: • The depth of water where Calthorpe-1 is located is 824 m and therefore far deeper than the depths paragraphs 3.1 and 3.2 recommend for removal. • Interference with other marine users has been assessed as 'low' in **Section 3.8.1** and **Section 7** as supported by the absence of feedback from relevant marine users during stakeholder consultation (**Section 6**) (paragraph 3.4.2). • Through this EP, Woodside commits to marking Calthorpe-1 on navigation charts (paragraph 3.8). • Calthorpe-1 is located in a fixed position and will not move from this location (paragraph 3.9). • Periodic monitoring is not required to ensure ongoing compliance against IMO Resolution A.672(16) (paragraph 3.10). This is on the basis the wellhead will be marked on navigational charts and the degradation of the wellhead is not expected to result in release material that will result in a risk to navigation. • No ongoing maintenance is required beyond decommissioning of the Calthorpe-1 wellhead. Furthermore, upon acceptance of this EP, Section 270 of the OPPGS Act provides for the title to be relinquished, at which point Woodside's responsibility for liability would cease. **Section 7** provides an assessment of the residual risks that are expected to remain at the time the title is relinquished (paragraph 3.11).

[1] *IMO Resolution A.672(16) sets out the matters to be considered by State parties to United Nations Convention on the Law of the Sea (UNCLOS) when making decisions dealing with abandoned or disused installations on the Continental Shelf. Australia's decommissioning policies consider the requirements of IMO Resolution A.672(16) (DISER, 2022)*

3.5 Technical Feasibility and Health and Safety Assessment

3.5.1 Technical Feasibility

Each decommissioning option has been assessed for technical feasibility, whereby "technical feasibility" is defined as "the expected ability to successfully execute the decommissioning option". The technical feasibility assessment in **Table 3-3** incorporates the definitions used for technical complexity and the estimated cost of each option. Technical feasibility is only assessed for the removal decommissioning option, given the alternate option to leave *in situ* does not require any activities.

Table 3-3: Technical Feasibility Assessment for Removal Decommissioning Options

Method	Description	Technical Feasibility
Internal mechanical cutting tool	**Method:** Method uses mechanical cutting knives that are inserted into the inner well casing and rotated. Where possible, cut is made at sufficient depth below the mudline (>3 m) in accordance with international Well standard practice, e.g. Oil and Gas UK Well Decommissioning Guidelines (OGUK 2018). This may also allow for additional cut attempts by moving up. **Uses:** Suitable for wells with up to two casing strings (unless additional inner casings can be pulled separately prior to cut) where an internal cut can be achieved, and within all water depths.	Feasible Following drilling of the well three attempts were made to remove the wellhead using an internal mechanical cutting tool (**Section 4.6**)[1]. Though previous attempts were unsuccessful, this method is still considered a feasible method to remove Calthorpe-1. This option is widely employed through the industry for similar activities.
External cut using Diamond Wire Saw (DWS)	**Method:** Method uses a hydraulically driven motor and pulley system to operate an industrial diamond cutting wire via a vessel or ROV. **Uses:** Suitable for wells with multiple casing strings and within all water depths. May require up to 1 m of well infrastructure to be left *in situ* above seabed due to external cut. Limited global availability of saws large enough for wells where there is an external structure such as a temporary guide base. These structures would also require long cut duration and carry a lower likelihood of success.	Feasible DWS is available as a feasible method to remove Calthorpe-1. This option is widely employed through the industry for similar activities.
Abrasive water jet cutting (AWJ)	**Method:** Method uses a system of high pressure water entrained with grit and flocculant pumped via an umbilical from a vessel to a subsea cutting tool that is inserted into the inner well casing. Where possible, cut is made at sufficient depth below the mudline (>3 m) in accordance with international Well standard practice, e.g. Oil and Gas UK Well Decommissioning Guidelines (OGUK 2018). This may also allow for additional cut attempts. **Uses:** Suitable where an internal cut can be achieved, generally within water depths shallower than approximately 300-350 m due to requirement for high pressure jetting. Not restricted by number of casing strings.	Not feasible AWJ cutting is suitable within water depths shallower than 300 to 350 m, due to the requirement for high pressure jetting. Therefore, it is not technically feasible at the depth Calthorpe-1 is located.

[1] *As noted in Appendix 2: Daily Offshore Reports of the Well Completion Report publicly available on National Offshore Petroleum Information Management System NOPIMS (Woodside, 2008)*

3.5.2 Health and Safety Assessment

A high-level health and safety (HS) assessment was undertaken to compare the HS risks associated with each decommissioning option. Wellhead removal activities are vessel-based and therefore have

HS risks (with the potential to cause injury to personnel or fatalities) associated with the introduction of a vessel and wellhead cutting and removal, summarised as:

- vessel collision risks
- loss of control of lifting equipment (e.g. crane when retrieving the wellhead)
- offshore occupational and manual handling hazards.

These activities are considered standard operations; therefore, HS risk would be adequately managed through industry standards and good practice. Leave *in situ* presents a better HS option as there are no offshore activities associated with it; therefore, there would be no HS risks.

3.6 Environmental Impacts/Risks Screening

Under the Environment Regulations, an environmental impact "means any change to the environment, whether adverse or beneficial, that wholly or partially results from an activity of an operator". The definition of environment under the Environment Regulations is:

- 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 value of places,

  and includes:

- the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d).

Table 3-5 evaluates the environmental impacts and risks associated with each decommissioning option. Impacts and risks are classified in accordance with the Woodside Risk Management Procedure and Risk Matrix (**Section 2.2**).

The assessment of environmental impacts and risks (**Table 3-5**) also considers the timeframe of the impact and risk. The following definitions have been used:

- Short-term – impact or risk during decommissioning operations (such as when vessels are in the field).
- Long-term – impact or risk beyond short-term (on completion of decommissioning option activity until infrastructure has reached a steady state, determined to be complete degraded).

Key outputs of the assessment are summarised in **Table 3-4** below.

Table 3-4: Summary of environmental impact and risk assessment for decommissioning options

Sub-criteria	Decommissioning Options	
	***Remove*[1]**	***Leave in situ***
Summary of planned activities and impacts		
Physical Presence: Interactions with Other Users	F-Negligible (short-term)	F-Negligible (long-term)
Physical Presence: Alteration of Seabed and Benthic Habitats	F-Negligible (short-term)	F-Negligible (long-term)
Routine Acoustic Emissions from the Vessel, Positioning Equipment and Helicopter Operations	F-Negligible (short-term)	No impact
Routine and Non-routine Discharges from the Vessel	F-Negligible (short-term)	No impact
Subsea Discharges: Associated with Wellhead Decommissioning Options	F-Negligible (short-term)	F-Negligible (long-term)
Routine Atmospheric Emission: Fuel Combustion and Incineration on the Vessel	F-Negligible (short-term)	No impact
Routine Light Emissions: External Lighting on the Vessel	F-Negligible (short-term)	No impact
Summary of unplanned activities and risks		
Interaction with Third party Users: Future Disruption to Commercial Fisheries	No impact	Low (long-term)
Accidental Hydrocarbon (Marine Diesel) Release: Result of a Vessel Collision	Moderate (short-term)	No impact
Unplanned Discharges: Hydrocarbons/Chemicals from use of Vessel and ROV	Moderate (short-term)	No impact
Unplanned Discharges: Release of Hazardous and Non-hazardous Solid Wastes from the Vessel	Low (short-term)	No impact
Vessel Collision with Marine Fauna	Low (short-term)	No impact
Physical Presence: Dropped Object During Wellhead Removal Resulting in Seabed Disturbance	Low (short-term)	No impact
Physical Presence: Accidental Introduction and Establishment of Invasive Marine Species (IMS)	Low (short-term)	No impact

1. *Impacts for the removal option are based on using the removal technique with the highest environmental impact, which is the diamond wire cutting saw.*

Table 3-5: Environmental Impact and Risk Assessment of Decommissioning Options

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
Evaluation of planned activities and impacts				
Physical Presence: Interactions with Other Users	Long-term physical presence of wellhead: displacement of current third party activities.	Long-term, after decommissioning operations	N/A	F-Negligible
			Removal of the wellhead results in no long-term interactions with current third party activities.	Leaving the wellhead *in situ* results in an ongoing presence on the seabed (and up to 4 m above it). This introduces potential for interactions with commercial fishers who target demersal species. For trawl fishers this may result in displacement from the immediate area around a wellhead; the potential for snagging trawl equipment on infrastructure is assessed below in the evaluation of unplanned activities and risks. Since trap fishers have been known to target subsea infrastructure including wellheads to target the increased abundances of commercially targeted species around wellheads (McLean et al., 2018b), no negative impacts to trap fishers are expected from the wellheads remaining *in situ*. The wellhead may become partially or fully buried overtime due to surrounding hydrodynamic conditions (**Section 7.6.2**) and will eventually fully degrade into seabed sediments over approximately 150 years (**Section 7.6.3**). The height of the wellhead (up to 4 m) is considered a worst-case scenario and the potential impacts from displacement will remain until the wellheads are significantly degraded or buried. The Commonwealth WDTF overlaps the wellhead location and historical fishing effort has indicated possible fishing in the broad area surrounding the EMBA; however, the majority of effort is concentrated south of the EMBA between North West Cape and the Abrolhos

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
				Islands. Of the species currently or historically targeted, only the orange roughy occurs at depths consistent with the wellhead and this species is primarily caught off the south and east coasts of Australia. No catch has been reported for this species in the WDTF since 2005-06 and it was removed from fishery status reports as a target species in 2015.Fishing for this species may recommence in the future. However, fishery reports also note that, should this occur, close monitoring would be required given the low productivity of the species. (**Section 5.9.2**) Overall historical fishing effort has been generally low in the fishery (**Section 5.9.2**). The EMBA represents 0.0001% of the total area available to the fishery and will continue to be marked on navigation charts. No feedback was received from licence holders in the WDTF during consultation for this EP (**Section 6**). Given this, while there is a potential for current and future trawl fishers to be displaced from the area around the wellhead, impacts are expected to be negligible given the water depth of the wellhead (824 m), historically low fishing effort which is concentrated further south, and small area the wellhead occupies in comparison to the area available to the fishery (**Section 7.6.1**).
	Proximity of a vessel used for decommissioning causing interference with or displacement to third party vessels (commercial and	Short-term, during decommissioning operations	F-Negligible	N/A
			Several State and Commonwealth managed fisheries overlap the wellhead location (**Section 5.9.2**). The presence of a vessel used for decommissioning activities may restrict the use of the area by commercial fishers. However, because the vessel will be in the area for short periods over a defined amount of time, and because the fisheries' areas	No activities would be required and, therefore, there would be no temporary disturbances to other users during the decommissioning phase.

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
	recreational fisheries, including charter operators, shipping and defence).		extend beyond that of the wellhead location, impacts during decommissioning activities will be negligible and with no lasting effect. No shipping fairways intercept the area. Shipping density at the wellhead location is low (**Section 5.9.5**). Due to the temporary nature of the decommissioning activity and low shipping density, impacts are expected to be negligible and with no lasting effect.	
Physical Presence: Alteration of Seabed and Benthic Habitats	Disturbance to seabed as a result of wellhead removal.	Short-term, during decommissioning operations	F-Negligible	N/A
			Removal of the wellhead would result in localised seabed disturbance at each wellhead location as a result of removal and remotely operated vehicle (ROV) activities. The habitat at the wellhead location is flat and featureless and comprised primarily of soft sediments, with a low abundance and patchy distribution of filter feeders and other epifauna. Potential impacts of removal activities include localised and temporary elevated turbidity and clogging of respiratory and feeding parts (turbidity) of filter-feeding organisms. The communities found around the infrastructure are common to the broader region. Seabed disturbance from the decommissioning activities will result in some short-term impacts to benthic communities.	No activities would be required and therefore there would be no disturbance to the seabed or benthic habitats as a result of removal activities.
	Disturbance to seabed and benthic habitat from wellhead remaining *in situ* permanently.	Long-term, after decommissioning operations	N/A	F-Negligible
			As there would be no infrastructure remaining *in situ*, this removes any potential impacts in the long term.	Leaving the wellhead *in situ* may continue to alter the localised seabed around the wellhead (within ~ 15 m) over the long-term (approximately 150 years; **Section 7.6.3**) through processes resulting from scouring and accretion, which may impact associated benthic habitats.

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
Routine Acoustic Emissions from the Vessel, Positioning Equipment and Helicopter Operations	Generation of acoustic signals from the vessel during normal operations (dynamic positioning [DP] thrusters) and generation of atmospheric noise from helicopter transfers.	Short-term, during decommissioning operations	F-Negligible	N/A
			Vessel and helicopters will generate noise both in the air and underwater during decommissioning activities. The main source of noise from a DP vessel relates to using DP thrusters. Listed threatened and listed migratory species that could be potentially impacted by noise and vibration may be present within the water column above the wellhead primarily including cetaceans, sharks and turtles. The wellhead is located in the pygmy blue whale migration biologically important area (BIA) (**Section 5.6**). Given the noise levels associated with routine operations of the vessel, the potential impacts are unlikely to be significant. It is reasonable to expect that fauna may demonstrate avoidance or attraction behaviour to the noise generated by the vessel and helicopter activities. It is considered that noise generated by the vessel and helicopters will result in localised, impacts to marine fauna with no lasting effect.	As there would be no activities required, this removes any potential impacts from acoustic emissions during decommissioning activities.
Routine and Non-routine Discharges from the Vessel	Routine discharges from the vessel (sewage, grey water, putrescible wastes, deck and bilge water, cooling water or brine) to the marine environment.	Short-term, during decommissioning operations	F-Negligible	N/A
			The vessel will routinely generate and discharge small volumes of treated sewage, putrescible wastes and grey water to the marine environment. It will also routinely/periodically discharge relatively small volumes of bilge water, and discharge deck drainage directly overboard or overboard via deck drainage systems. Cooling water from machinery engines or mud cooling units and brine water is produced during the desalination process of reverse osmosis (RO) to produce potable water onboard the vessel. Routine and non-routine discharges will be temporary and intermittent in nature for the duration of the decommissioning activities. It is possible that marine fauna transiting the localised area may come into contact with these discharges (such as marine turtles, pygmy blue whales, sharks), as they traverse the water column above the wellhead. However, it is expected that the small volumes of discharges will be rapidly diluted and dispersed in the	As there would be no activities required, this removes any potential impacts from routine discharges during decommissioning activities.

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
			open-water marine environment. Therefore, impacts are expected to be negligible with no lasting effect.	
Subsea Discharges: Associated with Wellhead Decommissioning Options	Subsea discharges during wellhead removal as a result of cutting/water jetting.	Short-term, during decommissioning operations	F-Negligible	N/A
			During wellhead cutting, there is potential for subsea discharges. This includes displacement of well fluids and small amounts of metal and cement shavings. If an internal cutting tool is used, it is likely the majority of discharges will be disposed down well; however, if diamond wire cutting is used, the discharges may be discharged directly to the marine environment. Displacement fluids above the abandonment plug and within the casing annulus may be discharged during removal of the wellhead. These include 25 m^3 of inhibited seawater and 19 m^3 of bentonite and viscosifier which are all OCNS ranking Gold or E (**Section 4.6.2**). The benthic habitat around the wellhead is comprised primarily of soft substrates with some with a low abundance and patchy distribution of filter feeders and other epifauna. The communities found around the infrastructure are common to the broader region. Subsea discharges from decommissioning will result in localised impacts with no lasting effect.	As there would be no activities, this removes any potential for an instantaneous release of well fluids during decommissioning activities.
	Corrosion and breakdown as a result of the wellhead being left *in situ* permanently.	Long-term, after decommissioning operations	N/A	F-Negligible
			There would be no long-term impact as the wellhead and residual fluids would be removed from the marine environment.	There is potential for well fluids (25 m^3 of inhibited seawater and 19 m^3 of bentonite and viscosifier (**Section 4.6.2**)) to be slowly released to the environment as the wellhead degrades over time (approximately 150 years; **Section 7.6.3**). Given the slow release rate and the rapid dilution in the open ocean environment, it is likely that any impacts to marine sediments, benthic habitats and water quality will be largely localised and negligible. As it degrades, the wellhead will release corrosion material. The wellhead is comprised

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
				predominantly of mild steel (7500 kg weight). Mild steel is comprised mainly of iron (around 98%) and also contains small amounts of carbon, manganese, chromium, silicon, and phosphorus. One plastic component, 500 g of Viton, is also present within seal components. Iron, the main constituent of wellhead (about 98%) is not considered a significant contaminant in the marine environment and is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997). All iron oxides are included on the OSPAR PLONOR list (Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment). As the wellhead degrades, the very small volumes of elastomeric materials (up to 500 g) may be released. However, corrosion of the steel is likely to be a relatively slow process, about 0.2 mm/year (Melchers, 2005), reducing the rate of potential discharge. Surface coatings and paints are comprised of zinc oxide; therefore, the risk of lead discharge is likely to be low, and heavy metals and naturally-occurring radioactive materials are not expected to be in the wellhead. Given the low toxicity of iron, the slow release rate and rapid dilution of the open ocean environment, it is likely any impacts to marine sediments, benthic habitats and water quality will be largely temporary and negligible. Given the small volume of plastic components within the wellhead (comparable to that in seal components of household taps), the degradation and subsequent release of up to 500 g of Teflon

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
				and Viton is also expected to result in negligible impacts.
Routine Atmospheric Emission: Fuel Combustion and Incineration on the Vessel	Internal combustion engines and incinerators on the vessel used for decommissioning.	Short-term, during decommissioning operations	F-Negligible	N/A
			Atmospheric emissions will be generated by the vessel from internal combustion engines (including all equipment and generators) and incineration activities (including on-board incinerators). Emissions will include SO_2, NO_x, ozone-depleting substances, CO_2, particulates and volatile organic compounds (VOCs). Given the short duration of the activity and exposed location of the wellhead, which will lead to the rapid dispersion of the low volumes of atmospheric emissions in an offshore environment, the potential impacts are expected to be negligible with no lasting effect.	As there would be no activities, this removes any potential for atmospheric emission from incineration and fuel combustion.
Routine Light Emissions: External Lighting on the Vessel	External light emissions onboard the vessel used to remove the wellhead. Lighting is typically managed to maintain good visibility for crew members at night.	Short-term, during decommissioning operations	F-Negligible	N/A
			Light emissions have the potential to cause localised and temporary disturbance to fauna (seabirds, migratory shorebirds and turtles) in the vicinity of the vessel. The surface waters above the wellhead may be occasionally visited by migratory and oceanic birds. A BIA for wedge-tailed shearwater foraging (during breeding) overlaps with the wellhead location (**Section 5.6**), with the breeding period occurring from August to April. The risk associated with collision from seabirds attracted to the light is considered to be low, given the low numbers expected to transit the area and that there is no critical habitat for these species at this location. The surface waters above the wellhead may also be occasionally visited by marine turtles, although no BIAs for marine turtles overlap. Further, individuals would not be undertaking behaviours which are sensitive to artificial light. Light emissions from the vessel are expected to be localised with no lasting effects on EPBC listed species.	As there would be no activities, this removes any potential for light emissions from a vessel.

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
Evaluation of unplanned activities and risks				
Physical Presence: Interactions with Other Users	Long-term physical presence of wellhead, interaction with third party activities.	Long-term after decommissioning operations	N/A	Low (E – 1)
			Removal of the wellhead results in no interactions with current and future third party activities.	*In situ* decommissioning of the wellhead may present a snag risk to trawl fishing vessels in the WDTF currently or in the future. The wellhead may become partially or fully buried overtime due to surrounding hydrodynamic conditions (**Section 7.6.2**) and will eventually fully degrade into seabed sediments over approximately 150 years (**Section 7.6.3**). The height of the wellhead (4 m) is considered a worst-case scenario and the risk will remain until the wellhead is significantly degraded or buried. An independent study undertaken on the Calthorpe-1 wellhead found current risks to trawl fishers were low based on current fishing effort, the location of the wellhead presenting limitations for trawling and due to modern navigational systems effectively reducing the risk of snagging as well as other controls available to reduce interaction probability or harm level (AMC, 2022; **Section 3.3**). Whilst current effort is low, this could increase in the future. The study considered a tenfold increase in activity to account for this; however, found that potential for interaction remained low (AMC, 2022). The study also found that the most credible outcome should a trawl net interact with the Calthorpe-1 wellhead was minor to moderate gear damage and subsequent catch loss (AMC, 2022; **Section 3.3**). Given the wellhead will continue to be marked on navigational charts and the negligible area the wellhead occupies in the overall fishery, the

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
				likelihood of interaction (in other words, snagging) is considered highly unlikely and the overall risk low (**Section 7.7.1**).
Accidental Hydrocarbon (Marine Diesel) Release: Result of a Vessel Collision	Loss of hydrocarbons (diesel) to marine environment due to a vessel collision (such as vessels and other marine users) resulting in a worst-case spill of up to 500 m^3 to the marine environment.	Short-term, during decommissioning operations	Moderate (D – 1)	N/A
			Marine diesel is a mixture of both volatile and persistent hydrocarbons. Given the environmental conditions experienced at the wellhead location, marine diesel is expected to undergo rapid spreading and this, together with evaporative loss, is likely to result in a rapid dissipation of the spill. Hydrocarbon spills have the potential to impact marine fauna, marine and coastal habitats, socio-cultural receptors and protected places. Surface hydrocarbons can result in smothering of emergent features, such as emergent reefs, sandy beaches and mangrove habitats, and marine fauna resulting in toxic impacts. Entrained and dissolved hydrocarbons can result in toxic impacts to receptors in the water column, including submerged habitats such as reefs and shoals, and marine fauna. Socio-cultural values, such as tourism and commercial fisheries, can be impacted directly by exclusion from an area due to the presence of a surface slick, and indirectly through effects on target species. While the spatial extent of a hydrocarbon spill can extend greater distances from the source, the wellhead location is located 40 km from land and does not overlap any protected areas. Protected places which could be impacted by a spill include the Ningaloo Marine Park and World Heritage Area and Gascoyne Marine Park. Tourism, including recreational fishing, is an important industry for the North West Cape region. Sensitive habitats could include the Ningaloo Reef, mangrove habitats within the Exmouth Gulf, intertidal mudflats and sandy beaches. Ningaloo Reef also supports a number of marine fauna species. Overlapping the wellhead location is the migration BIA for the pygmy blue whale (**Section 5.6**). Pygmy blue whale migration paths are poorly defined; while individuals may occur during peak	As there would be no activities, this removes any potential risk of accidental hydrocarbon (marine diesel) release as a result of a vessel collision.

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
			migration periods, large aggregations are not expected. The potential for adverse impacts to pygmy blue whales is limited to transient individuals that may be in offshore waters near the release location. A foraging (during breeding) BIA for wedge-tailed shearwaters overlaps the wellhead location (**Section 5.6**), although other species of seabird may also be present in low numbers. Impacts may include mortality due to oiling of feathers or the ingestion of hydrocarbons. An accidental hydrocarbon release as a result of a vessel collision represents a moderate risk rating and may result in minor, short-term impacts to species and habitat (but not affecting ecosystems function, physical or biological attributes).	
Unplanned Discharges: Hydrocarbons/ Chemicals from Use of Vessel and ROV	Accidental discharge to the marine environment of other hydrocarbons/ chemicals from the vessel deck activities and equipment (such as cranes), including subsea ROV hydraulic leaks.	Short-term, during decommissioning operations	Moderate (F - 2)	N/A
			An unplanned release of hydrocarbons/chemicals will result in a decrease in water quality in the immediate area of the spill. An unplanned release has the potential to cause minor impacts to marine megafauna (ingestion, irritation, etcetera), plankton and fish populations (surface and water column biota) in the immediate vicinity of the spill. Unplanned discharges from deck and subsea spills represent a moderate current risk rating and may result in slight, short-term impacts to species and habitat (but not affecting ecosystems function physical or biological attributes).	As there would be no activities, this removes any potential risk of unplanned discharges of hydrocarbons/chemicals.
Unplanned Discharges: Release of Hazardous and Non-hazardous Solid Wastes from the Vessel	Accidental loss of hazardous or non-hazardous solid wastes to the marine environment (excludes sewage, grey water, putrescible	Short-term, during decommissioning operations	Low (F - 2)	N/A
			The potential impacts of solid wastes accidentally discharged to the marine environment include direct pollution and contamination of the environment and secondary impacts relating to potential contact of marine fauna with wastes, resulting in entanglement or ingestion and leading to injury and death of individual animals. In the unlikely event the wellhead itself is dropped during retrieval, potential environmental effects would be limited to localised	As there would be no activities, this removes any potential risk of unplanned discharges of solid hazardous and non-hazardous wastes.

Aspect	Impact/Risk Description	Time Horizon	Impact/Risk and/or benefit of decommissioning options	
			Removal	***Leave in situ***
	waste and bilge water) from a project vessel.		physical impacts on benthic communities. Unplanned discharges of solid hazardous and non-hazardous wastes represent a low risk rating and may result in localised impacts with no lasting effect to water quality, habitats and species.	
Vessel Collision with Marine Fauna	Accidental collision between the vessel and protected marine fauna.	Short-term, during decommissioning operations	Low (F - 1)	N/A
			Cetaceans and whale sharks may be at risk of injury or mortality from vessel collision or being caught in thrusters during station-keeping operations. The vessel would typically be stationary or moving at low speeds when performing the activity, resulting in a collision event being highly unlikely. The wellhead is located within the pygmy blue whale migration BIA (**Section 5.6**), potentially increasing the likelihood of a collision during peak migration periods. A vessel collision with marine fauna represents a low risk rating that may result in slight, short-term impacts to species.	As there would be no activities, this removes any potential for vessel collision with marine fauna.
Physical Presence: Dropped Object During Wellhead Removal Resulting in Seabed Disturbance	Dropped objects during the wellhead removal, resulting in the disturbance of benthic habitat.	Short-term, during decommissioning operations	Low (F - 2)	N/A
			Potential impacts from a dropped object, the largest being the wellhead itself during a removal operation, include localised and temporary elevated turbidity and clogging of respiratory and feeding parts (turbidity) of filter-feeding organisms. The communities found around the infrastructure are common to the broader region. Seabed disturbance as a result of a dropped object represents a low risk ranking that will result in some temporary negligible impacts to benthic communities.	As there would be no activities, this removes any potential for dropped objects.
Physical Presence: Accidental Introduction and Establishment of Invasive Marine Species	Introduction of IMS from project vessel use.	Short-term, during decommissioning operations	Low (E - 0)	N/A
			Deep offshore waters, such as those of the wellhead location (824 m) are not conducive for IMS introduction; therefore, the accidental introduction and establishment of IMS represents a low risk rating and may result in slight impacts to habitats.	As there would be no activities, this removes any potential for introduction and establishment of IMS.

3.7 Decommissioning Options Assessment Summary

The outcomes of the Decommissioning Options Assessment are summarised in **Table 3-6**. This summary takes into consideration the outcomes of the technical feasibility assessment, health and safety assessment and the environmental risks and impacts assessment. Legislative requirements were not considered here as all options complied with, or were consistent with, the requirements of the relevant legislation. The outcomes of the environmental and risk assessment are evaluated in terms of the overall timeframe for both decommissioning options, from short-term impacts during decommissioning to longer term impacts associated with corrosion and degradation of the wellhead.

The assessment determined that leave *in situ* offered the best decommissioning option, as it presented no health and safety risks and equal environmental impacts and lower risks when compared to removal.

Table 3-6: Summary of the decommissioning options assessment

Option	Relevant Legislation	Technical Feasibility	Health and Safety Risk	Environment Impacts		Environmental Risks	
				Short-term	***Long-term***	***Short-term***	***Long-term***
Removal	Compliant	Feasible	Yes	F-Negligible	N/A – No impacts	Low to Moderate	N/A – No risks
Leave *in situ*	Compliant	Feasible	No	N/A – No impacts	F-Negligible	N/A – No risks	Low

3.8 Equal or Better Outcomes

To determine whether a decommissioning option presents an equal or better environmental outcome, the following criteria have been considered:

- Do the short and long-term environmental impacts and risks of leaving *in situ* outweigh or equal those associated with removal?
- Is the activity consistent with the Principles of ESD?
- Do stakeholders support the proposed decommissioning option?

3.8.1 Environmental Risks and Impacts

Short-term and long-term impacts and risks of removal compared to leaving *in situ* are compared in **Table 3-7**.

Table 3-7: Assessment of short and long-term impacts and environmental risks and impacts

Time horizon	Assessment	Outcome
Short-term – impact or risk during decommissioning operations	Removal Short-term impacts associated with removal include those arising from vessel use (such as vessel discharges, noise impacts, light emissions) and the wellhead removal itself (such as seabed disturbance, displacement fluids releases from the wellhead), as well as low and moderate risk events (such as vessel collision, spill risks and marine fauna collision). Leave *in situ* Impacts are limited to potential commercial trawl fishing. The wellhead is located within the WDTF. However, trawl fishing at the location and depth of the wellhead (824 m) is currently unlikely to occur due to the low fishing effort in the fishery, the limitations for trawling presented by the wellhead location (AMC, 2022), as well as the distribution of the target species of the fishery (AFMA, n.d.a). Potential fishing effort has been recorded at the wellhead location during the 2019 - 20 season (Patterson et al. 2021) however, overall fishery effort is low, supported by logbook data from 2010 to 2021 suggesting on average of approximately 17 days per annum is spent trawling in the fishery (AMC, 2022). Additionally, Woodside consulted all fishing license holders within the WDTF, however, no feedback from this fishery was received during stakeholder consultation. Potential impacts to commercial fishers are further reduced as the wellhead will continue to be marked on navigation charts, the navigational equipment on board the WDTF vessels allows for safe navigation around marked obstacles, such as wellheads (AMC, 2022), and there is low susceptibility of the fishing methods used by the fishery to an interaction with the Calthorpe-1 wellhead due to its relatively smooth shape, not having a PGB or other protrusions, and its small stature and low height (~4 m). Possible displacement of trawl fishers is expected to be highly localised to the area surrounding the wellhead. Summary Leave *in situ* represents a better environmental option in the short-term as it eliminates the impacts associated with removal, including those arising from vessel use (such as vessel discharges, noise impacts, light emissions) and the wellhead removal itself (such as seabed disturbance), as well as low and moderate risk events (such as vessel collision, spill risks and marine fauna collision).	Leaving *in situ* delivers better environmental outcome
Long-term – impact or risk beyond decommissioning operations	Removal Removal of the wellhead removes the long-term impacts associated with leaving the wellhead *in situ*, such as possible displacement of trawl fishers or snagging of trawl nets on the wellhead, and long-term corrosion and the release of materials to the marine environment. Leave *in situ*	Removal delivers better environmental outcome

	The wellhead is comprised predominantly of steel, which is non-toxic, and negligible quantities of plastic (up to 500 g). Corrosion of steel occurs at a slow rate, about 0.2 mm/year (Melchers, 2005), meaning the dilution of corroded steel will occur in the open ocean, reducing the concentration at any location at any one time. This will result in a localised increase in the iron content of the seabed, given iron's low toxicity. Coupled with the ongoing sedimentation of the seabed as a result of natural forces, impacts in the long term are expected to be negligible. Possible future displacement of trawl fishers is not expected to be significant given the negligible area the wellhead comprises and depth it is located at. Based on the low level of fishing effort in the vicinity of the wellhead, navigational equipment on board the WDTF vessels and the limitations for trawling presented by the wellhead location (AMC, 2022), the risk of accidental snagging is expected to be low. <u>Summary</u> Removal delivers better environmental outcome in the long term as it removes any impact to the seabed as the wellhead degrades.	

3.8.2 Principles of Ecologically Sustainable Development

The Environment Regulations require the titleholder to ensure the activity is undertaken in a manner consistent with the Principles of ESD, as outlined in Section 3A of the EPBC Act. The equal or better environmental outcomes evaluation assesses the activity against the relevant Principles of ESD, as summarised in **Table 3-8**.

Table 3-8: Assessment of the decommissioning options against the principles of ecologically sustainable development

Principles of ESD	Assessment
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations (the 'integration principle').	The Decommissioning Options Assessment process assessed the long-term and short-term environmental and social aspects associated with each option. The outcomes of this assessment are summarised in **Section 3.6**.
If 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 (the 'precautionary principle').	The main constituents of the wellhead are known and the potential effects of their degradation on the receiving environment understood. Considering the main constituents of the wellhead is iron (98%), which is not considered a contaminant in the marine environment, and small volumes of plastics (500g), no threat of serious or irreversible damage is associated with leaving the infrastructure *in situ*. The greatest risk of the removal option is a hydrocarbon spill. The marine environment is expected to fully recover from such an event and, therefore, there is no threat of serious or irreversible damage associated with removal of the wellhead.
The principle of intergenerational equity - that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle').	Removal of the wellhead removes any potential impact associated with long-term degradation of the wellhead in the marine environment or interference with other users. Wellheads brought onshore for disposal will be recycled, where feasible, or be disposed in a landfill where they will undergo a similar degradation process. Leaving the wellhead *in situ* has no significant impacts to future generations. This is on the basis that all impacts from leaving the wellhead *in situ* are ALARP and acceptable (**Section 7**)
The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making (the 'biodiversity principle').	The introduction of a vessel for removal of the wellhead results in more environmental risks and impacts in the short term than leaving the wellhead *in situ* (**Table 3-5**). However, the risks and impacts associated with either decommissioning option will not impact biological diversity or ecological integrity in the long term, should risks and impacts be managed to ALARP and acceptable levels (**Section 7**).

3.8.3 Recommendation

The recommendation is that the wellhead remains *in situ*. The leave *in situ* decommissioning option meets the requirements of subsection 572(3) and subsection 270(3)(c) of the OPGGS Act if those arrangements are satisfactory to NOPSEMA and subsection 572(7)(d) if application to DAWE for a sea dumping permit is required (**Table 1-3**). The option also aligns with the NOPSEMA policy on Section 572 (NOPSEMA, 2020) and DISER Decommissioning Guideline (DISER, 2022), which allows for consideration of alternatives to removal if those alternatives deliver equal or better environmental, safety and well integrity outcomes.

Regarding environmental outcomes more specifically, the leave *in situ* option is consistent with the relevant principles of ESD and overall provides a better or equal environmental outcome when comparing short- and long-term impacts and risks.

In the short term, the leave *in situ* option poses no environmental impacts and risks since no activity would occur. The wellhead removal activity would pose negligible environmental impacts, and risks from low to moderate.

Conversely, in the long term, once the seabed has recovered from the temporary disturbance, wellhead removal will eliminate any environmental impacts and risks. The perpetual presence of the

wellhead *in situ* will result in planned impacts of negligible consequence, and a highly unlikely risk ranked as low.

The differing timeframes characterising short- and long-term impacts makes direct comparison difficult. However, the consequence of the short-term impacts and risks are greater compared to the consequence of the long-term impacts and risks. Since the long-term impacts associated with the leave *in situ* option will have no lasting effect, and they are not expected to be sequentially cumulative (in other words, increase with time), the environmental outcomes of leaving the wellhead *in situ* are considered equal or better than the removal option.

Therefore, Woodside proposes to leave the Calthorpe-1 wellhead *in situ* permanently.

4. DESCRIPTION OF THE ACTIVITY

4.1 Overview

This section has been prepared in accordance with Regulation 13(1) of the Environment Regulations, and describes the activity to be undertaken as part of the Petroleum Activities Program under this EP.

4.2 Petroleum Activities Program Overview

An overview of the Petroleum Activities Program is provided in **Table 4-1**.

Table 4-1: Petroleum Activities Program overview

Item	Description
Title	WA-59-L
Wells	Calthorpe-1
Vessels	None required
Key activities	Permanent abandonment *in situ* of the wellhead and associated infrastructure

4.3 Location

The well is located within permit area WA-59-L, around 40 km north-west from the northern point of Cape Range (**Figure 4-1**). Details of the well seabed location and water depth is provided in **Table 4-2**.

Table 4-2: Location details for the Petroleum Activities Program, including all relevant infrastructure

Well	Water depth (m LAT)	Height of wellhead (m)	Latitude (S)	Longitude (E)
Calthorpe-1	824	4	113°50'15.381"E	21°33'56.323"S

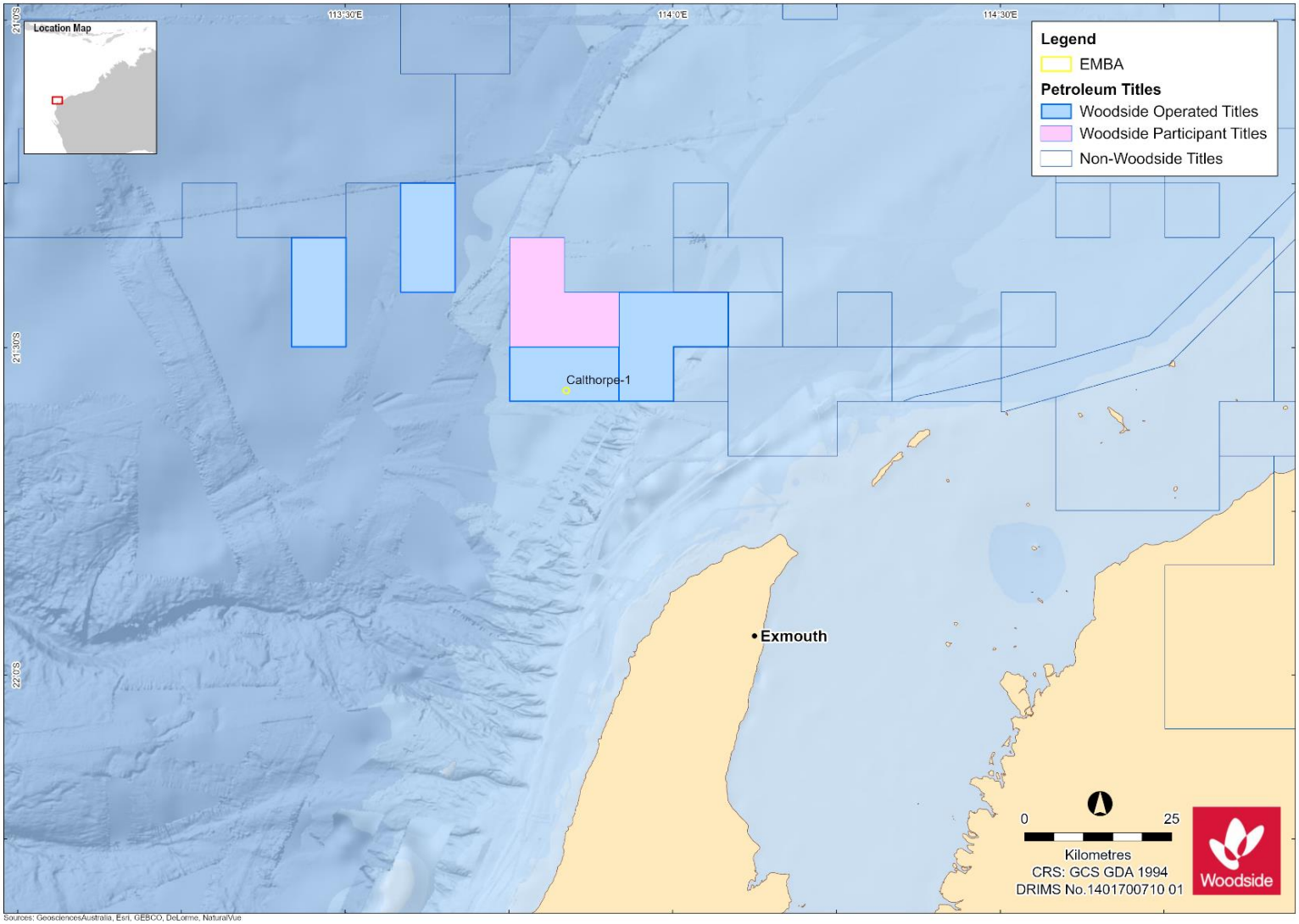


Figure 4-1: Location of the Petroleum Activities Program

4.4 Operational Area

As no planned operations are proposed, an Operational Area has not been defined. However, the area the wellhead occupies and an area around the wellhead where environmental impacts have potential to occur has been defined. This area is referred to throughout this EP as the EMBA.

The EMBA is shown in **Figure 4-1**. The EMBA is the spatial boundary of the Petroleum Activities Program, defined by the impacts and risks assessed and managed by this EP. The EMBA only includes the area encompassing a 500 m radius around the wellhead and the water column 20 m above it.

4.5 Timing

The proposed Petroleum Activities Program involves leaving the wellhead and associated infrastructure *in situ* and, therefore, no field activities are proposed. The Petroleum Activities Program will end on acceptance of this EP by NOPSEMA and, therefore, the duration of the activity will be zero days.

4.6 Infrastructure Overview

The Calthorpe-1 well was designed as a vertical exploration well drilled to determine the hydrocarbon prospectivity of the objective sandstones within tie-back distance of the Laverda Field. The top hole section of the well was initially drilled in June of 2007, after which time the Chikyu drillship departed the well location. In March 2008 a different drill rig, the Jack Bates, arrived at the site of the well. However, following failed connector tests on the 1st and 2nd of April 2008[2], drilling operations were suspended and an application was made to the Department of Industry and Resources (DoIR) to prematurely abandon the Calthorpe-1 well. On the 4th of April 2008, the DoIR accepted the abandonment of the Calthorpe-1 well on the basis no hydrocarbons or permeable zones were encountered in the well and the 9-5/8" casing shoe track remained intact (hereon referred to as the abandonment plug). On the 4th of April 2008, an unsuccessful attempt was made to cut the wellhead[3] involving multiple re-entries and a change out of tooling parts. The rig moved off location returning on the 21st of April 2008 where two further unsuccessful attempts were made to cut the wellhead[4]. On the 24th of April 2008, Woodside wrote to the DoIR outlining that several unsuccessful attempts had been made to cut the wellhead and as a result the wellhead remained *in situ*. The details of the well history and composition are summarised in **Table 4-3** and wellhead infrastructure remaining presented in **Figure 4-2** and **Figure 4-3**.

Table 4-3: Summary of Petroleum Activities Program infrastructure

Well	Year drilled	Drilling fluids	Displacement fluids (above the abandonment plug)	Fluids within casing annuli (above the abandonment plug)	Total section depth (mMDRT)	Abandonment plug depth (mMDRT)	Wellhead and associated infrastructure remaining
Calthorpe-1	2007	seawater and high-viscosity	25 m^3 inhibited seawater	19 m^3 residual drilling fluids (**Table 4-4**)	1681 m[5]	~1650 m to 1675 m[6]	One exploration wellhead and mudmat[7]

[2] As noted in Appendix 2; Daily Offshore Reports (pg.162 -171) of the Well Completion Report publicly available on NOPIMS (Woodside, 2008)

[3] As noted in Appendix 2; Daily Offshore Reports (pg. 173 – 181) of the Well Completion Report publicly available on NOPIMS (Woodside, 2008)

[4] As noted in Appendix 2; Daily Offshore Reports (pg. 257 -261) of the Well Completion Report publicly available on NOPIMS (Woodside, 2008)

[5] As noted in Table 1 of the Well Completion Report publicly available on NOPIMS (Woodside, 2008)

[6] As noted in Section 2 of the Well Completion Report publicly available on NOPIMS (Woodside, 2008)

[7] As noted in Appendix 2; Daily Offshore Reports of the Well Completion Report publicly available on NOPIMS (Woodside, 2008)

Well	Year drilled	Drilling fluids	Displacement fluids (above the abandonment plug)	Fluids within casing annuli (above the abandonment plug)	Total section depth (mMDRT)	Abandonment plug depth (mMDRT)	Wellhead and associated infrastructure remaining
		pre-hydrated gel sweeps					

[1] *As noted in Appendix 2: Daily Offshore Reports of the Well Completion Report publicly available on NOPIMS (Woodside, 2008)*

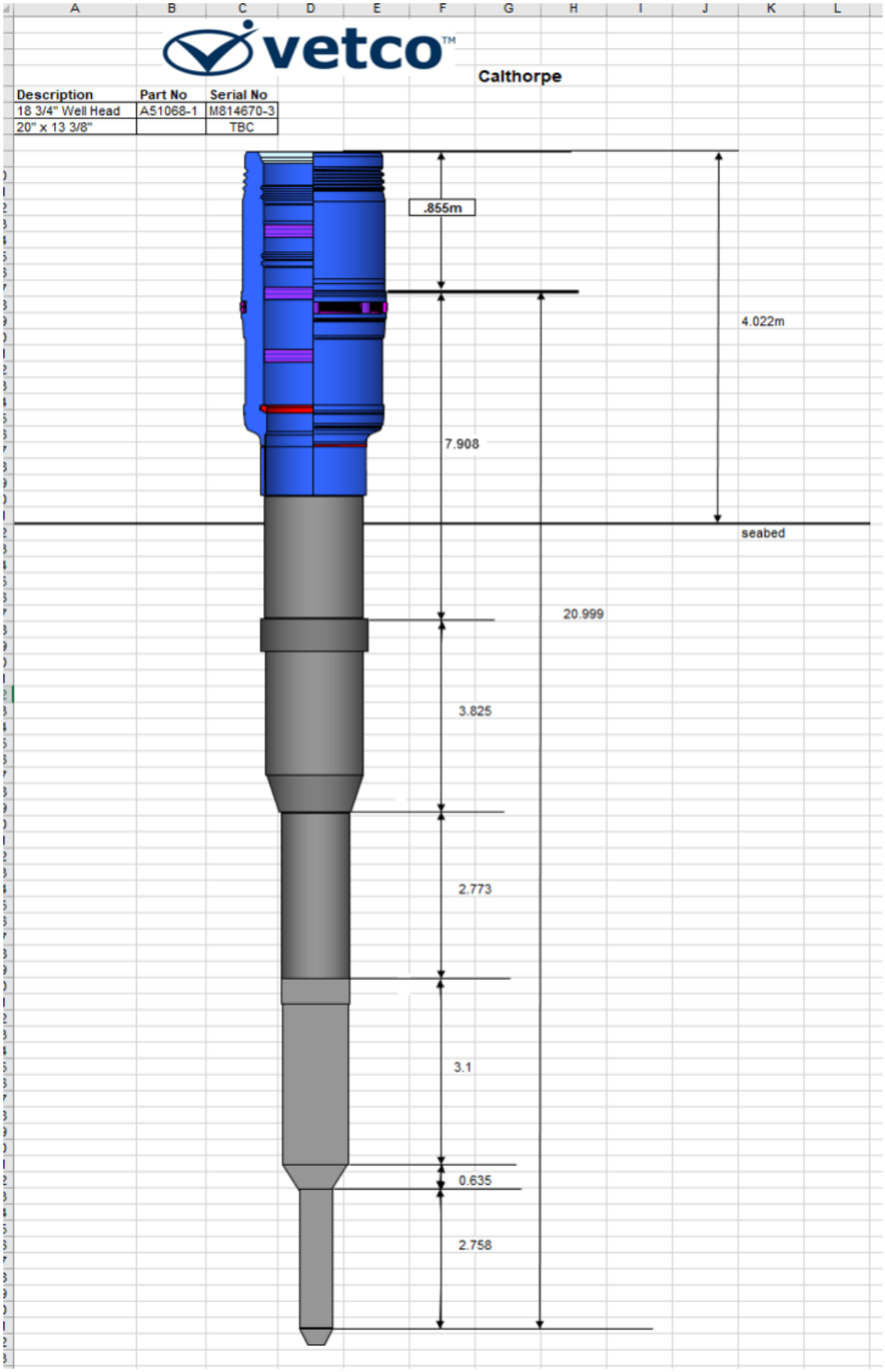


Figure 4-2: Calthorpe-1 wellhead schematic

Figure 4-3: Example image of Calthorpe Wellhead

4.6.1 Wellhead and Associated Infrastructure Composition

The wellhead is comprised of mild steel, with ~500 g of Viton associated with two o-rings. Surface coatings and paints have been used on the wellhead for corrosion protection and are likely to be zinc-oxide based, given the age of the wellhead. The total weight of the steel material varies very little between wellheads and is estimated to be about 7500 kg; the height of the wellhead is approximately 4 m.

Naturally occurring radioactive materials (NORM) are not considered to be present within the wellhead or associated infrastructure.

4.6.2 Residual Chemicals and Fluids

Chemicals and fluids within the well, either above the abandonment plug or behind the casing annulus are currently expected to be in communication with the marine environment due to holes likely in existence as a result of the failed wellhead recovery attempts (**Table 3-3**). These fluids have the potential to leak from the well over time. The fluid volumes remaining depend on the depth of the shallowest plug and diameter of the inner casing/well, as well as the volume that has leaked from the well since the failed wellhead recovery attempts. It is estimated approximately 25 m^3 of fluids remain within the well and 19 m^3 of fluids remain within the annulus (**Table 4-3**); however, these volumes do not consider fluids which may have leaked from the well since the failed recovery attempts. There is no credible risk of fluids below the abandonment plug being released to the marine environment given the well did not intersect hydrocarbons or permeable zones and has been approved for abandonment (**Section 7.5**).

The typical chemicals within the displacement fluids and residual fluids behind the casing annulus are presented in **Table 4-4**, along with their function and Centre for Environment, Fisheries and Aquaculture Science (CEFAS) Offshore Chemical Notification Scheme (OCNS) ranking.

Table 4-4: Residual chemicals and fluids above the abandonment plug

Chemical	Function	OCNS ranking
Displacement fluids		
Corrosion Inhibitor	Prevent corrosion in the wellhead	Gold
Biocide	Prevent marine growth in the wellhead	E
Fluids behind casing annulus		
Bentonite	Protects formation from invasion of drilling fluids	E
Viscosifier (e.g. Drispac SL and Drispac R)	Controls viscosity and prevents water-loss from water-based muds	E

4.6.3 Other Property in the License Area

WA-59-L also includes infrastructure covered under the approved Ngujima Yin Operations EP.

5. DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 Overview

In accordance with Regulations 13(2) and 13(3) of the Environment Regulations, this section describes the existing environment that may be affected by the activity (planned and unplanned, as described in **Section 4**). A detailed and comprehensive description of the environment (in accordance with regulation 13(1)(2) of the Environment Regulations) is available in **Appendix F**.

For the purposes of this EP, Woodside has identified the EMBA as the area encompassing a 500 m radius from the Calthorpe-1 wellhead and the water column 20 m above it (as defined in **Section 4.1**). It is noted that there is no credible spill risk associated with the Petroleum Activities Program (**Section 3.8**). Furthermore, no vessel based- activities are proposed.

The term 'EMBA' will be used to conservatively describe the area where potential impacts from the Petroleum Activities Program have potential to occur. No Operational Area has been defined as there are no planned operations associated with the Petroleum Activities Program.

5.2 Regional Context

The EMBA is located in Commonwealth waters within the North-west Marine Region (NWMR), as defined under the Integrated Marine and Coastal Regionalisation of Australia (v4.0) (Commonwealth of Australia, 2006), in water depths of about 824 m. Within the NWMR the EMBA lies in the Northwest Province (**Figure 5-1**). Woodside's Description of the Existing Environment (**Appendix F: Section 2**) provides a full summary of the characteristics of the NWMR and the Northwest Province.

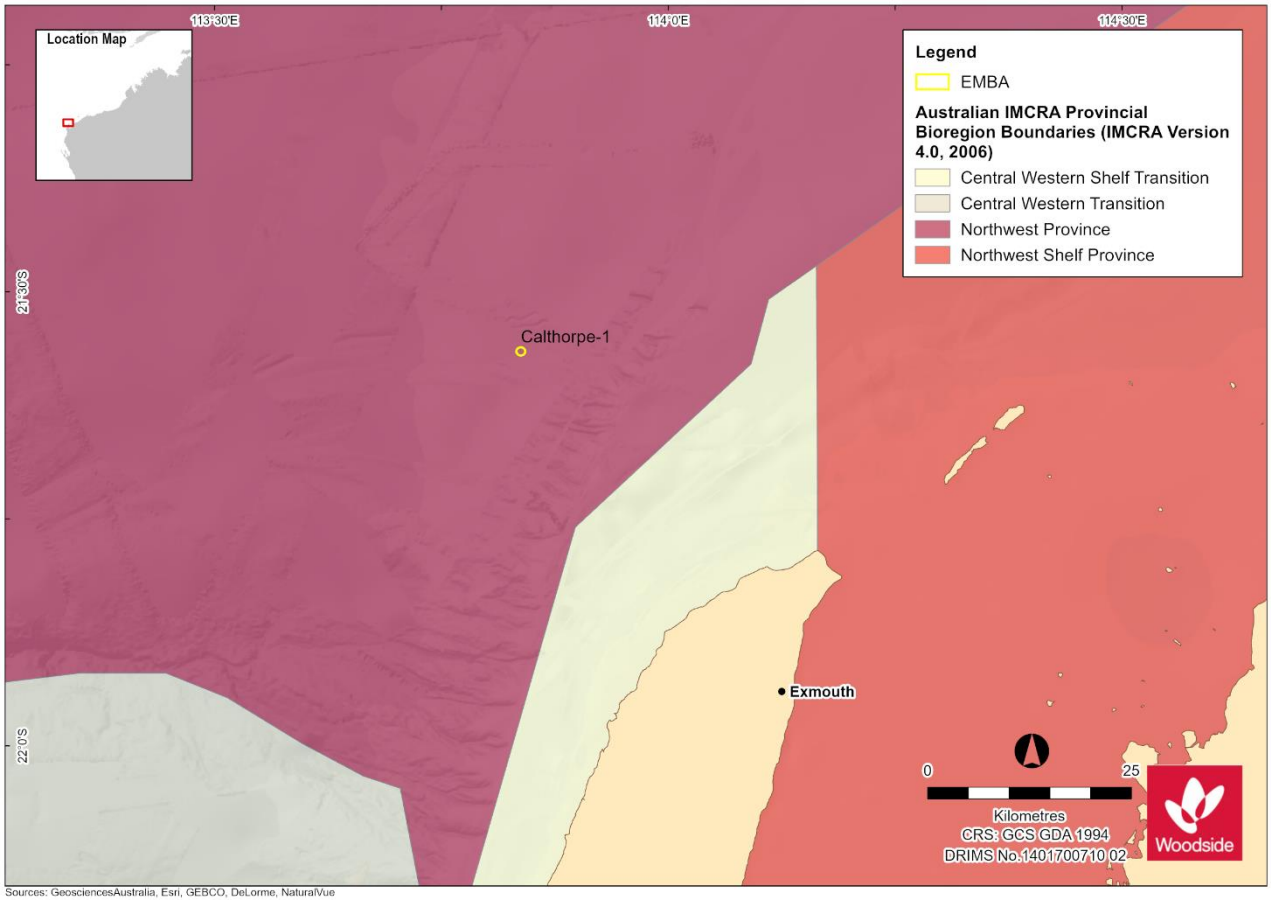


Figure 5-1: Location of the EMBA and relevant marine bioregions

5.3 Matters of National Environmental Significance (EPBC Act)

Table 5-1 summarises the MNES overlapping the wellhead location, according to Protected Matters Search Tool (PMST) results (**Appendix C**). It should be noted that the EPBC Act PMST is a general database that conservatively identifies areas in which protected species have the potential to occur.

Additional information on these MNES are provided in subsequent sections of this chapter and described in detail in **Appendix F: Section 3**.

Table 5-1: Summary of matters of national environmental significance identified by the PMST as potentially occurring at the wellhead location

MNES	Number	Relevant Section
World Heritage Properties	0	N/A
National Heritage Places	0	N/A
Wetlands of International Importance (Ramsar)	0	N/A
Commonwealth Marine Area	1	N/A - EEZ and Territorial Sea
Listed Threatened Ecological Communities	0	N/A
Listed Threatened Species	17	**Section 5.6** and **Appendix F: Section 5 – Section 8.**
Listed Migratory Species	30	**Section 5.6** and **Appendix F: Section 5 – Section 8.**

5.4 Physical Environment

The EMBA is located on the continental shelf in waters approximately 824 m deep. The bathymetry of the EMBA and surrounding area is shown in **Figure 5-2**. The area is largely characterised by the canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula key ecological feature (KEF), which consists of offshore deep-water canyons (described further in **Section 5.7**).

Oceanography in the EMBA is largely characterised by the Leeuwin Current and Ningaloo Current, which flow in opposite directions to each other, and local currents driven by winds and tides. The canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF, within which the EMBA is located, also interacts with the Leeuwin Current to produce eddies inside the heads of the canyons (Brewer *et al*., 2007).

Sediment investigations were undertaken in the area in 2016. Based on the results of these investigations, sediments within the EMBA are believed to be fine sediments comprising sand, clays and fines (BMT Oceanica, 2016). Although hard substrates were identified during sediment investigations, these were typically associated with the Ancient Coastline at 125 m depth contour KEF, which the EMBA does not overlap.

Appendix F: Section 2.3 provides a full description of the physical characteristics of the environment within the EMBA.

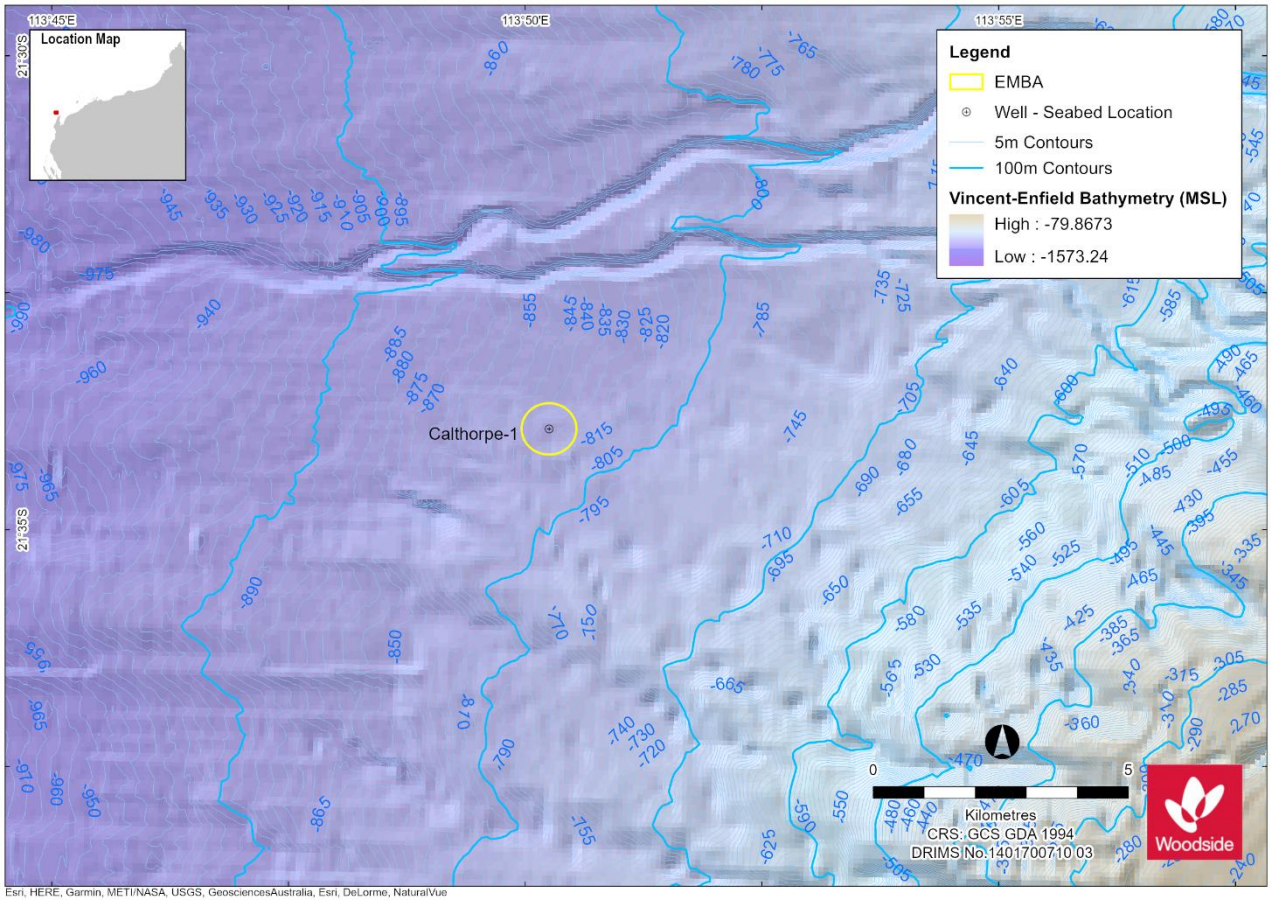


Figure 5-2: Bathymetry of the EMBA

5.5 Habitats and Biological Communities

Key habitats and ecological communities within the EMBA are identified in **Table 5-2** and described in **Appendix F**.

Table 5-2: Habitats and communities within the EMBA

Habitat/Community	Key locations within the EMBA
Marine primary producers	
Corals	None located within the EMBA. Closest hard corals are within the Ningaloo Coast World Heritage Property, approximately 19 km south of the EMBA.
Seagrass beds and macroalgae	None located within the EMBA. Closest seagrass beds are located along the Ningaloo coast, approximately 35 km south of the EMBA.
Mangroves	None located within the EMBA. Closest mangroves are located along the Ningaloo coast, approximately 35 km south of the EMBA.
Other communities and habitats	
Plankton	Phytoplankton within the EMBA is expected to reflect the distribution and abundance of the NWMR; refer to **Appendix F: Section 4.3**.
Pelagic and demersal fish populations	Fish populations within the EMBA are expected to have relatively high diversity but low abundance (BMT Oceanica, 2016; Last *et al.,* 2005); refer to **Appendix F: Section 5.5**.

Habitat/Community	Key locations within the EMBA
Epifauna and infauna	Deepwater feeding communities may be present in the sediments of the EMBA including deposit feeding epifauna and infauna (Heyward and Rees, 2001); refer to **Appendix F: Section 5.5**.

5.6 Protected Species

A total of 34 EPBC Act listed species (2 threatened, 15 threatened and migratory and 17 migratory only), considered to be MNES were identified as potentially occurring at the wellhead location, based on search results from the PMST (full PMST results are provided in **Appendix C**).

However, since the EMBA only includes the area encompassing a 500 m radius around the wellhead and the water column 20 m above it, species identified in the PMST search that are confined to surface waters are unlikely to occur within the EMBA. Additionally, six threatened and migratory species and nine migratory only species may occur in the EMBA.

The next subsections provide details of the MNES that may be expected within the EMBA, including any areas that are considered BIAs for those species or habitats identified as habitat critical to the survival of the species (Habitat Critical). Detailed discussion of protected species is provided in **Appendix F: Section 5 – Section 8.**

5.6.1 Fishes, Sharks and Rays

Table 5-3: Threatened and Migratory fish, shark and ray species predicted to occur within the EMBA

Species name	Common name	Threatened status	Migratory status	EMBA
Carcharodon carcharias	White shark	Vulnerable	Migratory	Species or species habitat may occur within area
Carcharhinus longimanus	Oceanic whitetip shark	N/A	Migratory	Species or species habitat may occur within area
Isurus oxyrinchus	Shortfin mako	N/A	Migratory	Species or species habitat likely to occur within area
Isusrus paucus	Longfin mako	N/A	Migratory	Species or species habitat likely to occur within area
Manta birostris	Giant manta ray	N/A	Migratory	Species or species habitat likely to occur within area

5.6.2 Marine Reptiles

Table 5-4: Threatened and Migratory marine reptile species predicted to occur within the EMBA

Species name	Common name	Threatened status	Migratory status	EMBA
Caretta	Loggerhead turtle	Endangered	Migratory	Species or species habitat known to occur within the water column at the wellhead location but are not expected within the EMBA.
Chelonia mydas	Green turtle	Vulnerable	Migratory	
Dermochelys coriacea	Leatherback turtle, Leathery turtle	Endangered	Migratory	
Eretmochelys imbricata	Hawksbill turtle	Vulnerable	Migratory	
Natator depressus	Flatback turtle	Vulnerable	Migratory	

5.6.3 Marine Mammals

Table 5-5: Threatened and Migratory marine mammal species predicted to occur within the EMBA

Species name	Common name	Threatened status	Migratory status	EMBA
Balaenoptera borealis	Sei whale	Vulnerable	Migratory	Species or species habitat known to occur within area
Balaenoptera musculus	Blue whale	Endangered	Migratory	Migration route known to occur within area
Balaenoptera physalus	Fin whale	Vulnerable	Migratory	Species or species habitat known to occur within area
Eubalaena australis	Southern right whale	Endangered	Migratory	Species or species habitat known to occur within area
Megaptera novaeangliae	Humpback whale	Vulnerable	Migratory	Species or species habitat known to occur within area
Balaenoptera bonaerensis	Antarctic minke whale	N/A	Migratory	Species or species habitat known to occur within area
Balaenoptera edeni	Bryde's whale	N/A	Migratory	Species or species habitat known to occur within area
Physeter macrocephalus	Sperm whale	N/A	Migratory	Species or species habitat known to occur within area
Orcinus orca	Killer whale	N/A	Migratory	Species or species habitat known to occur within area
Tursiops aduncus	Spotted bottlenose dolphin (Arafura/Timor Sea populations)	N/A	Migratory	Species or species habitat known to occur within area

Table 5-6: Marine mammal biologically important areas (BIAs) within the EMBA

Species	BIA type	Approximate distance and direction from EMBA (km)
Pygmy blue whale (*Balaenoptera musculus brevicauda*)	Migration (North-west Marine Region)	Overlaps

5.6.4 Seabirds and Migratory Shorebirds

Table 5-7: Threatened and Migratory seabird and migratory shorebird species predicted to occur within the EMBA

Species name	Common name	Threatened status	Migratory status	EMBA
Calidris canutus	Red knot	Endangered	Migratory	Individuals may traverse the air or water above the wellhead but will not occur in the EMBA.
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Migratory	
Macronectes giganteus	Southern giant petrel	Critically endangered	N/A	
Numenius madagascariensis	Eastern curlew	Critically endangered	N/A	
Pterodroma mollis	Soft-plumaged petrel	Vulnerable	N/A	
Sternula nereis	Australian fairy tern	Vulnerable	N/A	
Anous stolidus	Common noddy	N/A	Migratory	
Fregata ariel	Lesser frigatebird	N/A	Migratory	
Macronectes giganteus	Southern giant petrel	Endangered	Migratory	
Actitis hypoleucos	Common sandpiper	N/A	Migratory	
Calidris acuminata	Sharp-tailed sandpiper	N/A	Migratory	
Calidris melanotos	Pectoral sandpiper	N/A	Migratory	
Pandion haliaetus	Osprey	N/A	Migratory	

Table 5-8: Seabird and shorebird BIAs within the EMBA

Species	BIA type	Approximate Distance and Direction from EMBA (km)
Wedge-tailed shearwater *(Ardenna pacifica)*	Foraging and breeding	BIA overlaps with the wellhead location, but this species will not occur within the EMBA given water depths.

5.6.5 Seasonal Sensitivities for Protected Species

Seasonal sensitivities for protected migratory species identified as potentially occurring within the EMBA (i.e. within the 20 m of water column above the wellhead) are identified in **Table 5-9**. Movement patterns of all protected species identified in **Section 5.6** are described in **Appendix F: Section 5 – Section 8**.

Table 5-9: Key seasonal sensitivities for protected migratory species identified as occurring within the EMBA

Species	January	February	March	April	May	June	July	August	September	October	November	December
Fish, sharks and rays												
Manta rays – presence/ aggregation/breeding (Ningaloo)[1]												
Shortfin mako shark												
Mammals												
Blue whale – northern migration (Exmouth, Montebello, Scott Reef)[2]												
Blue whale – southern migration (Exmouth, Montebello, Scott Reef)[3]												
Bryde's whale – foraging (Shark Bay)[1]												
Humpback whale – northern migration (Jurien Bay to Montebello)[4]												
Humpback whale – southern migration (Jurien Bay to Montebello)[5]												
	Species may be present in the EMBA											
	Peak period. Presence of animals is reliable and predictable each year											

References for species seasonal sensitivities:

1. *Chevron Australia Pty Ltd, 2015; DSEWPaC, 2012a, 2012c)*

2. (DSEWPaC, 2012a; McCauley and Jenner, 2010; McCauley, 2011)

3. (DSEWPaC, 2012a; McCauley and Jenner, 2010)

4. (Environment Australia, 2002; Jenner et al., 2001a; McCauley and Jenner, 2001)

5. (McCauley and Jenner 2001)

5.7 Key Ecological Features

Two KEFs have been identified as overlapping the EMBA, this is the Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula KEF and Continental Slope Demersal Fish Communities KEF, as shown in **Figure 5-3**. KEFs are described in more detail in **Appendix F: Section 9.**

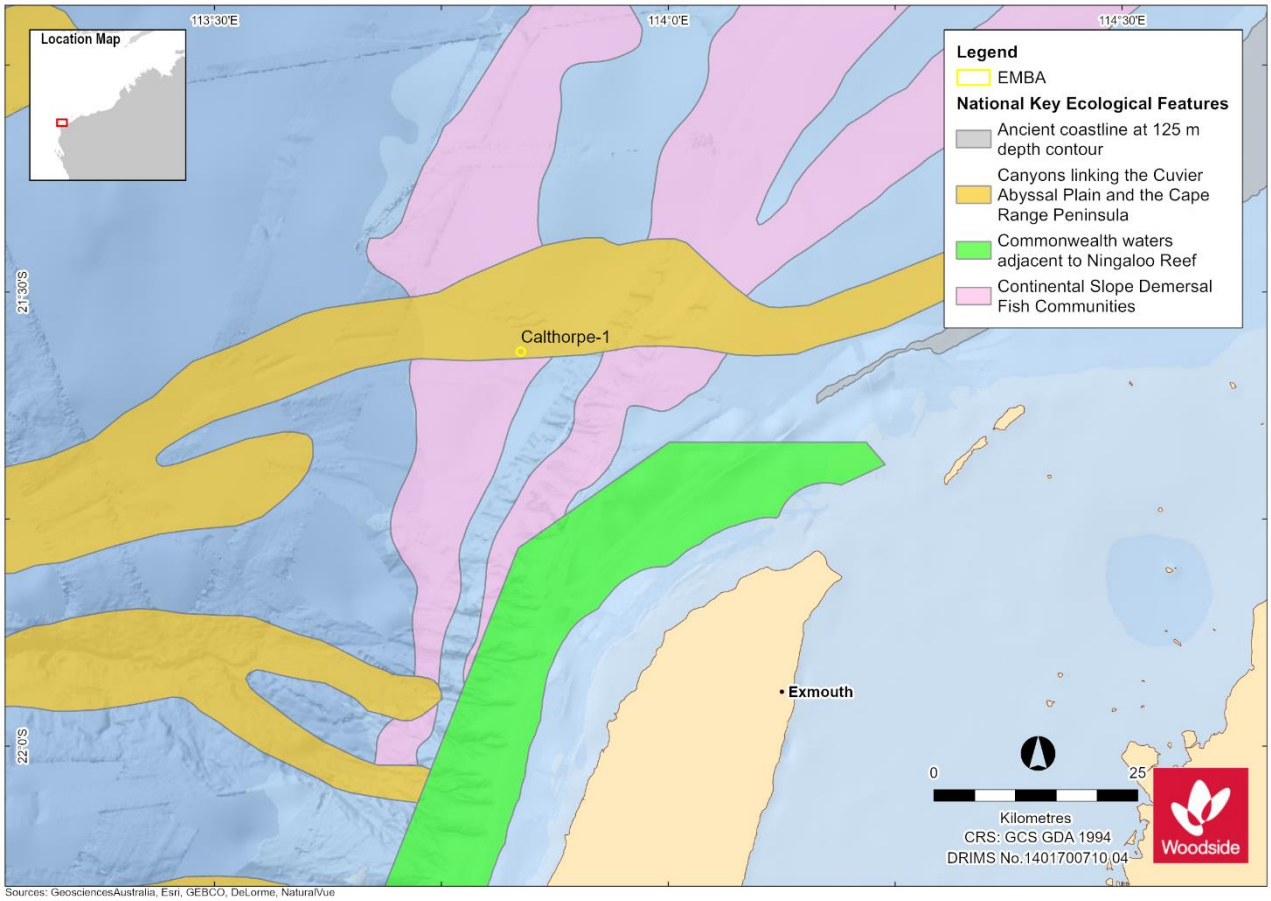


Figure 5-3: Key ecological features overlapping the EMBA

5.8 Protected Places

No protected places overlap the EMBA.

5.9 Socio-economic Environment

5.9.1 Cultural Heritage

5.9.1.1 European Sites of Significance

There are no known sites of European cultural heritage significance within the EMBA.

5.9.1.2 Indigenous Sites of Significance

Indigenous Australian people have a strong continuing connection with the area that extends back some 50,000 years. Woodside acknowledges this unique connection between Aboriginal peoples and the land and sea in which the company operates. Woodside also understands that while marine resources used by Indigenous people are generally limited to coastal waters for activities such as fishing, hunting and maintenance of culture and heritage, many Aboriginal groups have a direct cultural interest in decisions affecting the management of deeper offshore waters.

The longstanding relationship between Aboriginal people and the land and sea is prevalent in Indigenous culture today and Indigenous heritage places, including archaeological sites which are protected under the *Aboriginal Heritage Act 1972* (WA) or EPBC Act.

The Department of Aboriginal Affairs (DAA) Heritage Inquiry System was searched for the EMBA, which indicated no registered Indigenous heritage places (**Appendix E**).

5.9.1.3 Underwater Heritage

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

5.9.1.4 World, National and Commonwealth Heritage Listed Places

No listed heritage places overlap the EMBA.

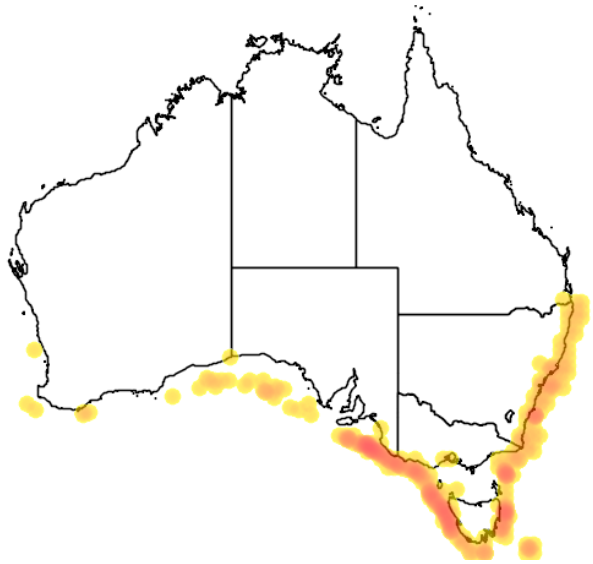
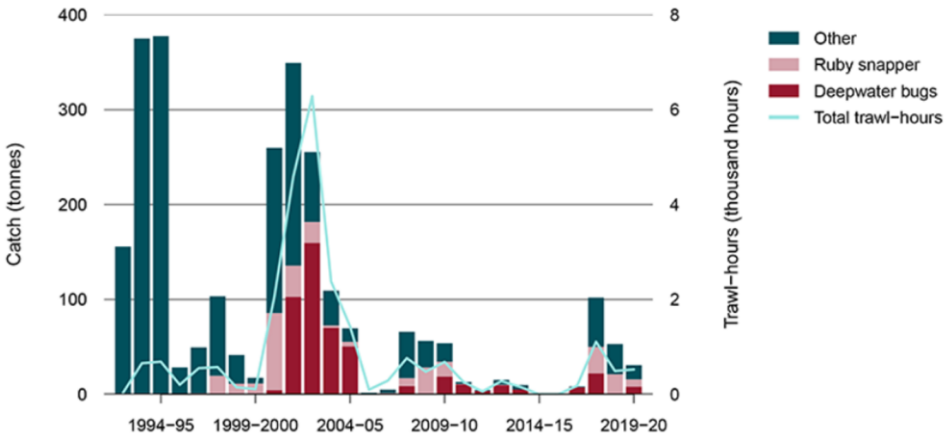
5.9.2 Commercial Fisheries

A number of Commonwealth and State fishery management areas are located within the EMBA. Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) reports were used to analyse the potential for interaction of Commonwealth-managed fisheries within the EMBA. FishCube data was requested to analyse the potential for interaction of State-managed fisheries within the EMBA.

Table 5-10 provides an assessment of the potential interaction based on the licences and number of registered vessels; **Appendix F: Section 11.5.1** provides further detail on the fisheries that have been identified through desk-based assessment and consultation (**Section 6**). **Figure 5-6** shows fisheries identified as having a potential interaction with the Petroleum Activities Program.

Table 5-10: Commonwealth and State commercial fisheries overlapping the EMBA

Fishery Name	Potential for interaction within EMBA	
Commonwealth Managed Fisheries		
Western Deepwater Trawl	✓	The WDTF extends from Albany to Exmouth and the wellhead is located approximately 20 km from its north eastern boundary (**Figure 5-6**). A review of available historical fishing effort data for the WDTF between 2009 and 2020 shows effort in the 60 nm grid square that overlaps the EMBA during the 2011/12, 2017/18 and 2019/20 seasons (ABARES, 2022). During these years the reported effort overlapping the EMBA represented the furthest north extent of fishing, and the majority of historical effort has been focused in the area south of North West Cape to the Abrolhos Islands (Patterson et al., 2017; **Figure 5-6**). As the 60 nm (111 km) grid square covers a relatively large area, it is not possible to determine from this data whether fishing has occurred previously within the EMBA or not. Furthermore, the 60 nm square covers water depths from 0 m (extending onto North West Cape itself) to over 2600 m water depth, indicating some of the area is not possible to be trawled as it is on land, in an area closed to trawling, or due to it being beyond depths currently suitable for trawl fishing or in water depths too shallow to be commercially trawled. Target species for the fishery include deepwater bugs, orange roughy and ruby snapper. Of these species, only the orange roughy utilise habitats at the depth of the wellhead (700 - 1400 m) (AFMA, n.d.a). Although the orange roughy is widely distributed across Australia, the species is primarily caught off the south and east coasts (AFMA, n.d.b) (Error! Reference source not found.). No catch has been reported for orange roughy since 2005-06 and it was removed from fishery status reports as a target species in 2015 (Chambers and Bath, 2015). Targeting of this species may resume in the future. However, fishery reports also note that, should this occur, close monitoring would be required given the low productivity of the species (Chambers and Bath, 2015). The species is thought to be long-lived (90 – 150 years) and slow to mature (20 – 30 years) suggesting a precautionary approach to management is necessary (Rodgers et al., 2009). Trawling at water depths consistent with the Calthorpe-1 wellhead (824 m) is possible; however, presents a limitation as it requires a minimum vessel/equipment specification (horsepower/thrust, winch capacity/power) which is normally only found on medium to large trawlers (AMC, 2022; **Section 3.3**).

		 **Figure 5-4: Orange roughy catch levels across Australia** Fishery status reports show that since 2005 between zero and three vessels have been active in the fishery. Three vessels are currently registered to the fishery (AMC 2022). No fishing effort was reported for the fishery in the 2014/15 or 2015/16 seasons (Patterson et al., 2017). Fishing effort (trawl hours) has been variable, but typically low in the fishery (<1000 hours), with the exception of a spike in the early 2000's (Error! Reference source not found.).  **Figure 5-5: Total catch and fishing effort in the Western Deepwater Trawl fishery, 1992–93 season to 2019-20 season. Source: Patterson *et al.*, 2021** Given historical fishing effort and target species, both current and future interaction with the wellhead is possible. No feedback was received from this fishery during stakeholder consultation (**Section 6**).
Southern Bluefin Tuna	×	Fishing effort for the Southern Bluefin Tuna Fishery occurs in the Great Australian Bight and north-east of Eden in New South Wales. Further, target species and fishing methods are entirely pelagic meaning there is no current or future potential for interaction within the EMBA.
Western Tuna and Billfish	×	Fishing effort occurs in offshore waters between Carnarvon and south-west Australia. Further, target species and fishing methods are entirely pelagic meaning there is no current or future potential for interaction within the EMBA.
Western Skipjack	×	There have been no active vessels operating since 2009 indicating there is no current potential for interaction within the EMBA. Further, target species and fishing methods are entirely pelagic meaning there is no current or future potential for interaction within the EMBA.
State Managed Fisheries		

Mackerel	×	The fishery has not been active in the EMBA within the last five years (DPIRD, 2021). Further, target species and fishing methods are entirely pelagic meaning there is no current or future potential for interaction within the EMBA.
Marine Aquarium	×	The fishery has not been active in the EMBA within the last five years (DPIRD, 2021). As a dive-based fishery, water depths in the EMBA are not conducive for current methods for this fishery (typically ~30 m) meaning that there is no potential for interaction.
Pilbara Line	×	The fishery has potentially been active in the EMBA within the last five years (DPIRD, 2019). Given target species and fishing methods are entirely pelagic, there is no current or future potential for interaction within the EMBA.
Pilbara Crab	×	The fishery has not been active in the EMBA within the last five years (DPIRD, 2021). Given the trap methods utilised, negative interaction such as snagging resulting in loss of damage to fishing equipment in the EMBA is not credible. Due to the tendency of fish to aggregate around subsea structures, trap fishers have reported targeting these structures in order to increase catch rates, which can be considered a positive interaction.
South-West Coast Salmon	×	The fishery has not been active in the EMBA within the last five years (DPIRD, 2021). Further, shore-based fishing methods prevent interactions from being credible.
West Coast Deep Sea Crustacean	×	The fishery has not been active in the EMBA within the last five years (DPIRD, 2021). Given the trap methods utilised, negative interaction such as snagging resulting in loss of damage to fishing equipment in the EMBA is not credible. Due to the tendency of fish to aggregate around subsea structures, trap fishers have reported targeting these structures in order to increase catch rates, which can be considered a positive interaction.
Specimen Shell	×	The fishery has not been active in the EMBA within the last five years (DPIRD, 2021). As a dive-based fishery, water depths in the EMBA are not conducive for current methods for this fishery (typically ~30 m) meaning that there is no potential for interaction.

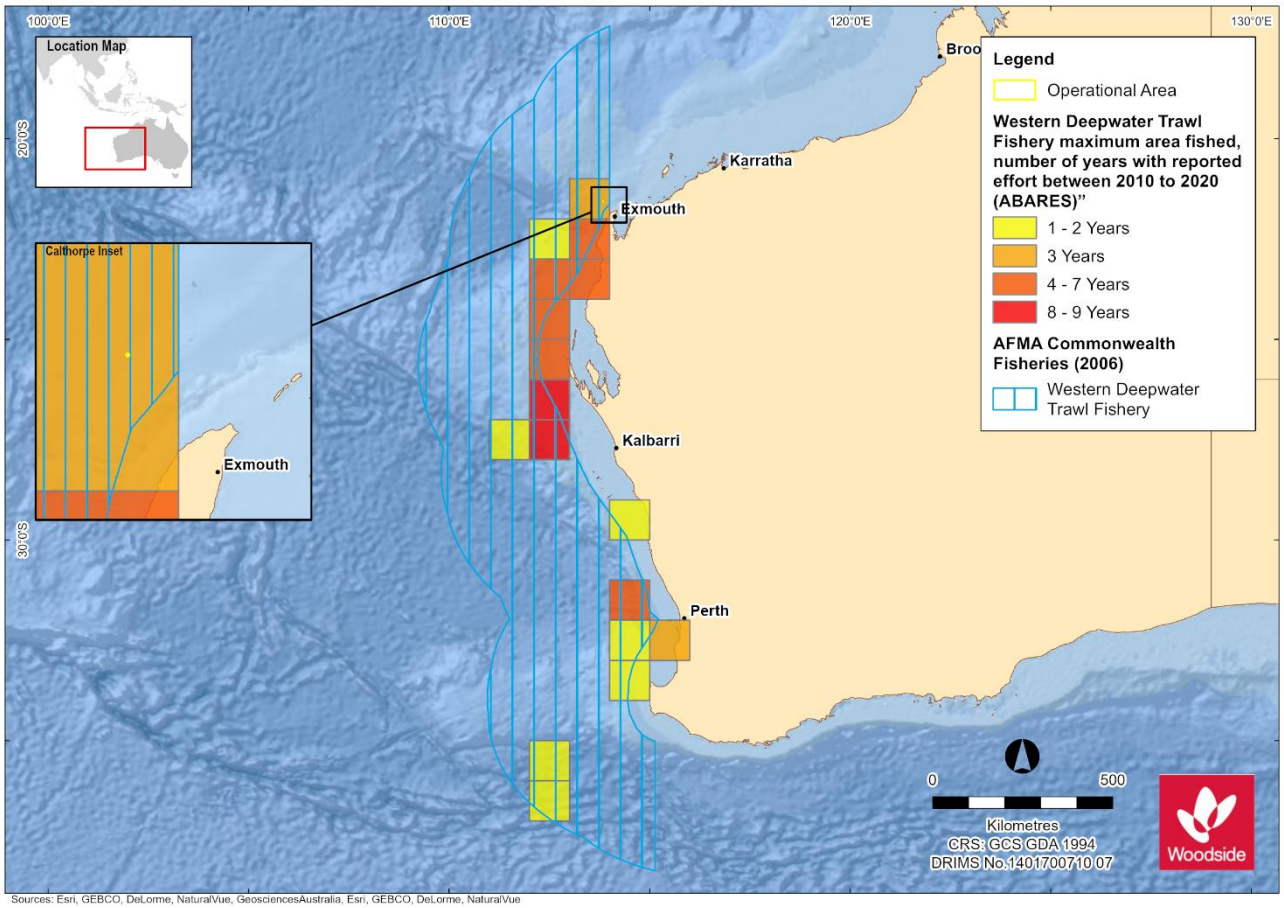


Figure 5-6: Commercial fisheries overlapping the EMBA with a potential for Interaction with the Petroleum Activities Program, including maximum area fished between 2010 and 2020

5.9.3 Traditional Fisheries

There are not expected to be any traditional fisheries that operate within the EMBA. This is because traditional fisheries are typically restricted to coastal waters and/or areas with suitable fishing structures such as reefs.

5.9.4 Tourism and Recreation

Given the depth of the EMBA and distance from shore, recreational fishing and tourism are not expected.

5.9.5 Commercial Shipping

The Australian Maritime Safety Authority (AMSA) has introduced a network of marine fairways across the NWMR off WA to reduce the risk of vessel collisions with offshore infrastructure. It is noted that none of these fairways intersect with the EMBA and vessel drafts would not occur at the depth of the EMBA. The nearest fairway is approximately 20 km from EMBA. Vessel tracking data suggests shipping is concentrated to the west of the EMBA.

5.9.6 Oil and Gas

Table 5-11 details other oil and gas facilities located within 50 km of the EMBA. **Appendix F** describes current oil and gas development within the EMBA, also shown in **Figure 5-7**.

Table 5-11: Other oil and gas facilities located within 50 km of the EMBA

Facility Name and Operator	Distance and Direction from EMBA (km)
Nganhurra FPSO (Woodside)[1]	15 km east
Pyrenees Venture FPSO (BHP Billiton)	25 km east
Ngujima-Yin FPSO (Woodside)	28 km east
Ningaloo Vision FPSO (Santos)	30 km north-east

[1] Nganhurra FPSO sailed away in 2019 and only the riser turret mooring currently remains at the sea surface (i.e. no ongoing operations outside of decommisioning activities

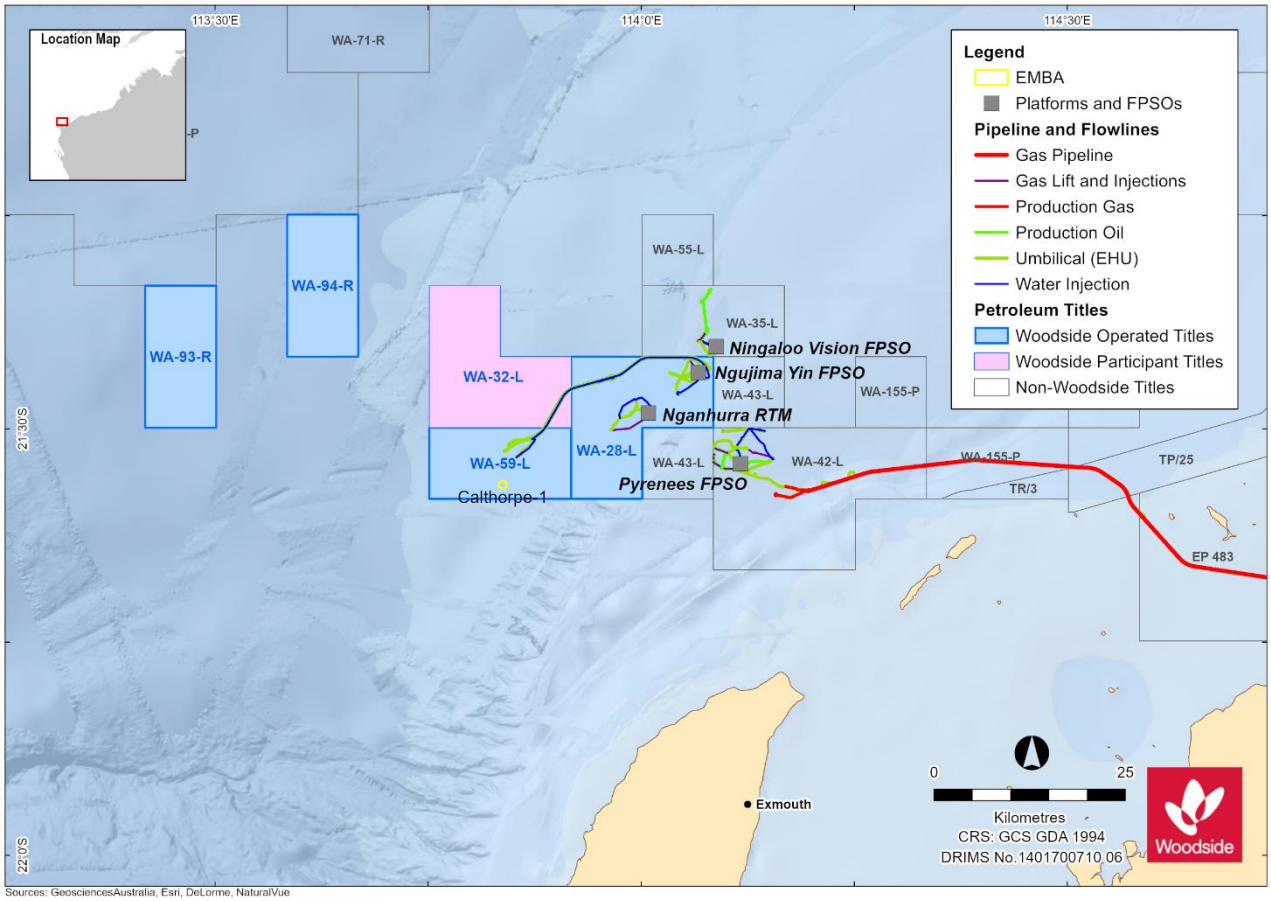


Figure 5-7: Oil and gas infrastructure

5.9.7 Defence

There are no defence areas overlapping the EMBA.

6. STAKEHOLDER CONSULTATION

6.1 Summary

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

6.2 Identification of Relevant Persons

Woodside has followed the requirements of sub regulation 11A (1) of the Environment Regulations to identify relevant persons, these being:

- Each Department or agency of the Commonwealth Government to which the activities to be carried out under the Environment Plan, or the revision of the Plan, may be relevant.
- Each Department or agency of a State or the Northern Territory Government to which the activities to be carried out under the Environment Plan, or the revision of the Plan, may be relevant.
- The Department of the responsible State Minister, or the responsible Northern Territory Minister.
- A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the Environment Plan, or the revision of the Plan.
- Any other person or organisation that the Titleholder considers relevant.

Woodside's assessment of stakeholder relevance is outlined in **Table 6-1.**

6.3 Stakeholder Consultation Objectives

In support of this EP, Woodside has sought to:

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

6.4 Stakeholder Expectations for Consultation

Stakeholder consultation for this activity has also been guided by stakeholder organisation expectations for consultation on planned activities. This guidance includes:

NOPSEMA:

- *GL1721 - Environment plan decision making – June 2021*
- *GN1847 - Responding to public comment on environment plans - September 2020*
- *GN1344 - Environment plan content requirements - September 2020*
- *GN1488 - Oil pollution risk management - February 2021*
- *GN1785 – Petroleum activities and Australian Marine Parks – June 2020*

- *GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – July 2020*
- *NOPSEMA Bulletin #2 – Clarifying statutory requirements and good practice consultation – November 2019*

Australian Fisheries Management Authority:

- *Petroleum industry consultation with the commercial fishing industry*

Commonwealth Department of Agriculture and Water Resources:

- *Fisheries and the Environment – Offshore Petroleum and Greenhouse Gas Act 2006*
- *Offshore Installations Biosecurity Guide* WA Department of Primary Industries and Regional Development:
- *Guidance statement for oil and gas industry consultation with the Department of Fisheries*

WA Department of Transport:

- *Offshore Petroleum Industry Guidance Note*

Woodside acknowledges that additional relevant persons may be identified, in the course of preparing this Environment Plan. If appropriate, these relevant persons will be contacted, provided with information relevant to their interests, and invited to provide feedback about the proposed activity. Woodside will assess their feedback, respond to the relevant person, and incorporate feedback into the management of the proposed activity where practicable.

Woodside consultation arrangements typically provide relevant persons up to 30 days to review and respond to proposed activities where relevant persons are potentially affected. However, for this EP a 45-day period was provided as consultation was combined with the Thebe-1 Wellhead Decommissioning Environment Plan given the proposed activity and identified relevant persons were similar. As such, consultation summarised in **Section 6.5** covers feedback for both these EPs. Woodside considers this consultation period an adequate timeframe in which relevant persons can assess potential impacts of the proposed activity and provide feedback.

Table 6-1:Assessment of Relevant Persons for the Proposed Activity

Stakeholder	Relevant person	Reasoning
Commonwealth Government department or agency		
Australian Border Force (ABF)	No	Responsible for coordinating maritime security. No field activities are planned following Environment Plan acceptance.
Australian Fisheries Management Authority (AFMA)	Yes	Responsible for managing Commonwealth fisheries. Western Deepwater Trawl Fishery is active in wellhead area.
Australian Hydrographic Service (AHS)	Yes	Responsible for maritime safety and Notices to Mariners.
Australian Maritime Safety Authority (AMSA) - Shipping	Yes	Statutory agency for vessel safety and navigation in Commonwealth waters. Whilst the wellhead is outside of maritime shipping channels and do not currently pose a hazard to commercial shipping, Woodside has provided information considering potential impacts from the ongoing presence of the wellhead.
Australian Maritime Safety Authority (AMSA) – Oil Spill	No	Legislated responsibility for oil pollution response in Commonwealth waters. There is no oil spill risk as the well was approved for abandonment (**Section 3.8**) and there are no planned field activities.
Department of Agriculture, Water and the Environment (DAWE) – Fisheries	Yes	Responsible for implementing Commonwealth policies and programs to support agriculture, water resources, the environment and our heritage. The Western Deepwater Trawl Fishery is active in the wellhead area.
DAWE – Biosecurity (marine pests, vessels, aircraft and personnel)	No	DAWE administers, implements and enforces the Biosecurity Act 2015. The Department requests to be consulted where an activity has the potential to transfer marine pests. DAWE also has inspection and reporting requirements to ensure that all conveyances (vessels, installations and aircraft) arriving in Australian territory comply with international health regulations and that any biosecurity risk is managed. The Department requests to be consulted where an activity involves the movement of aircraft or vessels between Australia and offshore petroleum activities either inside or outside Australian territory. No field activities are planned following Environment Plan acceptance.
DAWE – Sea Dumping	Yes	DAWE administers the *Environment Protection (Sea Dumping) Act 1981*. The Department is required to be consulted where an activity has the potential to require a sea dumping permit under the Act.
Department of Defence (DoD)	Yes	Responsible for defending Australia and its national interests. The wellhead overlaps the Defence training area.
Department of Industry, Science, Energy and Resources (DISER)	Yes	Department of relevant Commonwealth Minister and is required to be consulted under the Regulations.
Director of National Parks (DNP)	No	Responsible for managing AMPs and therefore requires an awareness of activities that occur within AMPs, and an understanding of potential impacts and risks to the values of parks (NOPSEMA guidance note: N-

Stakeholder	Relevant person	Reasoning
		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). No field activities are planned that would trigger the DNP's functions, interests or activities. Woodside has chosen to provide information given the proximity of the activity to the Ningaloo AMP.
WA Government department or agency		
Department of Biodiversity, Conservation and Attractions (DBCA)	No	Responsible for managing WA's parks, forests and reserves. Planned activities do not impact DBCA's functions, interests or activities; however, Woodside has chosen to provide information given the proximity of the activity to the Ningaloo State Marine Park.
Department of Mines, Industry Regulation and Safety (DMIRS)	Yes	Department of relevant State Minister and is required to be consulted under the Regulations.
Department of Primary Industries and Regional Development (DPIRD)	Yes	Responsible for managing State fisheries. DPIRD data indicates active fishing in the area by the Pilbara Line Fishery.
Department of Transport (DoT)	No	Legislated responsibility for oil pollution response in State waters. There is no oil spill risk as is the well was approved for abandonment (**Section 3.8**) and there are no planned field activities.
Commonwealth fisheries*		
Southern Bluefin Tuna Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods by licence holders for species fished in this fishery (Australia has a 35% share of total global allowable catch of Southern Bluefin Tuna, which is value-added through tuna ranching near Port Lincoln (South Australia), or fishing effort in New South Wales (Australian Southern Bluefin Tuna Industry Association). In addition, future interactions are not expected given the species' pelagic distribution. Woodside has provided information on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.
Western Tuna and Billfish Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods for species fished by licence holders. Future interactions are not expected given the species' pelagic distribution.Woodside has provided information on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.
Western Deepwater Trawl Fishery	Yes	The fishery overlaps the Operational Area and there has been possible active fishing in the last five years.

Stakeholder	Relevant person	Reasoning
Western Skipjack Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods for species fished by licence holders. Future interactions are not expected given the species' pelagic distribution. Woodside has provided information on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.
State fisheries*		
Mackerel Managed Fishery – Pilbara (Area 3)	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given the water depth for species fished by licence holders (fishers are not active at water depths greater than 70 m (previous WAFIC advice).
South West Coast Salmon Managed Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods and location for species fished by licence holders (fishers are active south of Perth and from the beach (previous WAFIC advice).
West Coast Deep Sea Crustacean Managed Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods and location for species fished by licence holders. In recent years fishing has only been undertaken along the continental shelf edge and in waters south of Exmouth (West Coast Deep Sea Crustacean Managed Fishery; DPIRD, 2005).
Pilbara Crab Managed Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods and location for species fished by licence holders (target species (blue swimmer crab) are only found in waters up to 50 m deep).
Marine Aquarium Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods (dive and wade fishery, with activities generally restricted to waters less than 30 m deep (previous WAFIC advice).
Specimen Shell Fishery	No	The wellhead is located in the fishery, but commercial fishing has not been active at the wellhead location within the last five years. Woodside does not consider that leaving the wellhead *in situ* will present a future risk to licence holders, given fishing methods, location, and water depth for species fished by licence holders. Although the EMBA overlaps the area of this fishery, it is a dive and wade fishery with activities generally restricted to waters less than 30 m deep (previous WAFIC advice).
Pilbara Demersal Scalefish Fishery		

Stakeholder	Relevant person	Reasoning
• Pilbara Trawl Fishery	No	The EMBA is outside of the Pilbara Trawl Fishery.
• Pilbara Trap Fishery	No	The EMBA is outside of the Pilbara Trap Fishery.
• Pilbara Line Fishery	Yes	The fishery overlaps the area and DPIRD data indicates active fishing.
Industry		
BHP	Yes	Adjacent Titleholder.
Industry representative organisations		
Australian Petroleum Production and Exploration Association (APPEA)	Yes	Represents the interests of oil and gas explorers and producers in Australia.
Commonwealth Fisheries Association (CFA)	Yes	Represents the interests of commercial fishers with licences in Commonwealth waters. Western Deepwater Trawl Fishery is active in the EMBA.
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	No	Represents the interests of the Southern Bluefin Tuna Fishery. The Fishery isn't active in the Operational Area. Woodside has provided information to ASBTIA on AFMA advice that it expects all Commonwealth fishers who have entitlements to fish within the proposed area to be consulted, which can be through the relevant fishing industry associations.
Pearl Producers Association (PPA)	No	Although interactions with licence holders in the Pearl Oyster Managed Fishery are unlikely, PPA has requested to be informed of Woodside's planned activities.
Recfishwest	Yes	Represents the interests of recreational fishers in WA. Wellhead remaining *in situ* has the potential to impact recreational fishers.
Marine Tourism WA	Yes	Represents the interests of recreational fishers in WA. Wellhead remaining *in situ* has the potential to impact recreational fishers.
WA Game Fishing Association	Yes	Represents the interests of charter owners and operators in WA. Wellhead remaining *in situ* has the potential to impact recreational fishers.
Western Australian Fishing Industry Council (WAFIC)	Yes	Represents the interests of commercial fishers with licences in State Waters. DPIRD data indicates active fishing in the area by the Pilbara Line Fishery. AFMA data indicates active fishing in the area by the Western Deepwater Trawl Fishery.
Other Relevant Persons		
Exmouth based charter boat, tourism and dive operators	Yes	DPIRD data indicates active tour operator activity in the area.

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

* Fisheries have been identified as being relevant on the basis of fishing licence overlap with the proposed EMBA, as well as consideration of fishing effort data, fishing methods, water depth, and likelihood of fishing in the future. **Table 5-10** provides a detailed assessment of Commonwealth and State fisheries within or adjacent to the EMBA.

6.5 Stakeholder Consultation

Consultation activities conducted for the proposed activity with relevant persons are outlined in **Table 6-2.**

The Consultation Information Sheet (**Appendix F**, reference 1.27) is published on the Woodside website and includes a toll-free 1800 phone number.

Table 6-2: Stakeholder Consultation Activities

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
Australian Government department or agency				
AFMA	On 12 July 2021, Woodside emailed AFMA advising of the proposed activity (Appendix F, reference 1.8) and provided a Consultation Information Sheet, and fisheries map.	On 13 July 2021, the AFMA responded acknowledging Woodside's intention to submit a Decommissioning Environment Plan for Calthorpe-1. AFMA advised that: • Due to limited resources AFMA is unable to comment on individual proposals. • It is important to consult with all fishers who have entitlements to fish within the proposed area.	On 13 July 2021, Woodside thanked the AFMA for its feedback and responded confirming that: • Woodside has provided relevant fishery stakeholders, including government departments or agencies, licence holders and industry associations, with consultation materials. • Fisheries have been identified as being relevant using Fishcube, ABARES/AFMA data, fishing methods and water depth, as well as previous advice from the Western Australian Fishing Industry Council (WAFIC). Woodside requested the AFMA's advice as to whether its expectations are to consult all Commonwealth Fisheries who are entitled to fish over the EMBA. Woodside stated that previous advice from other fisheries stakeholders (to reduce stakeholder consultation fatigue) is to only consult those fishers who have been active in the area over the last 5 years, and based on fishing methods and water depth.	Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 5.9.2** of this EP and consulted all Commonwealth fisheries with entitlement to fish in the area on advice from the AFMA. In addition, DAWE, CFA and ASBTIA have been notified and no feedback received. Woodside has addressed feedback received from WAFIC as outlined below. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
		On 14 July 2021, the AFMA responded advising that AFMA expects all Commonwealth fishers	On 15 July 2021, Woodside responded to request a time to discuss this matter further with AFMA.	

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
		who have entitlements to fish within the proposed area to be consulted irrespective of the current status of fishing activity.	On 16 and 17 July 2021, Woodside called AFMA to follow up on email request.	
		On 20 July 2021, the AFMA called Woodside to discuss Woodside's Environment Plan consultation process and how we determine relevancy of fisheries.	On 20 July 2021, Woodside emailed the AFMA to thank them for the call and to confirm its understanding of the conversation, including: • AFMA's view is that Operators should consult all fisheries who have a right to fish in that area, regardless of whether they are actively fishing. If the fishery doesn't think the consultation is relevant to them then they can choose not to respond. • Woodside advised that its current process is to determine relevant stakeholders using Fishcube, ABARES/AFMA data, fishing methods and water depth, as well as based on previous advice from WAFIC. This enables the consultation to be appropriate to fisheries and the specific activity, whilst also considering stakeholder fatigue. • Woodside confirmed that on this basis, Woodside will consult with additional fisheries that overlap the EMBA for Calthorpe-1 Environment Plan, in line with AFMA's request.	
		On 9 August 2021, the AFMA responded to thank Woodside for its confirmation.		

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
AHO	On 12 July 2021, Woodside emailed the AHO advising of the proposed activity (Appendix F, reference 1.10) and provided a Consultation Information Sheet, and shipping lanes map.	On 13 July 2021, the AHO responded acknowledging receipt of Woodside's email.	Woodside notes the AHO has received the consultation materials.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
AMSA (shipping)	On 12 July 2021, Woodside emailed AMSA advising of the proposed activity (Appendix F, reference 1.10) and provided a Consultation Information Sheet, and shipping lanes map.	No feedback received.	No response required.	No feedback provided. The wellhead is outside of maritime shipping channels and does not currently pose a hazard to commercial shipping. There is no oil spill risk as the well was approved for abandonment (**Section 3.8**) and there are no planned field activities. Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
DAWE - Fisheries	On 12 July 2021, Woodside emailed DAWE advising of the proposed activity considering biosecurity matters (Appendix F, reference 1.11) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	No feedback provided. Woodside has consulted AFMA, CFA, ASBTIA and WAFIC and individual Licence holders who have an entitlement to fish in the area. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 5.9.2** of this EP.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	On 26 July 2021, Woodside emailed DAWE providing an update that Woodside will consult additional Commonwealth fishery licence holders who have entitlements to fish in the area (Appendix F, reference 1.24), and provided an updated fisheries map.			Maritime biosecurity issues are not credible due to the absence of vessel based activities. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
DAWE – Sea Dumping		On 27 October 2021, Woodside received a letter from DAWE relating to the *Environment Protection (Sea Dumping) Act 1981* and advised that a sea dumping permit is required for the Calthorpe-1 wellhead.	On 16 November 2021 and 5 January 2022, Woodside and DAWE had meetings to discuss DAWE's new draft guidance document relating to the application of the Sea Dumping Act to petroleum infrastructure. At the 5 January 2022 meeting, DAWE raised that a two-year sea dumping permit trail with NOPSEMA had been initiated and asked if Woodside would like to participate, which Woodside agreed to.	Woodside has consulted DAWE – Sea Dumping regarding requirements under the *Environment Protection (Sea Dumping) Act 1981.* Woodside will continue to engage with DAWE regarding the application of the *Environment Protection (Sea Dumping) Act 1981* and to comply with requirements under the Act as referenced as **PS 1.1** in this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
			On 2 February 2022, Woodside sent a letter to DAWE responding to its 27 October 2021 letter and subsequent meetings and stated that: • Woodside understands that DAWE's interpretation of Section 5(1) of the *Sea Dumping Act* is that the exemption does not apply to decommissioned infrastructure, which is an interpretation of the legislation that Woodside has not come across previously, and that the language in the Act does not immediately support an	

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
			interpretation that removes decommissioning from the exemption. Similarly, the London Protocol and IMO Guidelines do not appear to support this interpretation. • Raised concerns with DAWE's interpretation of the legislation in relation to fluids, wellheads and pipelines.	
			On 9 May 2022, Woodside and DAWE had a meeting to discuss Sea Dumping permit applications, including how the proposed NOPSEMA/DAWE streamlining process would work, and provided an overview of upcoming permits (including Calthorpe-1) and approximate submission dates. DAWE confirmed that wells with a wellhead in place that were drilled and subsequently plugged and abandoned prior to the date the act came into force did not require a permit to leave the wellhead *in situ*.	
DoD	On 12 July 2021, Woodside emailed DoD advising of the proposed activity (Appendix F, reference 1.12) and provided a Consultation Information Sheet, and defence map.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
DISER	On 12 July 2021, Woodside emailed DISER advising of the proposed activity (Appendix F, reference 1.1) and provided a consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Director of National Parks (DNP)	On 17 August 2021, Woodside emailed the DNP advising of the proposed activity (Appendix F, reference 1.25) and provided a consultation Information Sheet.	On 1 September 2021, the DNP responded thanking Woodside for the information provided and: • Advised it notes that planned activities do not overlap any Australian Marine Parks. However, the Calthorpe-1 wellhead is adjacent to the Gascoyne Marine Park and near Ningaloo Marine Park which may impact on the values present. • Requested further details in regard to the proposed decommissioning of the wellhead including assessment of options and associated identification of risks. • Requested advice on whether Woodside has engaged with the Yamatji Marlpa Aboriginal Corporation. • Advised that a Sea Dumping permit may be required. • Referenced the NOPSEMA and Parks Australia guidance note that outlines what titleholders need to consider and evaluate for an EP.	On 9 September 2021, Woodside thanked the DNP for its feedback and advised that: • An overview of DNP's comments and Woodside's response will be included in our EP. • Noted that an options assessment determined that there were two feasible decommissioning options for the wellhead, complete removal and leave *in situ*. The outcome of the assessment undertaken by Woodside is that the wellhead remains *in situ* which provides a better or equal environmental outcome when comparing short- and long-term impacts and risks. • Woodside's EPs describe the existing environment that may be affected by the activity during planned and unplanned activities. • There are no planned activities given Woodside is proposing to leave the wellhead *in situ*. • No operational area has been defined and the EMBA comprises a conservative 500 m radius.	Woodside has addressed the DNP's feedback, including: • Reaffirming that no areas of ecological importance, including the Ningaloo Marine Park and Muiron Islands Nature Reserve and Marine Management Area, will be impacted by proposed activities covered under the EP. Woodside also advised that the environment that may be affected (EMBA) is outside the boundary of any AMPs. • Provided information relating to the materials and size of the exploration wellhead, and impacts and risks from the wellhead being left *in situ*. • Reaffirmed that there are no credible oil spill risks associated with the planned activity, including unplanned hydrocarbon release due to wellhead plugging fail, and advised that the well has been accepted by the regulator as abandoned.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
		• Advised that DNP should be made aware of oil/gas pollution incidences which occur within a marine park or are likely to impact on a marine park as soon as possible.	• The well is proposed to be left *in situ*. There are no credible oil spill risks or associated spill response plans or monitoring programs for the EPs. • There are also no planned or unplanned impacts associated with any vessel's operations. • Woodside has concluded that there will be no areas of ecological importance, including the Gascoyne Marine Park and Ningaloo Marine Park, impacted from the activity. • Confirmed that Woodside consulted with the Yamatji Marlpa Aboriginal Corporation and the Department of Agriculture, Water and the Environment.	• Reaffirmed that the leave *in situ* decommissioning option meets the requirements of Section 572(3) and Section 270(3)(c) of the OPGGS Act and aligns with the DISER Decommissioning Guideline. • Reaffirmed that it considers this information sufficient to conclude that no impacts will occur to the values of the Gascoyne Marine Park or Ningaloo World Heritage Area. Woodside also confirmed that it had consulted with the Yamatji Marlpa Aboriginal Corporation and DAWE. Woodside has consulted DAWE on Sea Dumping Act requirements (PS 1.1). Following Woodside providing further information in response to DNP's requests and advice, DNP confirmed: • They have no objections and claims at this time. • The risk of a hydrocarbon spill affecting Australian Marine Parks and the values of the parks have been assessed as acceptable and ALARP (i.e. there is no credible spill risk). Woodside considers this adequately addresses stakeholder

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
		On 27 September 2021, the DNP responded stating that it does not consider its request for further information to be addressed. The DNP requested information relating to: • risk assessments associated with removal of the wellhead and leaving it *in situ*, including risks relating to its continued physical presence and degradation over time. • risk of unplanned hydrocarbon release. The DNP: • acknowledged the OPGGS Act and the Offshore Petroleum Decommissioning Guideline 2018 allows for consideration of alternatives to complete removal. It also noted that the DNP can raise any claims and objections. • stated that wellhead is adjacent to the Gascoyne Marine Park and the Ningaloo World Heritage Area and decommissioning activities could impact values present.	On 30 September 20221, Woodside responded thanking the DNP for its feedback and advised that: • Planned activities do not overlap any Australian Marine Parks (AMPs), and the environment that may be affected (EMBA) is outside the boundary of any AMPs. • No impacts on marine parks or impacts that may affect the two KEFs have been identified from leaving the wellhead *in situ*. • All impacts and risks from the proposed activity have been assessed as acceptable and ALARP in the EP, and will be limited to a highly conservative 500 m radius around the wellhead. Information relating to the materials and size of the exploration wellhead, and impacts and risks from the wellhead being left *in situ* was provided. • The EP is expected to be made available on NOPSEMA's website approximately mid-October. Woodside reaffirmed that: • There are no credible oil spill risks associated with the planned activity, including unplanned hydrocarbon release due to wellhead plugging fail, and advised that the well has been accepted by the regulator as abandoned. • The leave *in situ* decommissioning option meets the requirements of	interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
			Section 572(3) and Section 270(3)(c) of the OPGGS Act and aligns with the DISER Decommissioning Guideline. Woodside noted that it considers this information sufficient to conclude that no impacts will occur to the values of the Gascoyne Marine Park or Ningaloo World Heritage Area. Woodside offered a meeting with the DNP to further discuss the activities covered under this EP and/or Woodside's wellhead decommissioning approach more broadly.	

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
		On 12 October 2021, DNP responded thanking Woodside for the additional information and advised: • DNP has no objections and claims at this time. • the risk of a hydrocarbon spill affecting AMPs and the values of the parks have been assessed as acceptable and ALARP. DNP reiterated its 1 September 2021 correspondence requesting advice on whether Woodside intends to engage the Gnulli people, via the Yamatji Aboriginal Corporation, as DAWE.	On 12 October 2021, Woodside responded thanking DNP for its feedback. We noted DNP's confirmation that: • DNP has no objections and claims at this time. • The risk of a hydrocarbon spill affecting AMPs and the values of the parks have been assessed as acceptable and ALARP. Woodside confirmed that as per its 9 September 2021 correspondence, Woodside has consulted the Nganhurra Thanardi Garrbu Aboriginal Corporation, via their nominated representative the Yamatji Marlpa Aboriginal Corporation (YMAC), as well as DAWE.	
Western Australian Government department or agency or advisory body				
DBCA	On 12 July 2021, Woodside emailed DBCA advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	On 20 July 2021, DBCA thanked Woodside for the information provided and advised: • DBCA has previously provided comment to Woodside in relation to petroleum production activities in proximity to ecologically sensitive receptors including marine parks and other reserves and the need for comprehensive baseline monitoring of these receptors and oil spill response preparedness. • Noted that DBCA has previously received a response from	On 22 July 2021, Woodside thanked DBCA for their feedback and advised: • An overview of DBCA's comments and Woodside's response will be included in our EP. • Reaffirmed that no areas of ecological importance, including the Ningaloo Marine Park and Muiron Islands Nature Reserve and Marine Management Area, will be impacted by proposed activities covered under the EP. • Woodside's EPs describe the existing EMBA by the activity	Woodside has addressed the DBCA's feedback, including reaffirming that no areas of ecological importance, including the Ningaloo Marine Park and Muiron Islands Nature Reserve and Marine Management Area, will be impacted by proposed activities covered under the EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
		Woodside in relation to this advice. • Reiterated its comments in relation to the Ningaloo Marine Park and Muiron Islands Nature Reserve and Marine Management Area. • Requested that should Woodside have additional information relating to its monitoring or oil spill preparedness this would be welcome.	during planned and unplanned activities. • There are no planned activities given Woodside is proposing to leave the wellhead *in situ*. • No operational area has been defined and the EMBA comprises a conservative 500 m radius. • The well is proposed to be left *in situ*. There are no credible oil spill risks or associated spill response plans or monitoring programs for the EPs. • There are also no planned or unplanned impacts associated with any vessel's operations, such as light, air emissions, noise, discharges etc.	
DMIRS	On 12 July 2021, Woodside emailed DMIRS advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	On 13 July 2021, DMIRS responded: • acknowledged receipt of consultation information. • advised it has reviewed the consultation information and no further information is required at this stage. • provided linked Consultation Guidance Note outlining information pertaining to the reporting of incidents.	No response required.	Woodside notes that DMIRS acknowledged consultation information provided and did not require further information. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
DPIRD	On 12 July 2021, Woodside emailed DPIRD advising of the proposed activity (Appendix F, reference 1.13) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside has consulted DPIRD, WAFIC, and individual relevant Licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 5.9.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Commonwealth Fisheries				
Southern Bluefin Tuna Fishery	On 26 July 2021 Woodside emailed the Southern Bluefin Tuna Fishery advising of the proposed activity (Appendix F, reference 1.18) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside has consulted DAWE, AFMA, CFA, ASBTIA and WAFIC and individual Licence holders who have an entitlement to fish in the area. As the Department responsible for managing Commonwealth fisheries, Woodside has addressed the AFMA's feedback as outlined above. Woodside has also addressed WAFIC's feedback as outlined below. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 5.9.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
Western Tuna and Billfish Fishery	On 26 July 2021 Woodside emailed the Western Tuna and Billfish Fishery advising of the proposed activity (Appendix F, reference 1.19) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside has consulted DAWE, AFMA, CFA, ASBTIA and WAFIC and individual Licence holders who have an entitlement to fish in the area. As the Department responsible for managing Commonwealth fisheries, Woodside has addressed the AFMA's feedback as outlined above. Woodside has also addressed WAFIC's feedback as outlined below. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 5.9.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Western Deepwater Trawl Fishery	On 12 July 2021 Woodside emailed the Western Deepwater Trawl Fishery advising of the proposed activity (Appendix F, reference 1.9) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	No feedback received. Woodside has consulted DAWE, AFMA, CFA, ASBTIA and WAFIC and individual Licence holders who have an entitlement to fish in the area. As the Department responsible for managing Commonwealth fisheries, Woodside has addressed the AFMA's feedback as outlined above. Woodside has also addressed WAFIC's feedback as outlined below. Woodside has assessed the relevancy of Commonwealth
	On 8 December 2021, Woodside emailed the Western Deepwater Trawl Fishery following up on the 12 July 2021 consultation Appendix F, reference 3.1) and re-provided the Consultation Information Sheet, and fisheries	No feedback received.	No response required.	

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	map for feedback by 7 January 2022.			fisheries issues in **Section 5.9.2** of this EP, as well as assessed potential current and future impacts to this fishery in **Sections 7.6.1** and **7.7.1** including the adoption of relevant controls to manage these impacts and risks (**PS 1.1** and **PS 1.2**). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 30 December 2021, Woodside emailed the Western Deepwater Trawl Fishery following up on the 12 July 2021 and 8 December 2021 consultation Appendix F, reference 3.2) for feedback by 7 January 2022.	No feedback received.	No response required.	
Western Skipjack Fishery	On 26 July 2021, Woodside emailed the Western Skipjack Fishery advising of the proposed activity (Appendix F, reference 1.20) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside has consulted DAWE, AFMA, CFA, ASBTIA and WAFIC and individual Licence holders who have an entitlement to fish in the area. As the Department responsible for managing Commonwealth fisheries, Woodside has addressed the AFMA's feedback as outlined above. Woodside has also addressed WAFIC's feedback as outlined below. Woodside has assessed the relevancy of Commonwealth fisheries issues in **Section 5.9.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
State Fisheries				
Pilbara Line Fishery	On 12 July 2021, Woodside emailed the Pilbara Line Fishery advising of the proposed activity (Appendix F, reference 1.15) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside has consulted DPIRD, WAFIC, and individual relevant Licence holders. As the representative industry body, WAFIC has provided a response. Woodside has addressed WAFIC's feedback as outlined below. Woodside has assessed the relevancy of State fisheries issues in **Section 5.9.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Industry				
BHP	On 12 July 2021, Woodside emailed BHP advising of the proposed activity (Appendix F, reference 1.16) and provided a Consultation Information Sheet, and Titleholder map.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Industry representative organisations				
APPEA	On 12 July 2021 Woodside emailed APPEA advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
CFA	On 12 July 2021, Woodside emailed the CFA advising of the proposed activity (Appendix F, reference 1.3) and provided a Consultation Information Sheet, and fisheries map. On 26 July 2021, Woodside emailed CFA providing an update that Woodside will consult additional Commonwealth fishery licence holders who have entitlements to fish in the area (Appendix F, reference 1.22), and provided an updated fisheries map.	No feedback received.	No response required.	Woodside has consulted relevant Commonwealth fishery stakeholders including DAWE, AFMA, ASBTIA, WAFIC and individual Licence holders who have an entitlement to fish in the area. Woodside has assessed the relevance of Commonwealth fisheries issues in **Section 5.9.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
ASBTIA	On 26 July 2021, Woodside emailed the ASBTIA advising of the proposed activity (Appendix F, reference 1.21) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside has consulted relevant Commonwealth fishery stakeholders including DAWE, AFMA, CFA, WAFIC and individual Licence holders who have an entitlement to fish in the area. Woodside has assessed the relevance of Commonwealth fisheries issues in **Section 5.9.2** of this EP.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
				Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
PPA	On 12 July 2021, Woodside emailed the PPA advising of the proposed activity (Appendix F, reference 1.14) and provided a Consultation Information Sheet, and fisheries map.	No feedback received.	No response required.	Woodside has consulted relevant State fishery stakeholders including WAFIC, DPIRD and relevant Licence holders. Woodside has assessed the relevancy of State fisheries issues in **Section 5.9.2** of this EP. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Recfishwest	On 12 July 2021, Woodside emailed Recfishwest advising of the proposed activity (Appendix F, reference 1.1) and a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has consulted WA Game Fishing Club, Marine Tourism Association of WA and individual relevant charter operators. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Marine Tourism Association of WA	On 12 July 2021, Woodside emailed Marine Tourism Association advising of the proposed activity (Appendix F,	No feedback received.	No response required.	Woodside has consulted Recfishwest, WA Game Fishing Club and individual relevant charter operators.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	reference 1.1) and provided a Consultation Information Sheet.			Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
WA Game Fishing Association	On 12 July 2021, Woodside emailed the WA Game Fishing Association advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has consulted Recfishwest, Marine Tourism Association of WA and individual relevant charter operators. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
WAFIC	On 12 July 2021, Woodside emailed WAFIC advising of the proposed activity (Appendix F, reference 1.13) and provided a Consultation Information Sheet, and fisheries map.	On 2 August 2021, WAFIC responded querying whether consultation had been provided to commercial fisheries outlined.	On 2 August 2021, Woodside responded thanking WAFIC for their email and advising: • Woodside provided consultation information to Pilbara Line Fishery and Western Deepwater Trawl Fishery on 12 July 2021. • In addition, consultation information was provided to Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery and the Australian Southern Bluefin Tuna Industry Association n 26 July 2021, on advice from the AFMA to consult all Commonwealth fishery licence holders who have entitlements to fish within the proposed area. • The update sent to WAFIC on 26 July 2021 was attached for reference.	Woodside has consulted AFMA, CFA, ASBTIA and individual Licence holders who have an entitlement to fish in the area. Woodside has assessed the relevancy of Commonwealth and State fisheries issues in **Section 5.9.2** of this EP. Woodside has addressed WAFIC's feedback, including advising: • Woodside has undertaken a comprehensive assessment of decommissioning options (**Section 3**). • We consider outlined activities to not be inconsistent with Australian and International Guidelines and Standards (**Section 3**). • Fishery licence holders do not currently operate at the water

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	On 19 July 2021, Woodside called WAFIC to discuss the AFMA's advice to consult all Commonwealth fishery licence holders who have entitlements to fish in the area. Woodside advised: • It was planning to discuss the request further with the AFMA and to outline that Woodside's current process is to determine relevant stakeholders using Fishcube, ABARES/AFMA data, fishing methods and water depth, as well as based on previous advice from WAFIC for State fisheries. • Woodside believes this enables the consultation to be appropriate to fisheries and the specific activity, whilst also considering stakeholder fatigue. • Woodside will consult Commonwealth fisheries that have entitlement to fish within the proposed area if this is AFMA's advice. WAFIC will be updated accordingly.	On 18 August 2021, WAFIC thanked Woodside for the information provided and advised that: • Based on WAFIC discussions with trawl fisheries, the total removal of wellhead and other infrastructure would be the base case preferred option. • This mitigates any potential snag risk. • Consideration of options to manage changes to fishery boundaries, including trawl zones.	On 24 August 2021, Woodside responded thanking WAFIC for their feedback and advised: • Woodside has undertaken a comprehensive assessment of all decommissioning options for the Calthorpe-1 exploration wellhead. • We consider the outlined activities to not be inconsistent with Australian or International Guidelines and Standards, including Section 572(3) of the OPGGS Act, IMO Resolution A.672 (16) paragraphs 3.1, 3.2, 3.4.2, 3.8. • Previous consultation with WAFIC and license holders on other activities has indicated that the fisheries outlined do not operate at the water depths of the wellhead location. • Given the total fishery area that the wellhead occupies, the consequence of displacement to the long-term function of the fishery is expected to be negligible. • Given the wellhead will continue to be marked on navigational charts, the likelihood of interaction (i.e. snagging) is considered remote and the overall risk low.	depths of the wellhead location (**Section 5.9.2**). • The consequence of displacement to the long-term function of the fishery is expected to be negligible (**Sections 7.6.1** and **7.7.1**). • The wellhead will continue to be marked on navigational charts (**PS 1.2**). • The likelihood of interaction (i.e. snagging) is considered remote and the overall risk low (**Section 7.7.1**). Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	On 26 July 2021, Woodside emailed WAFIC providing an update that following advice from the AFMA, Woodside will consult all Commonwealth fishery licence holders who have entitlements to fish in the area (Appendix F, reference 1.23), and provided an updated fisheries map.	On 10 September 2021, WAFIC responded thanking Woodside for its detailed response and sought further clarification on the point: • IMO Resolution A.672 (16) paragraphs 3.1 and 3.2 – The depth of water at the Calthorpe-1 and Thebe-1 wellheads is approximately 820 m and approximately 1170 m respectively, and therefore far deeper than the depths recommending complete removal. WAFIC requested the recommendation that states that in these water depths complete removal is not regulated and queried whether this is regulated through NOPSEMA. WAFIC queried whether the inherent risks associated with the initial installation of the wellhead was potentially the same.	On 15 September 2021, Woodside thanked WAFIC for its query and advised that: • NOPSEMA administers an objective-based regulatory regime and therefore does not prescribe specific water depths/rules for wellheads. • Woodside notes that NOPSEMA does provide guidance to titleholders on ALARP and acceptability with encouragement for the application of good practices determined in international guidelines and standards as specifically outlined in the NOPSEMA section 572 Maintenance and removal of property policy. • Woodside considers the outlined activities to not be inconsistent with Australian or International Guidelines and Standards, including IMO Resolution A.672 (16) paragraphs 3.1 and 3.2 as the Calthorpe-1 and Thebe-1 wellheads are in water depths of approximately 820 m and approximately 1170 m respectively, and therefore far deeper than the depths recommending complete removal. • IMO Resolution A.672 (16) paragraphs 3.1 and 3.2 outlines that all abandoned or disused installations or structures standing in less than 75 m of water (or less than 100 m if placed on the	

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
			seabed on or after January 1998) and weighing less than 4000 tonnes in air should be entirely removed. • There are no credible oil spill risks or associated spill response plans or monitoring programs for the EP as there are also no planned or unplanned impacts associated with activity nor any vessel operations.	

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	On 30 November 2021, Woodside called and emailed WAFIC advising that further consultation with Western Deepwater Trawl Fishery had been requested by NOPSEMA and requested assistance with contacting licence holders to arrange a meeting prior to Christmas. Woodside also requested confirmation of previous advice from licence holders that fishers only operate to a depth of 800 m.	On 30 November 2021, WAFIC confirmed during a phone call that it would contact licence holders to request a meeting on Woodside's behalf and offered its office to host the meeting if able to be scheduled. WAFIC also confirmed that it would seek confirmation regarding the water depth licence holder operate at.		
		On 7 December 2021, WAFIC emailed Woodside confirming that it contacted two Western Deepwater Trawl licence holders which were supportive of a meeting with Woodside on its overall decommissioning approach, but this would not be possible before Christmas. Given the deadline for the Calthorpe-1 and Thebe-1 EPs, WAFIC recommended that if re-consultation is required that this is undertaken via email and to be specific about the planned activities and why feedback from the fishery is important.	On 8 December 2021, Woodside emailed WAFIC thanking it for requesting a meeting with Western Deepwater Trawl licence holders on Woodside's behalf and for seeking advice regarding the fisheries operations water depth. Woodside confirmed that on WAFIC's advice it would re-consult licence holders via email and make the proposed activity clear in the email. Woodside also advised that it would include a meeting request for January 2022 in this email to discuss Woodside's decommissioning approach, separate to Calthorpe-1 and	

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
		On 8 December 2021, WAFIC responded to Woodside thanking it for its email and confirmed that it was happy to assist.	Thebe-1 consultation and thanked WAFIC for its offer to host this meeting at its office.	
	On 30 December 2021, Woodside emailed following up on its request to confirm the maximum water depth Western Deepwater Trawl licence holders operate to.	On 12 January 2022, WAFIC responded advising that the maximum water depth hadn't been confirmed by licence holders and recommended reviewing literature and the bathymetry of the spatial boundary of the fishery.		
Other stakeholders				
Exmouth-based charter boat, tourism and dive operators	On 12 July 2021, Woodside emailed stakeholders advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has consulted Recfishwest, Marine Tourism Association of WA and WA Game Fishing Association. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
CCG	On 12 July 2021, Woodside emailed the CCG advising of the proposed activity (Appendix F, reference 1.3) and provided a Consultation Information Sheet.	On 12 July 2021, the CCG responded to request greater detail about the wellhead, what it include and risks it might pose. A diagram of a wellhead was also requested.	On 15 July 2021, Woodside thanked the CCG for their response and provided information relating to the materials and size of the exploration wellheads, and impacts and risks from the wellheads being left *in situ*. Woodside advised that the current planned submission date for the Environment Plan is around October 2021. An image of a typical wellhead like Calthorpe-1 was provided for reference.	Woodside has addressed the CCG's feedback, including providing additional information relating to the wellheads and impacts and risk from the wellheads being left *in situ*. Woodside has consulted the CCG individually and as a member of the Exmouth Community Reference Group with an update provided to the Group in August 2021.
	On 19 August 2021, Woodside provided the Exmouth Community Reference Group with an update on current and upcoming Woodside Environment Plan stakeholder consultation (Appendix F,	On 13 July 2021, the CCG responded querying the date that the Environment Plan will be submitted or made available for viewing.		

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	reference 1.26), including Calthorpe-1.			Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Protect Ningaloo	On 12 July 2021, Woodside emailed Protect Ningaloo advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Exmouth Community Reference Group	On 12 July 2021, Woodside emailed the Community Reference Group advising of the proposed activity (Appendix F, reference 1.2) and provided a Consultation Information Sheet. On 19 August 2021, Woodside provided the Exmouth Community Reference Group with an update on current and upcoming Woodside Environment Plan stakeholder consultation (Appendix F, reference 1.26), including Calthorpe-1. On 4 November 2021, Woodside provided the Exmouth Community Reference Group with an update on current and upcoming Woodside Environment Plan stakeholder consultation (Appendix F,	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside has consulted the Exmouth Community Reference Group individually and with an update provided to the Group in August 2021 and November 2021. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	reference 3.3), including Calthorpe-1.			
Exmouth Game Fishing Club	On 12 July 2021, Woodside emailed the Exmouth Game Fishing Club advising of the proposed activity (Appendix F, reference 1.4) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
ECCI	On 12 July 2021, Woodside emailed ECCI advising of the proposed activity (Appendix F, reference 1.5) and provided a Consultation Information Sheet. On 19 August 2021, Woodside provided the Exmouth Community Reference Group with an update on current and upcoming Woodside Environment Plan stakeholder consultation (Appendix F, reference 1.26), including Calthorpe-1.	No feedback provided.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside has consulted ECCI individually and as a member of the Exmouth Community Reference Group with an update provided to the Group in August 2021. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Shire of Exmouth	On 12 July 2021, Woodside emailed the Shire of Exmouth advising of the proposed activity (Appendix F, reference 1.6) and provided a Consultation Information Sheet.	No feedback provided.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside has consulted the Shire individually and as a member of the Exmouth Community Reference

Stakeholder	Information provided	Relevant person response	Woodside response	Woodside assessment and outcome
	On 19 August 2021, Woodside provided the Exmouth Community Reference Group with an update on current and upcoming Woodside Environment Plan stakeholder consultation (Appendix F, reference 1.26), including Calthorpe-1.			Group with an update provided to the Group in August 2021. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Ningaloo Coast World Heritage Advisory Committee	On 12 July 2021, Woodside emailed the Ningaloo Coast World Heritage Advisory Committee advising of the proposed activity (Appendix F, reference 1.7) and provided a Consultation Information Sheet.	No feedback provided.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
Nganhurra Thanardi Garrbu Aboriginal Corporation	On 12 July 2021, Woodside emailed the Nganhurra Thanardi Garrbu Aboriginal Corporation advising of the proposed activity (Appendix F, reference 1.1) and provided a Consultation Information Sheet.	No feedback received.	No response required.	Woodside has provided sufficient information and opportunity to respond. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.
	On 20 July 2021, Woodside sent an additional email to the Nganhurra Thanardi Garrbu Aboriginal Corporation advising of the proposed activity (Appendix F, reference 1.17) and provided a Consultation Information Sheet.			

6.6 Other person Consultation

Table 6-3: Consultation Activities

Stakeholder	Other person feedback	Woodside response	Woodside assessment and outcome
Maritime Union of Australia (MUA)	On 22 June 2022, the MUA sent a letter to NOPSEMA providing feedback on the EP that: • titleholders should adhere to the base case outlined in the Australian Government's offshore petroleum decommissioning guidelines, and total removal of infrastructure should always be the best practice. • queried Woodside's health and safety risk assessment in the EP. • NOPSEMA should reject Woodside's *in situ* decommissioning of the Calthorpe-1 exploration wellhead and looks forward to Woodside engaging with MUA about the safest way to carry out this work. The letter was provided to Woodside by NOPSEMA on 28 June 2022 as Third Party Correspondence for consideration in the EP.	On 1 July 2022, Woodside responded to the MUA: • referring it to decommissioning provisions in the legislation as well as information available on NOPSEMA's website and information from DISER which confirms that removal of the Calthorpe-1 wellhead is not the only decommissioning option. • advised that health and safety of workers is a priority for Woodside and it takes health and safety very seriously. • confirmed the health and safety aspect of the options assessment was completed in accordance with the relevant legislation and is consistent with guidance from NOPSEMA and DISER. • confirmed that the activities and content of the EP is consistent with the requirements of the legislation. • advised that an activity specific information sheet was made available on Woodside's website in July 2021 and the EP was submitted to NOPSEMA for assessment in October 2021 and is publicly available on its website.	Woodside has addressed the MUA's feedback, including referring it to the relevant regulations under the OPGGS Act which permit alternate arrangements to removal if those arrangements are satisfactory to NOPSEMA. Woodside considers this adequately addresses stakeholder interests and no further consultation is required.

7. ENVIRONMENTAL IMPACT AND RISK ASSESSMENT, PERFORMANCE OUTCOMES, STANDARDS AND MEASUREMENT CRITERIA

7.1 Overview

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

7.2 Impact and Risk Analysis and Evaluation

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

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

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

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

The ENVID (performed in accordance with the methodology described in **Section 2**) identified sources of environmental impacts and risks. A summary of the ENVID is provided in **Table 7-1**.

The impact and risk analysis and evaluation for the Petroleum Activities Program indicate that all current environmental risks and impacts associated with the individual activities are reduced to ALARP and are of an acceptable level, as discussed further in **Sections 7.6** and **0**.

7.2.1 Cumulative Impacts

Woodside has assessed the cumulative impacts of the Petroleum Activities Program in relation to other relevant petroleum activities, which might result in overlapping temporal and spatial extents. No existing oil and gas infrastructure is located within or adjacent to the EMBA. Any potential impacts from the Petroleum Activities Program are highly localised and concentrated around the wellhead location.

Table 7-1: Environmental risk analysis and summary

Aspect	EP Section	Current Risk Rating				Acceptability of Impact/Risk
		Impact/Consequence	Potential Impact/Consequence Level	Likelihood	Current Risk Rating	
Planned Activities (Routine and Non-routine)						
Interaction with third party users: Displacement of commercial fisheries	**7.6.1**	F	Environment – No lasting effect (less than one month). Localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Physical presence: Alteration of seabed and benthic habitats	**7.6.2**	F	Environment – No lasting effect (less than one month). Localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Discharges to the marine environment	**7.6.3**	F	Environment – No lasting effect (less than one month). Localised impact not significant to environmental receptors.	-	-	Broadly acceptable
		F	Environment – No lasting effect (less than one month). Localised impact not significant to environmental receptors.	-	-	Broadly acceptable
Unplanned Activities (Accidents/Incidents)						
Interaction with third party users: Future disruption to commercial fisheries	**7.7.1**	E	Social and Cultural – Slight, short-term impact (< 1 year) to a community or area or item of cultural significance	1	L	Broadly acceptable

7.3 Environmental Performance Outcomes, Standards and Measurement Criteria

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

EPOs, EPSs and MC for the Petroleum Activities Program have been identified to allow the measurement of Woodside's environmental performance and the implementation of this EP to determine whether the EPOs and EPSs have been met.

The EPOs, EPSs and MC specified are consistent with legislative requirements and Woodside's standards and procedures. They have been developed based on the Codes and Standards, Good Industry Practices and Professional Judgement outlined in **Section 2.7.2** as part of the acceptability and ALARP justification process.

The EPOs, EPSs and MC are presented throughout this section. A breach of these EPOs or EPSs constitutes a 'Recordable Incident' under the OPGGS Environment Regulations (refer to **Section 8**).

7.4 Presentation

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

<table>
<tr><th colspan="15">Context
<Description of the context for the impact/risk. Regulation 13(1, 13(2) and 13(3)></th></tr>
<tr><td colspan="3">Description of the Activity – Regulation 13(1)</td><td colspan="6">Description of the Environment – Regulations 13(2)(3)</td><td colspan="6">Consultation – Regulation 11A</td></tr>
<tr><th colspan="15">Impacts/Risks Evaluation Summary – Summary of ENVID outcomes</th></tr>
<tr><td rowspan="2">Source of Impact/Risk Regulation 13(1)</td><td rowspan="2">Time Horizon (refer Section 3.6)</td><td colspan="7">Environmental Value Potentially Impacted Regulations 13(2)(3)</td><td colspan="6">Evaluation Section 2.7</td></tr>
<tr><td>Soil and Groundwater</td><td>Marine Sediment</td><td>Water Quality</td><td>Air Quality (incl Odour)</td><td>Ecosystems/Habitat</td><td>Species</td><td>Socioeconomic</td><td>Decision Type</td><td>Impact/Consequence</td><td>Likelihood</td><td>Current Risk Rating</td><td>ALARP Tools</td><td>Acceptability</td><td>Outcome</td></tr>
<tr><td>Summary of source of risk/impact</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><th colspan="15">Description of Source of Impact/Risk</th></tr>
<tr><td colspan="15">Description of the identified impact/risk including sources or threats that may lead to the risk or identified event. Regulation 13(1).</td></tr>
<tr><th colspan="15">Impact/Risk Assessment</th></tr>
<tr><td colspan="15">Discussion and assessment of the potential impacts/risks to the identified environment value(s). Regulation 13(5)(6).
Potential impacts/risks to environmental values have been assigned and discussed based on Woodside's Environmental Consequence Definitions for Use in Environmental Risk Assessments (Section 2.6.5.1).</td></tr>
</table>

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[8]***	***Benefit in Impact/Risk Reduction[9]***	***Proportionality***	***Control Adopted***
ALARP Tool Used – Section 2.7.1 and Section 2.7.2				
Summary of control considered to ensure the impacts and risks are continuously reduced to ALARP. *Regulation 13(5) (c)*	*Technical/logistical feasibility of the control.* *Cost/sacrifice required to implement the control (qualitative measure).*	*Qualitative commentary of impact or risk that could be averted or environmental benefit gained if the cost/sacrifice is made and the control is adopted.*	*Proportionality of cost/sacrifice versus environmental benefit. If proportionate (benefits outweigh costs), the control will be adopted. If disproportionate (costs outweigh benefits), the control will not be adopted.*	*If control is adopted.* *Reference to Control # provided.*
ALARP Statement: *Made based on the environmental risk assessment outcomes, use of the relevant tools appropriate to the decision type (**Section 2.7**) and a proportionality assessment. Regulation 10A(b).*				

Demonstration of Acceptability
Acceptability Statement: *Made based on applying the process described in **Section 2.7.2**, taking into account internal and external expectations, risk to environmental thresholds and use of environment decision principles. Regulation 10A (c).*

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO# *S: Specific performance which addresses the legislative and other controls that manage the activity and against which performance by Woodside in protecting the environment is measured.* *M: Performance against the outcome is measured by measuring 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 is relevant to the source of risk and the potentially impacted environmental value.* *T: The outcome states the timeframe during which the outcome will apply or by which it will be achieved.*	**C#** *Identified control adopted to ensure the impacts and risks are continuously reduced to ALARP.* *Regulation 13(5)(c)*	**PS#** *Statement of the performance required of a control measure.* *Regulation 13(7)(a)*	**MC#** *Measurement criteria for determining whether the outcomes and standards have been met.* *Regulation 13(7) (c)*

[8] Qualitative measure.
[9] Measured in terms of reduction of likelihood, consequence and current risk rating.

7.5 Environmental Risks/Impacts Deemed Not Credible

The ENVID identified sources of environmental risk and impact that were assessed as not being applicable (not credible) within the EMBA and, therefore, were determined to not form part of this EP (refer to **Section 2.5**). These are described in the next subsections for information only.

7.5.1 Interference with Third Party Oil and Gas Operators

No current or known oil and gas facilities are planned within the vicinity of the wellhead. Any future oil and gas operators will have access to the wellhead location on the navigation charts. Impacts to third party oil and gas operators now or in the future as a result of the physical presence of the wellhead was assessed as not credible.

7.5.2 Interference with Commercial Shipping

Due to the water depths of the EMBA, the wellhead is not expected to interfere with shipping in the short term. In the long term, degradation of the wellhead is not expected to result in the release of material that could present a navigation risk to shipping.

7.5.3 Release of Fluids from Below the Abandonment Plug

The Calthorpe-1 well was prematurely abandoned following failed connector tests to pressure test the wellhead after installing and cementing the 9-5/8” casing. No hydrocarbons or permeable zones were encountered and the 9-5/8” casing shoe track remains intact. This shoe track constitutes the only cement plug in the well and has been accepted as the abandonment plug (**Section 4.6**).

Any residual fluids below the depths of the abandonment plug would, therefore, be trapped and there is no credible risk of exposure of these fluids. Fluids with the potential to be released to the marine environment have been included in **Section 4.6.2**.

7.5.4 Loss of Well Integrity

There is no credible hydrocarbon release risk as the well has been approved for abandonment and no hydrocarbons were encountered during drilling of the well (**Section 4.6**).

7.6 Planned Activities (Routine and Non-routine)

7.6.1 Interaction with Third Party Users: Displacement of Current and Future Commercial Fisheries

Context	
Wellhead and associated infrastructure composition – **Section 4.6**	Socioeconomic environment – **Section 5.9** Stakeholder consultation – **Section 6**

Risk Evaluation Summary

Source of Impact	*Time Horizon (refer Section 3.6)*	*Environmental Value Potentially Impacted*						*Evaluation*						
		Marine Sediment	*Water Quality*	*Air Quality (incl Odour)*	*Ecosystems/Habitat*	*Species*	*Socioeconomic*	*Decision Type*	*Consequence/Impact*	*Likelihood*	*Risk Rating*	*ALARP Tools*	*Acceptability*	*Outcome*
Wellhead left *in situ* resulting in ongoing displacement of commercial fishers	Long-term						X	A	F	-	-	LCS GP	Broadly acceptable	EPO 1

Description of Source of Impact

The Petroleum Activities Program will result in the long-term, physical presence of the wellhead on the seabed (and up to 4 m above it). The presence of the wellhead may displace commercial fishers operating trawl equipment from the wellhead location, in addition to a 500 m radius as displayed on navigation charts, as they avoid the area to prevent damage to equipment from snagging on the wellhead (**Section 7.7.1**). The wellhead may become partially or fully buried overtime due to surrounding hydrodynamic conditions (**Section 7.6.2**) and will eventually fully degrade into seabed sediments over approximately 150 years (**Section 7.6.3**). The height of the wellhead (up to 4 m) is considered a worst-case scenario and the potential impacts from displacement will remain until the wellhead is significantly degraded or buried.

Trap and line fishers are not expected to negatively interact with wellheads *in situ*. However, trap fishers have been known to target subsea infrastructure as the presence of aggregating fish improves catch rates.

Currently, there is one fishery identified as having potential for current or future interaction with the EMBA, the Commonwealth-managed WDTF. This fishery extends from Albany to Exmouth and the wellhead is located approximately 20 km within its north-eastern boundary. The WDTF currently targets deepwater bugs and ruby snapper (AFMA, n.d.a); however, historically also caught orange roughy (Chambers and Bath, 2015).

The wellhead is not expected to displace commercial fishers utilising traps as these fishers have been known to target subsea infrastructure including wellheads and equipment is unlikely to be damaged by interacting with the wellhead. Therefore, no negative impacts to trap fishers are expected.

Impact Assessment

The wellhead is located within 20 km of the north-eastern extent of the WDTF. Historical fishing effort has indicated possible fishing in the broad area surrounding the EMBA; however, it is unknown whether fishing has occurred within the EMBA given the low resolution of effort data available (**Section 5.9.2**). Review of available fishing effort data found that between 2009 and 2020 the majority of effort has been concentrated south of the EMBA between North West Cape and the Abrolhos Islands (**Section 5.9.2**; **Figure 5-6**). Furthermore, overall effort in the fishery has been generally low over this time with between zero to three vessels in operation since 2005 and only three vessels currently registered in the fishery (**Section 5.9.2**).

Of the fish species currently or historically targeted by this fishery (orange roughy, deepwater bugs, ruby snapper), only the orange roughy utilise habitats at the depth of the wellhead (700 - 1400 m) (AFMA, n.d.a). Although the orange roughy is widely distributed across Australia, the species is primarily caught in off the south and east coasts (AFMA, n.d.b), has not been targeted by the fishery since 2005 and was removed as a target species in 2015 (Chambers and Bath, 2015), indicating that the EMBA is unlikely to be commercially important to this fishery. Given the species is long-lived and slow to mature, a precautionary approach has also been recommended for management if this species is targeted in the future (**Section 5.9.2**).

Trawling at water depths consistent with the Calthorpe-1 wellhead (824 m) is possible; however, presents a limitation as it requires a minimum vessel/equipment specification (horsepower/thrust, winch capacity/power) which is normally only found on medium to large trawlers (AMC, 2022; **Section 3.3**). The wellhead and EMBA occupy a very small portion of the overall fishery (approximately 1 km^2 or 0.0001%), which extends from Albany to Exmouth and covers an area of approximately 717,000 km^2.

Given this, while there is a potential for current and future trawl fishers to be displaced from the area around the wellhead, impacts are expected to be negligible given the water depth of the wellhead (824 m), historically low fishing effort which is concentrated further south, and small area the wellhead occupies in comparison to the area available to the fishery. Should displacement occur, it will have no lasting effect or significant impact to the operation and commercial viability of this fishery. No feedback was received from licence holders in the WDTF during consultation for this EP (**Section 6**).

Woodside also engaged a subject matter expert, the AMC to undertake an independent assessment of the potential impacts on commercial fishing activity in the EMBA from leaving the Calthorpe-1 wellhead *in situ*. The study confirmed impacts were confined to trawl fishers operating in the WDTF. The study also found that impacts to current fishers were low based on (AMC, 2022; **Section 3.3**):

- The wellhead is located in deep water (824 m). Whilst demersal trawling at such depths is possible, it necessitates having vessel/equipment specifications (horsepower and winch capacity) typically found on medium sized vessels (30 – 40 m in length) only one of which is currently registered to the WDTF. Smaller vessels would have difficulty meeting the necessary requirements.
- Overall effort across the fishery has been low, supported by historical WDTF logbook data (2010-21) suggesting on average approximately 17 days per annum are spent trawling in the fishery. Further, effort by the fishery has been focused on the area offshore and slightly south of Shark Bay in more recent years (Patterson et al., 2021).
- Oceanographic data for the region indicates there are generally southward moving surface waters with a northward moving subsurface current (DEWHA, 2007) which would make demersal trawling at the depth of the wellhead challenging in terms of maintaining gear symmetry and stability. Additionally, peak wind and wave conditions registered through summer, would make trawling difficult for smaller vessels.
- The trawlers are equipped with modern wheelhouse electronics including GPS plotters. GPS plotters accurately show the vessels position relative to marked seabed obstacles, such as the wellhead, and enable operators to safely navigate around these obstacles.
- Trawl operators have numerous risk mitigation options available to them which either reduce interaction probability or harm level (e.g. modern wheelhouse electronics, vessel safety management systems, AMSA trawler hook-up safety procedures/guidelines, winch tension release mechanisms, hydroacoustic trawl monitoring systems, appropriate breaking load components on trawl gear).

Whilst fishing effort in the WDTF is currently low, there is a potential for this to increase in the future. The AMC study considered a tenfold increase in activity when considering the future outlook, however found that the potential for interaction remained low. Results from the AMC study provide further support that impacts to the WDTF will be negligible with no lasting effect or significant impact to the operation and commercial viability of the fishery.

Summary of Potential Impacts to Environmental Values(s)

The wellhead remaining *in situ* permanently is not expected to result in an impact greater than localised displacement from less than 0.0001% of the overall fishery area. This displacement is with no lasting effect or significant impact to the operation of the WDTF (Environment Impact – F).

Demonstration of ALARP

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)[10]*	*Benefit in Impact/Risk Reduction*	*Proportionality*	*Control Adopted*
Legislation, Codes and Standards				
Compliance with *Environmental*	F: Yes	Sea dumping permit may be required.	If required, control based on legislative	Yes **C 1.1**

[10] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[10]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Protection (Sea Dumping) Act 1981	CS: Minimal to moderate cost. Standard practice.		requirements and must be adopted.	
Good Practice				
Notify relevant State and Commonwealth fisheries of wellhead left *in situ*	F: Yes. CS: Minimal cost. Standard practice.	Communication of the wellhead being left *in situ* to other marine users ensures they are informed and aware, thereby reducing the risk of accidental damage to fishing equipment.	Benefits outweigh cost/sacrifice.	Yes **C 1.2**
Notify AHO so the well can continue to be marked on navigation charts	F: Yes. CS: Minimal cost. Standard practice	Communication of the wellhead being left *in situ* to AHO ensures the wellhead will continue to be marked on navigation charts, giving fisheries and other marine users sufficient information to plan activities around the infrastructure.	Benefits outweigh cost/sacrifice.	Yes **C 1.3**
As-left survey to verify wellhead's status and condition	F: Yes. CS: Moderate.	No additional benefits would be gained from performing an as-left survey given: • the wellhead location is known (**Section 4.3**) • impact assessment has considered impacts to commercial trawl fishers over the long-term and, therefore, any changes in the status/condition of the infrastructure would not alter the assessment (e.g. changing height of infrastructure due to partial burial or corrosion would still result in displacement) • conducting a survey adds additional risks to the activity, associated with vessel use and seabed disturbance from ROV use (**Section 3.6**).	Cost of the control is disproportionate to the benefit that may be gained from it given impacts to current and future commercial trawl fishers have been assessed as negligible and outcomes of the survey would not credibly alter impact assessment.	No
Monitoring and/or remediation to make good any damage to the seabed or subsoil in the area of the wellhead.	F: Yes. CS: Moderate.	Displacement of current and future commercial trawl fishers from the ongoing presence of the wellhead was assessed as a negligible impact with no lasting effect or significant impact to the operation and commercial viability of the WDTF fishery. This does not represent unacceptable damage to the	Cost of the control is disproportionate to the benefit that may be gained from it given impacts to current and future commercial trawl fishers have been assessed as negligible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[10]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		seabed or subsoil given the small area the wellhead and EMBA occupies in comparison to available fishing grounds to the WDTF (0.0001%). There are no additional impacts to commercial trawl fishers from previous activities associated with the well. Therefore, there is no benefit to be gained from further monitoring or remediation of the seabed surrounding the wellhead.		
Professional Judgement – Eliminate				
Removal of wellhead	See **Section 3** Decommissioning Options Assessment.			No
Rock dumping over wellhead	F: Yes. CS: Substantial cost.	Additional benefits are low, as there is a low risk of snagging for commercial fisheries. Rock dumping over the wellhead adds additional risks to the activity, associated with vessel use and seabed disturbance from rock placement.	Cost/sacrifice outweigh potential benefits. This option would be a high cost due to the requirement of a specialised vessel.	No
Installing an over-trawlable structure	F: Yes. CS: Substantial cost.	Additional benefits are low as there is a low risk of snagging for commercial fisheries. Installing an over-trawlable structure over the wellhead adds additional risks to the activity, associated with vessel use and seabed disturbance from installation.	Cost/sacrifice outweigh potential benefits. There is considered little benefit from installing an over-trawlable structure.	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, Woodside considers the adopted controls appropriate to manage the displacement of commercial fisheries from the physical presence of the wellhead left *in situ*. As no reasonable additional/alternative controls were identified that would further reduce the risk without grossly disproportionate sacrifice, the impacts are considered ALARP. Furthermore, no additional controls are required to make good any damage to the seabed or subsoil, as per Section 270(3)(f) of the OPGGS Act.				

Demonstration of Acceptability
This residual impact is considered acceptable. This is on the basis that the area of the WDTF that is occupied by the EMBA is very small when compared with the rest of the fishery area (1 km^2 of the 717,000 km^2 fishery, less than 0.0001%). While potential fishing effort has been reported in the area, overall fishery effort across the fishery is low and even considering a tenfold increase in effort, impacts to commercial trawl fishers will remain low. Licence holders in the fishery were engaged during consultation for this EP; however, no response was received. Woodside considers the adopted controls appropriate to manage the impact of displacement to commercial trawling from the physical presence of the wellhead left *in situ* to a level that is broadly acceptable. In the context of Section 270(3)(e) and (f) of the OPGGS Act, impacts to current and future commercial trawl fisheries are of an acceptable level given: • principles of ESD have been considered during the assessment of decommissioning options (**Section 3.8.2**) and no significant adverse impacts will occur to any natural resource • impacts and risks from damage to the seabed or subsoil are demonstrated to be reduced to ALARP • international and domestic requirements that apply to the activity will be complied with.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 1 Prevent adverse interactions with other marine users from infrastructure.	**C 1.1** Compliance with the Environmental Protection (Sea Dumping) Act 1981	**PS 1.1** Woodside continues to engage with DAWE regarding the application of the Environment Protection (Sea Dumping) Act 1981 and to comply with requirements under the Act.	**MC 1.1.1** Records demonstrate DAWE continue to be engaged on the application of the Environment Protection (Sea Dumping) Act 1981 relevant to the Petroleum Activities Program and demonstrate Woodside's commitment to complying with the Act.
	C 1.2 Notify relevant State and Commonwealth fisheries that the wellhead will remain *in situ*.	**PS 1.2** Woodside has notified State and Commonwealth fisheries of the wellhead location and that the wellhead will remain *in situ* for perpetuity.	**MC 1.2.1** Records demonstrate State and Commonwealth fisheries have been notified of wellhead locations.
	C 1.3 Notify AHO so the well can continue to be marked on navigation charts.	**PS 1.3** Woodside will notify AHO that the wellhead will be left *in situ* so it can continue to be marked on navigation charts.	**MC 1.3.1** Records demonstrate that AHO has been notified that the wellhead will remain *in situ*.

7.6.2 Physical Presence: Alteration of Seabed and Benthic Habitats

Context	
Wellhead and associated infrastructure composition – **Section 4.6**	Physical environment – **Section 5.4** Habitats and biological communities – **Section 5.5** Stakeholder consultation – **Section 6**

Impact Evaluation Summary

Source of Impact	*Time Horizon (refer Section 3.6)*	*Environmental Value Potentially Impacted*						*Evaluation*						
		Marine Sediment	*Water Quality*	*Air Quality (incl Odour)*	*Ecosystems/Habitat*	*Species*	*Socioeconomic*	*Decision Type*	*Consequence/Impact*	*Likelihood*	*Risk Rating*	*ALARP Tools*	*Acceptability*	*Outcome*
Disturbance to seabed and benthic habitat from wellhead remaining *in situ* permanently	Long-term	X			X			A	F	-	-	LCS GP PJ	Broadly acceptable	EPO 2

Description of Source of Impact

The remaining wellhead infrastructure sits 4 m above the seabed. The wellhead is primarily made from mild steel, as described in **Section 4.6**. The physical presence of the wellhead remaining *in situ* permanently has the potential to result in disturbance to the seabed and benthic habitats over the long-term (approximately 150 years; **Section 7.6.3**) by:

- altering hydrodynamic conditions around the wellhead, potentially resulting in scouring and accretion
- introducing hard substrate resulting in the creation of a new habitat.

Scouring and Accretion Around Wellhead

The presence of the wellhead on the seafloor can interact with the surrounding hydrodynamic conditions, potentially resulting in disturbance to the seabed (scouring and accretion) which may impact on associated benthic habitats.

Studies on the effects of sediment movements associated with anthropogenic structures on the seabed, such as shipwrecks and artificial reefs, indicate impacts to be limited to within 10 m of the structure (Smiley, 2006; Lewis and Pagano, 2015).

Habitat Creation

Analysis of habitats on exploration wellheads at depths ranging from 78 m to 825 m have shown a relatively high coverage of crustacea, hydroids, black/octocorals and sponges (McLean *et al.*, 2018b) which provides habitat in areas dominated by soft sediments. Several studies of wellheads on the NWS have observed a diverse range of reef-dependent and transient pelagic species associating with structures, including commercially fished species (Pradella *et al*., 2014; McLean *et al*., 2018a, 2018b; Fowler and Booth, 2012).

In addition, research suggests that the structurally complex habitats provided by subsea infrastructure are used by many demersal fish for predator avoidance and foraging opportunities (Caddy, 2014).

Studies have found that the presence of fish assemblages on wellheads is strongly influenced by depth, age and height of the structures. Wellheads at water depths between 135 m to 175 m possessed an abundance of reef-dependent and transient pelagic species, while the number of species declined markedly beyond 350 m depth (Pradella *et al.*, 2014; McLean *et al*., 2018a). Therefore, based on the depth of the EMBA, the wellhead may provide a small area hard substrate habitat for benthic fauna, but is unlikely to attract an abundance of fish species.

Impact Assessment
Scouring and Accretion Around Wellhead Studies on the effects of sediment movements associated with anthropogenic structures on the seabed, such as shipwrecks and artificial reefs, indicate impacts to be limited to within 10 m of the structure (Smiley, 2006; Lewis and Pagano, 2015). The wellhead is located within the Canyons linking the Cuvier Abyssal Plain and Cape Range Peninsula KEF, located along the southerly edge of Exmouth Plateau, adjacent to Ningaloo Reef, as well as the Continental Slope Demersal Fish Communities KEF. The canyons within this area are repositories for particulate matter deposited from the shelf and sides of the canyons and serve as conduits for organic matter between the surface, shelf and abyssal plains. The hard substrates of the canyons' sides provide habitat for deepwater snappers and other species (Brewer *et al.,* 2007); however, the KEFs also include flat featureless areas with soft sediments. The wellhead is located near to the largest canyon on the slope linking the Cuvier Abyssal Plain and Cape Range Peninsula. The seabed surrounding the wellhead and within the EMBA is comprised of relatively flat and featureless habitat dominated by soft sediment (fine to coarse sands), inhibited by infauna and sparsely distributed epifauna. Localised scouring and accretion around the wellhead, and up to 10 m from the wellhead, have the potential to alter associated benthic communities around the wellhead. Given benthic habitat at the wellhead location primarily consists of a flat, featureless seabed dominated by soft sediments, impacts are expected to remain localised with no lasting effects to environmental receptors. ***Habitat Creation*** Although wellheads have been found to provide habitat on the NWS, these wellheads have typically been located at water depths far shallower than Calthorpe-1. Furthermore, studies have shown that the number of species found on wellheads declines when the wellheads are located in water deeper than 350 m. As Calthorpe-1 is located in approximately 824 m of water, it is expected that any benefits would be limited.
Summary of Potential Impacts to Environmental Values(s)
The wellhead remaining *in situ* permanently is not expected to result in an impact greater than localised scouring and accretion of sediments within 10 m of the wellhead, with no lasting effect to environmental receptors (Environment Impact – F).

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Compliance with *Environmental Protection (Sea Dumping) Act 1981*	F: Yes CS: Minimal to moderate cost. Standard practice.	Sea dumping permit may be required.	If required, controls based on legislative requirements must be adopted.	Yes **C 1.1**
Good Practice				
Monitoring program to assess any changes in seabed, sediment and settlement of marine organisms on the wellhead	F: Yes; an ROV would be required to assess any changes in seabed, sediment and settlement of marine organisms on the wellhead. CS: Moderate; need to include cost of mobilising an ROV for this water depth.	Impacts to seabed and sediment from *in situ* wellhead are likely to be limited to within 10 m of the wellhead. There is limited environmental benefit (information) gained by monitoring sediment and settlement of marine organisms around the wellhead.	Cost of the control is disproportionate to the environmental benefit that may be gained from it. If changes were detected through monitoring, no remediation is possible other than the removal of the wellhead to prevent further impacts. However, this is likely to result in increased environmental impacts (such as	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
			vessel- and ROV-based risks as well as further seabed disturbance from removal activities).	
As-left survey to verify wellhead's status and condition	F: Yes. CS: Moderate.	No additional benefits would be gained from performing an as-left survey given: • impact assessment has considered alteration of the seabed and benthic habitats over the long-term and, therefore, any changes in the status/condition of the infrastructure would not alter the assessment • conducting a survey adds additional risks to the activity, associated with vessel use and seabed disturbance from ROV use (**Section 3.6**).	Cost of the control is disproportionate to the benefit that may be gained from it given impacts to the seabed and benthic habitats have been assessed as negligible and outcomes of the survey would not credibly alter impact assessment.	No
Monitoring and/or remediation to make good any damage to the seabed or subsoil and provide for conservation and protection of the natural resources in the area of the wellhead	F: Yes. CS: Moderate.	Physical impacts to the seabed and subsoil from the ongoing presence of the wellhead are limited to localised scouring and accretion and habitat creation, which will have a negligible impact to benthic habitats within an estimated 10 m around the wellhead. Impacts to benthic habitats from previous drilling activities (i.e. cuttings) are likely to be localised (~250 m radius around wellhead) and negligible given the low sensitivity of the area, that the well was drilled with water-based muds, and given the time that has passed since the activities occurred (2007) which would have provided sufficient duration for benthic habitats to recover and restabilise. These impacts do not represent unacceptable damage to the seabed or subsoil and allow for the conservation and protection of the natural resources in the area. Therefore, there is no benefit to be gained from	Cost of the control is disproportionate to the benefit that may be gained from it given impacts to the seabed have been assessed as negligible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		further monitoring or remediation of the seabed surrounding the wellhead.		
Professional Judgement – Eliminate				
Removal of wellhead	See **Section 3** Decommissioning Options Assessment.			No
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls identified.				
ALARP Statement: On the basis of the decommissioning options assessment outcomes (refer to **Section 3.8**), the environmental impact assessment outcomes and use of the relevant tools appropriate to the decision type (in other words, Decision Type A, **Section 2.6.1**), Woodside considers the potential impacts associated with seabed and benthic habitat alteration from the presence of the wellhead being left *in situ* to be ALARP. No reasonable additional/alternative controls were identified that would further reduce the impacts without significantly disproportionate sacrifice. Furthermore, no additional controls are required to provide for the conservation and protection of natural resources in the area of the wellhead, or to make good any damage to the seabed or subsoil, as per Section 270(3)(e) and (f) of the OPGGS Act.				

Demonstration of Acceptability
Acceptability Statement: The impact assessment has determined that alteration of the seabed and benthic habitats from the wellhead being left *in situ* represents a localised impact to sediments with no lasting effects. Further opportunities to reduce the impacts have been investigated above. DNP provided feedback during consultation requesting confirmation no impacts would occur to the values of any AMP, including any KEF associated with an AMP (**Table 6-2**). Woodside has addressed these concerns by providing documentation to assure no impacts would occur to the values of any AMP from the proposed activity. Therefore, Woodside considers the impacts of discharge of trace metals as a result of wellhead corrosion to be broadly acceptable. In the context of Section 270(3)(e) and (f) of the OPGGS Act, impacts to benthic habitats are of an acceptable level given: • principles of ESD have been considered during the assessment of decommissioning options (**Section 3.8.2**) and no significant adverse impacts will occur to any natural resource • impacts and risks to natural resources or from damage to the seabed or subsoil are demonstrated to be reduced to ALARP • international and domestic requirements that apply to the activity will be complied with.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 2 No impacts to benthic habitats greater than a consequence level of F[11] from leaving the wellhead *in situ*.	**C 1.1** Refer **Section 7.6.1**	**PS 1.1** Refer **Section 7.6.1**	**MC 1.1.1** Refer **Section 7.6.1**

[11] *Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors' (**Section 2.6**).*

7.6.3 Discharges to the Marine Environment

Context	
Wellhead and associated infrastructure composition – **Section 4.6** Residual chemicals and fluids – **Section 4.6.2**	Habitats and biological communities – **Section 5.5**

Impact Evaluation Summary

Source of Impact	*Time Horizon (refer Section 3.6)*	*Environmental Value Potentially Impacted*						*Evaluation*						
		Marine Sediment	*Water Quality*	*Air Quality (incl Odour)*	*Ecosystems/Habitat*	*Species*	*Socioeconomic*	*Decision Type*	*Consequence/Impact*	*Likelihood*	*Risk Rating*	*ALARP Tools*	*Acceptability*	*Outcome*
Corrosion of wellhead resulting in the non-routine discharge of trace amounts of metals to the marine environment	Long-term	X	X		X	X		A	F	-	-	LCS GP	Broadly acceptable	EPO 2
Corrosion/ breakdown of wellhead over time resulting in release of fluids	Long-term	X	X		X	X		A	F	-	-			

Description of Source of Impact

As the wellhead will remain *in situ* permanently, over time, the wellhead will corrode (either internal or external corrosion). In the long term, this could result in the introduction of contaminants from the wellhead composition (such as iron) and residual well fluids (**Section 4.6**) to marine sediments. The release has the potential to adversely impact marine sediment and water quality in the surrounding water column in a localised area.

Release of Contaminants

The wellhead is 4 m high and made predominately from approximately 7500 kg of mild steel (refer to **Section 4.6**). Mild steel is mainly comprised of iron (around 98%) and also contains small amounts of carbon, manganese, chromium, silicon, molybdenum, phosphorus and sulphur (**Table 7-2**). Approximately 500 g of Viton (a fluoropolymer elastomer and synthetic rubber compound) is also present in the wellhead and it is coated in approximately 3-5 kg of paint (most likely zinc-oxide).

Table 7-2: Typical content of mild steel

Element	Carbon	Silicon	Manganese	Phosphorous	Sulphur	Chromium	Molybdenum
Typical content (%)	0.28-0.33	0.15-0.35	0.40-0.60	≤ 0.035	≤ 0.040	0.80-1.10	0.15-0.25

Corrosion of the wellhead over time could result in the release of trace amount of metals (such as iron and manganese) to the water column and surrounding sediments. Due to the robustness of the materials of the wellhead and the deepwater location of the wellhead, corrosion is likely to be a relatively slow process about 0.2 mm/year (Melchers, 2005). Degradation of the wellhead over time may also result in the gradual, progressive release of 500 g of Viton as these components within the wellhead slowly become exposed to seawater (in other words, after the metal casing around them corrodes).

Release of Fluids

In the long-term, wells left *in situ* will corrode and break down. Chemicals and fluids either within the wellhead above the abandonment plug or trapped behind the casing annulus have the potential to leak from the wellhead over time. Displacement fluids above the abandonment plug include 25 m^3 of inhibited seawater which contains corrosion inhibitor and biocide. Well annulus fluids contain bentonite and viscosifiers and are estimated to be 19 m^3 (**Section 4.6.2**).

Impact Assessment

Release of Contaminants

Deterioration of the wellhead will result in a much smaller footprint than the EMBA described in **Section 5.1** due to the passive nature of corrosion of the structure and lack of mechanical movement of the particles. Seafloor currents at the water depth of the wellhead are typically very low speed, in the range of 0.02 - 0.2 knots. The structure is therefore likely to collapse in place and particles of material fall to the seafloor in the immediate vicinity. For example, shipwrecks at similar depths (aside from wreckage scatter) slump to the seafloor beneath the wreck. Based on the rate of corrosion anticipated, it is estimated that the structure will fully degrade and become incorporated into seabed sediments after approximately 150 years.

A radius of about 15 m around the wellhead is likely to delineate the limit of area of the seabed that may be impacted by deterioration of the wellhead (i.e. an area of about 700 m^2). This area is defined as the area in which the structure will rest on completion of its collapse following a period of slow corrosion. It is based on the wellhead structure with dimensions of up to 3 x 3 m length and breadth and an height above the seabed of up to 4 m. This radius of impact permits consideration of physical movement of some of the material by larger benthic animals.

The main release of contaminants from the wellhead is iron, which makes up around 98% of the wellhead. Iron is not considered a significant contaminant in the marine environment, and is only toxic to marine organisms at extremely high concentrations (Grimwood and Dixon, 1997), and is an abundant element in marine sedimentary systems (Taylor *et al*., 2011). Given the low toxicity of iron (iron oxides are included on the OSPAR PLONOR list) and the slow release rate over many decades, and that the wellhead will eventually collapse and be covered in sediments, the iron may be expected to be buried and ultimately assimilated into the surrounding marine environment with no adverse effects. As such, it is likely that any impacts to marine sediments, benthic habitats, and water quality will be largely localised and not significant. No impacts are expected to protected species that may occur at the depth of the wellhead.

The other elements(**Table 7-2**), are widely found in the environment and are not present in quantities that present a risk of impact.

Carbon is the fifteenth most abundant element in the earth's crust (Allaby,2020), and key building block supporting the growth and development of marine life.

Silicon is the second most abundant element on earth's crust (Allaby, 2020), and abundant in marine sedimentary systems. Silicon is an essential element for marine plants and animals, but only traces are required by animals. Some sponges and planktonic organisms possess silica (silicon dioxide) skeletal structures and so utilise more (Underwood, 2018).

Manganese is the twelfth most abundant element in Earth's crust (Allaby, 2020), and it is fundamental to the growth and development of marine life. Manganese has an important role as a coenzyme that assists in the activation of enzymes in metabolism of plants and animals (Chen et al. 2018).

Phosphorus is widespread in the marine environment and is the second most abundant inorganic element in plants and animals. Phosphorus is a key element within deoxyribonucleic acid (DNA), ribonucleic acid (RNA), and energy storing substances such as adenosine triphosphate (ATP). Phosphorus is fundamental to life (Butsov et al. 2013).

Sulphur is widespread in the marine environment and is the fifth most abundant inorganic element in the marine environment (Allaby, 2020). Sulphur is an essential element for life and is present in some amino acids and vitamins.

Chromium is the 21st most abundant element on the earth's crust (Allaby, 2020), while hexavalent chromium is considered to be highly toxic, other forms including the metallic form are not.

Molybdenum is the 25th most abundant element in the world's oceans (Allaby, 2020), and it is fundamental to the growth and development of marine life. Molybdenum is considered to be naturally occurring in seawater (Abbott, 2007) and is an essential trace element for aquatic organisms (Eisler, 2007). Molybdenum has an important role as a coenzyme that assists in the activation of enzymes in metabolism of plants (Bittner, 2014) and animals (Hall, 2018).

The small quantities of Carbon, Silicon, Manganese, Phosphorous, Sulphur, Chromium and Molybdenum present in steel that is liberated as it slowly corrodes will be assimilated into the surrounding marine environment with no adverse effects. As the wellhead location is covered in sediment, ultimately any remaining material will be permanently buried.

Given the low toxicity of iron (iron oxides are on the OSPAR PLONOR list) and other wellhead constituents, the slow release rate and rapid dilution in the open ocean environment, it is likely that any impacts to marine sediments, benthic habitats and water quality will be largely localised and not significant. As such, any impacts to marine sediments, benthic habitats, and water quality will be localised and negligible. No impacts are expected to protected species that may occur at the depth of the wellhead.

Paint on the wellhead is likely to be zinc-oxide based. This type of paint is used to reduce corrosion of the mild steel and applied as a surface coating. Content of zinc-oxide in protective coatings can be up to 90%. Therefore, up to 2.7-4.5 kg of zinc could be present. As the structure degrades, the zinc coating is likely to break down over time and become mixed with the seabed sediments and corrosion particles from the wellhead. Distribution into the immediate vicinity of the wellhead will have a negligible impact on the marine environment as the deep water area of the wellhead location consists of soft substrate which typically support a low abundance and diversity of benthic communities (Heyward et al., 2001; Etter & Grassle, 1992).

Very small amounts (500 g) of Viton are associated with the seals within the wellhead. This volume is comparable to that found in household taps. These components are unable to be removed in isolation, and therefore will remain *in situ*. It is expected that as the iron around the seals corrode, the seals will be exposed to seawater and may begin to degrade themselves. Plastics are generally known to break down in seawater over long periods of time (hundreds to thousands of years); therefore, these components are also expected to slowly break down into various particle sizes. The low rate of degradation, combined with the very small volumes of Viton remaining *in situ*, means the concentrations of plastics in the EMBA are expected to be low with negligible localised impacts.

As identified in **Section 7.8**, marine debris is identified as a key threat to marine turtles in the Recovery Plan for Marine Turtles in Australia 2017-2027 (Commonwealth of Australia, 2017). While the term marine debris in the recovery plan relates to floating non-degradable debris, such as lost or discarded fishing gear, land-sourced garbage and ship-sourced materials disposed of at sea, the term can be applied to the materials released from the wellhead, such as plastic, as it degrades over time.

The Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (Commonwealth of Australia, 2018) includes an objective to understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations. The discharge of negligible quantities of plastic (approximately 500 g of Viton) is therefore an applicable discharge under this plan.

An assessment against relevant recovery objectives and actions of both the recovery plan and threat abatement plan relating to marine debris is provided in **Section 7.8**. It is determined that leaving the wellhead *in situ* is not inconsistent with the objectives and actions within these plans.

Release of Fluids

As presented in **Table 4-4**, the chemicals within the displacement and annulus fluids are low risk to the marine environment, based on OCNS ranking and the slow release rate.

Seabed around the wellhead is comprised of relatively flat and featureless habitat, dominated by soft sediment (fine to coarse sands) inhabited by infauna and sparsely distributed epifauna. The release of fluids is unlikely to impact these species.

It is possible that fish species transiting the localised area at the seabed or around the wellhead may come into contact with the fluids as they are released, albeit at very low concentrations. However, given the slow release of the fluids from the wellhead, the bottom currents, rapid dispersion on release and the transient nature of fish species, it is unlikely they will be within the leak for a period that causes any lasting impact.

As the fluids would be released slowly over a number of years, given the slow release rate, the rapid dilution in the open ocean environment, and low sensitivity of habitat, it is likely that any impacts will be negligible, with no lasting effect.

Summary of Potential Impacts to Environmental Values(s)

It is considered that the release of contaminants and fluids from the wellhead remaining *in situ* permanently will not result in an impact greater than localised impacts to marine sediments, benthic habitats and water quality, with no lasting effect, not significant to surrounding marine habitats (Environment Impact – F).

Demonstration of ALARP

Control Considered	*Control Feasibility (F) and Cost/Sacrifice (CS)*	*Benefit in Impact/Risk Reduction*	*Proportionality*	*Control Adopted*
Legislation, Codes and Standards				
Compliance with *Environmental Protection (Sea Dumping) Act 1981*	F: Yes CS: Minimal to moderate cost. Standard practice.	Sea dumping permit may be required.	If required, control based on legislative requirements and must be adopted.	Yes **C 1.1**
Good Practice				
As-left survey to verify wellhead's status and condition	F: Yes. CS: Moderate.	No additional benefits would be gained from performing an as-left survey given:	Cost of the control is disproportionate to the benefit that	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		• there is no credible loss of well integrity (**Section 7.5.4**) • impact assessment has discharges to the marine environment over the long-term and, therefore, any changes in the status/condition of the infrastructure would not alter the assessment • conducting a survey adds additional risks to the activity, associated with vessel use and seabed disturbance from ROV use (**Section 3.6**).	may be gained from it given impacts from the discharge of corrosion materials and fluids have been assessed as negligible and outcomes of the survey would not credibly alter impact assessment.	
Monitoring program of water quality, sediment quality and benthic communities	F: Yes; an ROV would be required to sample sediment right up against the wellhead to be able to detect any sediment contamination. CS: Moderate; need to include cost of mobilising an ROV for this water depth. The activity introduces health and safety risk to personnel and additional environmental risks (vessel- and ROV-based risks, disturbance to seabed).	Impacts to water quality, sediment quality and benthic communities as a result of the release of trace metals are likely to be localised and have no lasting effect. Therefore, there is limited environmental benefit (information) gained from monitoring sediment quality and benthic communities around the wellhead.	Cost/sacrifice outweigh benefit. Survey methodology would require vessel operations with associated impacts and risks. Considering the negligible impacts expected to water, sediment and benthic communities, the environmental costs associated with monitoring outweigh any potential benefits form the monitoring results. Consequently, monitoring has not been adopted as a control.	No
Monitoring and/or remediation to make good any damage to the seabed or subsoil and provide for conservation and protection of the natural resources in the area of the wellhead	F: Yes. CS: Moderate.	Impacts to the seabed and subsoil from long-term corrosion of the wellhead will have a negligible impact to the environment within an estimated 15 m around the wellhead. Impacts to benthic habitats from previous drilling activities (e.g. cuttings) are likely to be localised (~250 m radius around wellhead and negligible given the low sensitivity of the area, that the well was drilled with	Cost of the control is disproportionate to the benefit that may be gained from it given impacts to the seabed have been assessed as negligible.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
		water-based muds, and given the time that has passed since the activities occurred (2007) which would have provided sufficient duration for benthic habitats to recover and restabilise. These negligible impacts do not represent unacceptable damage to the seabed or subsoil and allow for the conservation and protection of the natural resources in the area. Therefore, there is no benefit to be gained from further monitoring or remediation of the seabed surrounding the wellhead.		
Professional Judgement – Eliminate				
Removal of wellhead	See **Section 3** Decommissioning Options Assessment.			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 (refer to **Section 3.8** for discussion of wellhead management options) and use of the relevant tools appropriate to the decision type, Woodside considers the potential impacts of release of contaminants and fluids from the wellhead remaining *in situ* permanently to be ALARP. No reasonable additional/alternative controls were identified that would further reduce the impacts without significantly disproportionate sacrifice. Furthermore, no additional controls are required to provide for the conservation and protection of natural resources in the area of the wellhead, or to make good any damage to the seabed or subsoil, as per Section 270(3)(e) and (f) of the OPGGS Act.				

Demonstration of Acceptability

Acceptability Statement: The impact assessment has determined that the release of contaminants and fluids from the wellhead remaining *in situ* permanently may result in localised impacts, with negligible effects to environmental receptors (sediment, water column and benthic habitats). Further opportunities to reduce the impacts have been investigated above. DNP provided feedback during consultation requesting confirmation no impacts would occur to the values of any AMP, including any KEF associated with an AMP (**Table 6-2**). Woodside has addressed these concerns by providing documentation to assure no impacts would occur to the values of any AMP from the proposed activity. Therefore, Woodside considers the impacts of discharge of trace metals as a result of wellhead corrosion to be broadly acceptable.

In the context of Section 270(3)(e) and (f) of the OPGGS Act, impacts to benthic habitats are of an acceptable level given:

- principles of ESD have been considered during the assessment of decommissioning options (**Section 3.8.2**) and no significant adverse impacts will occur to any natural resource
- impacts and risks to natural resources or from damage to the seabed or subsoil are demonstrated to be reduced to ALARP
- international and domestic requirements that apply to the activity will be complied with.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 2 No impacts to benthic habitats greater than a consequence level of F[12] from leaving the wellhead *in situ*.	**C 1.1** Refer **Section 7.6.1**	**PS 1.1** Refer **Section 7.6.1**	**MC 1.1.1** Refer **Section 7.6.1**

[12] *Defined as 'No lasting effect (<1 month) or negligible impact. Localised impact not significant to environmental receptors' (**Section 2.6**).*

7.7 Unplanned Activities (Routine and Non-routine)

7.7.1 Interaction with Third Party Users: Snag Risk to Commercial Trawl Fisheries

Context	
Wellhead and associated infrastructure composition – **Section 4.6**	Socioeconomic environment – **Section 5.9** Stakeholder consultation – **Section 6**

Risk Evaluation Summary

Source of Impact	*Time Horizon (refer Section 3.6)*	*Environmental Value Potentially Impacted*						*Evaluation*						
		Marine Sediment	*Water Quality*	*Air Quality (incl Odour)*	*Ecosystems/Habitat*	*Species*	*Socioeconomic*	*Decision Type*	*Consequence/Impact*	*Likelihood*	*Risk Rating*	*ALARP Tools*	*Acceptability*	*Outcome*
Wellhead left *in situ*, resulting in accidental snagging on trawl equipment	Long-term						X	B	F	1	Low	LCS GP PJ SV	Acceptable	EPO 1

Description of Source of Risk

The Petroleum Activities Program will result in the ongoing, long-term, physical presence of the wellhead on the seabed (and up to 4 m above it). This snag hazard to commercial fisheries operating trawl equipment. The wellhead may become partially or fully buried overtime due to surrounding hydrodynamic conditions (**Section 7.6.2**) and will eventually fully degrade into seabed sediments over approximately 150 years (**Section 7.6.3**). The height of the wellhead (4 m) is considered a worst-case scenario and the risk will remain until the wellhead is significantly degraded or buried.

One fishery was identified as having potential for interaction with the wellhead: the WDTF. This fishery extends from Albany to Exmouth and the wellhead is located approximately 20 km from the northern boundary. The Western Deepwater Trawl Fishery operates in water deeper than 200 m and targets deepwater bugs, orange roughy and ruby snapper (AFMA, n.d.a).

Consequence Assessment

An independent study on the potential impacts and risks to the WDTF fishers from leaving the Calthorpe-1 wellhead *in situ* found the risk of snagging to be low (AMC, 2022; **Section 3.3**). The study identified that current fishing effort in the WDTF was low with a small number of vessels operating. Whilst current effort is low, there is potential for increased fishing in the future. The study considered a tenfold increase in activity to account for this, however found that potential for interaction remained low (AMC, 2022).

The low ranking was based on:

- The wellhead is located in deep water (**Table 4-2**). Whilst demersal trawling at such depths is possible, it necessitates having vessel/equipment specifications (horsepower and winch capacity) typically found on medium sized vessels (30-40 m) only one of which is registered to the WDTF. Smaller vessels would have difficulty meeting the necessary requirements.
- Overall effort across the fishery has been low, supported by historical WDTF logbook data (2010-21) suggesting on average approximately 17 days per annum are spent trawling in the fishery. Further, effort by the fishery has been focused on the area offshore and slightly south of Shark Bay in more recent years (Patterson et al., 2021).
- Oceanographic data for the region indicates there are generally southward moving surface waters with a northward moving subsurface current (DEWHA, 2007) which would make demersal trawling at the depth of the wellhead challenging in terms of maintaining gear symmetry and stability. Additionally, peak wind and wave conditions registered through summer would make trawling difficult for smaller vessels as such they may opt not to fish

- The trawlers are equipped with modern wheelhouse electronics including GPS plotters. GPS plotters accurately show the vessel position relative to marked seabed obstacles, such as wellheads, and enable operators to safely navigate around these obstacles.
- Trawl operators have numerous risk mitigation options available to them which either reduce interaction probability or harm level (e.g. modern wheelhouse electronics, vessel safety management systems, AMSA trawler hook-up safety procedures/guidelines, winch tension release mechanisms, hydroacoustic trawl monitoring systems, appropriate breaking load components on trawl gear).

Further a review of historical fishing vessel incident data from AMSA Monthly Domestic Vessel Incident Reporting Database (2020-22) and Australian Transport Bureau Marine Safety Investigation Reports (1982-2022) showed there was no reported fishing vessel incidents confirmed as related to offshore oil and gas infrastructure in Australia.

To understand the consequence of snagging, the AMC study also created a simulation 'interaction event' with scale models of the wellhead and trawl net in a flume tank facility. The results of the study identified that the most credible outcome should a trawl net interact with the Calthorpe-1 wellhead is minor to moderate gear damage and subsequent catch loss. This result was based on the wellheads relatively smooth shape, not having a PGB or other protrusions, allowing the skipper to work the net clear of the obstacle with minor damage to the equipment. Should the base of the wellhead sit above the seabed creating a gap the net may catch resulting in more moderate damage and catch loss. Provided the skipper adheres to hook-up guidelines issued by AMSA, the risk of harm to the vessel and crew would remain very low.

Snagging may result in financial loss to commercial fishers either through lost fishing time or damages to, and losses of, fishing gear (Rouse, 2020). Studies of historical snag incidents in the UK have found that vessel damage or abandonment occurred less than 0.5% of the time, with capsizes only occurring in 0.06% of incidents in the UK between 1989 and 2016 (Rouse, 2020). Rouse *et al*. (2020) found pipelines and marine debris were responsible for most (> 50%) of the snagging interactions between 1989 and 2016, with other production infrastructure, which includes wellheads, involved in 4% of incidents over the same period (Rouse, 2020). Overall, the likelihood of interactions between trawl equipment and oil and gas infrastructure is reducing over time, with an increase in communication between the oil & gas industry and improvement in fishery GPS equipment being the reason for this reduction in incidents (Rouse, 2020).

Additionally, of all the species currently or historically targeted by the WDTF, only the orange roughy utilise habitats at the depth of the wellhead (700 - 1400 m) (AFMA, n.d.a). Although the orange roughy is widely distributed across Australia, the species is primarily caught in off the south and east coasts (AFMA, n.d.b), has not been targeted by the fishery since 2005 and was removed as a target species in 2015 (Chambers and Bath, 2015), indicating that the EMBA is unlikely to be commercially important to this fishery. Given the species is long-lived and slow to mature, a precautionary approach has also been recommended for management if this species is targeted in the future (**Section 5.9.2**).

The likelihood of interaction between fishing vessels and the wellhead is further reduced by the size of the Western Deepwater Trawl Fishery. As described in **Section 7.6.1**, the wellhead and EMBA occupy a very small portion of the fishery (approximately 1 km^2), which extends from Albany to Exmouth and covers an area of approximately 717,000 km^2 (i.e. 0.0001% of the fishery). If current trends in fishing effort continue with few vessels (around one to three per year), the likelihood of a fishing vessel interacting with the wellhead is highly unlikely.

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[13]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Legislation, Codes and Standards				
Compliance with *Environmental Protection (Sea Dumping) Act 1981*	F: Yes CS: Minimal to moderate cost. Standard practice.	Sea dumping permit may be required.	If required, control based on legislative requirements and must be adopted.	Yes **C 1.1**
Good Practice				
Notify relevant State and Commonwealth fisheries of wellhead left *in situ*	F: Yes. CS: Minimal cost. Standard practice.	Communication of the wellhead being left *in situ* to other marine users ensures they are informed and aware, thereby reducing the risk accidental damage to fishing equipment.	Benefits outweigh cost/sacrifice.	Yes **C 1.2**

[13] Qualitative measure

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[13]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Notify AHO so the well can continue to be marked on navigation charts	F: Yes. CS: Minimal cost. Standard practice.	Communication of the wellhead being left *in situ* to AHO ensures the wellhead will continue to be marked on navigation charts, giving fisheries and other marine users sufficient information to plan activities around the infrastructure.	Benefits outweigh cost/sacrifice.	Yes **C 1.3**
As-left survey to verify wellhead's status and condition	F: Yes. CS: Moderate.	No additional benefits would be gained from performing an as-left survey given: • the wellhead location is known (**Section 4.3**) • risk assessment has considered impacts to commercial trawl fishers over the long-term and, therefore, any changes in the status/condition of the infrastructure would not alter the assessment (e.g. changing height of infrastructure due to partial burial or corrosion would still result in a potential snag hazard) • conducting a survey adds additional risks to the activity, associated with vessel use and seabed disturbance from ROV use (**Section 3.6**).	Cost of the control is disproportionate to the benefit that may be gained from it given risk to current and future commercial trawl fishers has been assessed as low and outcomes of the survey would not credibly alter impact assessment.	No
Monitoring and/or remediation to make good any damage to the seabed or subsoil in the area of the wellhead.	F: Yes. CS: Moderate.	Risks to commercial trawl fishers from the ongoing presence of the wellhead was assessed as low. These impacts do not represent unacceptable damage to the seabed or subsoil given the small area the wellhead and EMBA occupies in comparison to available fishing grounds by the WDTF (0.0001%). There are no additional risks to commercial trawl fishers from previous activities associated with the well. Therefore, there is no benefit to be gained from further monitoring or remediation of the seabed surrounding the wellhead.	Cost of the control is disproportionate to the benefit that may be gained from it given risks to commercial trawl fishers have been assessed as low.	No

Demonstration of ALARP				
Control Considered	***Control Feasibility (F) and Cost/Sacrifice (CS)[13]***	***Benefit in Impact/Risk Reduction***	***Proportionality***	***Control Adopted***
Professional Judgement – Eliminate				
Removal of wellhead	See **Section 3** Decommissioning Options Assessment.			No
Rock dumping over wellhead	F: Yes. CS: Substantial cost.	Additional benefits are low, as there is a low risk of snagging for commercial fisheries. Rock dumping over the wellhead adds additional risks to the activity, associated with vessel use and seabed disturbance from rock placement.	Cost/sacrifice outweigh potential benefits. This option would be a high cost due to the requirement of a specialised vessel.	No
Installing an over-trawlable structure	F: Yes. CS: Substantial cost.	Additional benefits are low as there is a low risk of snagging for commercial fisheries. Installing an over-trawlable structure over the wellhead adds additional risks to the activity, associated with vessel use and seabed disturbance from installation.	Cost/sacrifice outweigh potential benefits. There is considered little benefit from installing an over-trawlable structure.	No
Professional Judgement – Substitute				
No additional controls identified.				
Professional Judgement – Engineered Solution				
No additional controls identified.				
Risk Based Analysis				
No additional controls identified.				
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 Compass. This EP has been internally reviewed and approved in line with the Woodside Manual of Authorities.				
Societal Values				
Extensive consultation was performed when preparing the Australia Oil Calthorpe-1 Wellhead Abandonment (WA-59-L) EP to identify the views and concerns of relevant stakeholders, as described in **Section 6**.				
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 future unplanned disruption to commercial fisheries from the physical presence of the wellhead left *in situ*. As no reasonable additional/alternative controls were identified that would further reduce the risk without grossly disproportionate sacrifice, the impacts are considered ALARP. Furthermore, no additional controls are required to make good any damage to the seabed or subsoil, as per Section 270(3)(f) of the OPGGS Act.				

Demonstration of Acceptability
Acceptability Criteria and Assessment
Principles of ESD **Table 7-3** specifically assesses the risks to third party users against the relevant principles of ESD. For a full assessment of the Petroleum Activities Program against all principles of ESD, see **Section 3.8.2**.

Demonstration of Acceptability

Table 7-3: How risks to third party users have been assessed against the principles of ecologically sustainable development

Principles of ESD	Consideration
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations (the 'integration principle').	The impact assessment presented in this section assessed the long-term and short-term impacts to third party marine users of leaving the wellhead *in situ*.
If 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 (the 'precautionary principle').	The impact assessment presented in this section assessed the risk to future commercial fisheries as low.
The principle of intergenerational equity is that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle').	Leaving the wellhead *in situ* does not compromise the health, diversity and productivity of the environment and does not prevent third party marine users from continuing to use the marine environment in the future.

Internal Context

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

- Woodside Health, Safety and Environment Policy (**Appendix A**)
- Woodside Risk Management Policy (**Appendix A**).

External Context

During stakeholder consultation (**Section 6**), WAFIC advised that, based on their discussions with trawl fishers, their preference is for removal of the wellhead as this mitigates any potential snag risk. WAFIC also requested clarification on Woodside's reference to alignment with the IMO Resolution as an international standard for determining whether it is suitable for infrastructure to remain *in situ*. Woodside has addressed these comments by providing demonstration that leaving the wellhead *in situ* meets all requirements of the OPGGS Act and relevant international legislation and standards (**Section 3.4**), as well as assessment that all impacts and risks from this activity are acceptable and ALARP (**Section 7**).

Other Requirements

- Leaving the wellhead *in situ* is consistent with relevant legislation, as assessed in **Section 3.4**, including the OPGGS Act, the *Environment Protection (Sea Dumping) Act 1981* and the IMO Resolution A.672(16).

In the context of Section 270(3)(e) and (f) of the OPGGS Act, impacts to future commercial trawl fisheries are of an acceptable level given:

- principles of ESD have been considered during the assessment of decommissioning options (**Section 3.8.2**), as well as above for specific risks to future commercial trawl fishers, and no significant adverse impacts will occur to any natural resource
- impacts and risks from damage to the seabed or subsoil are demonstrated to be reduced to ALARP
- international and domestic requirements that apply to the activity will be complied with.

Acceptability Statement

Demonstration of Acceptability
The risk assessment has determined that in the unlikely event of a trawl fishing net snagging on the wellhead, the impacts to commercial fishers are expected to be slight and short term. The physical presence of the wellhead left *in situ* represents a low risk to any current and future commercial trawling activities. This residual risk is considered acceptable. This is on the basis that the area of the Western Deepwater Trawl Fishery that is occupied by the EMBA is very small (0.0001% or 1 km^2 of the 717,000 km^2 available to the fishery), the location of the wellhead will be made available to all marine users through continued marking on navigation charts, and improved GPS technology on commercially fishing vessels has been found to be sufficient for reducing the number of snag incidents that have occurred over time (Rouse, 2020**; Section 3.3**). Given the information on the location of the wellhead will continue to be made available to commercial fishers, any interaction between trawl equipment and the wellhead would be the result of a failure in a navigation control and a number of factors must align as follows: • The GPS equipment onboard the vessel would fail, or not be correctly reflecting the location of the wellhead. • The catch at the time would need to be large and heavy (Rouse, 2020). • Risk mitigation measures including AMSA hook-up guidelines not adopted or complied with. Therefore, Woodside considers the adopted controls appropriate to manage the risk of future unplanned disruption to commercial trawling from the physical presence of the wellhead left *in situ* to a level that is broadly acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 1 Prevent adverse interactions with other marine users from infrastructure.	**C 1.1** Refer **Section 7.6.1**	**PS 1.1** Refer **Section 7.6.1**	**MC 1.1.1** Refer **Section 7.6.1**
	C 1.2 Refer **Section 7.6.1**	**PS 1.2** Refer **Section 7.6.1**	**MC 1.2.1** Refer **Section 7.6.1**
	C 1.3 Refer **Section 7.6.1**	**PS 1.3** Refer **Section 7.6.1**	**MC 1.3.1** Refer **Section 7.6.1**

7.8 Recovery Plan and Threat Abatement Assessment

As described in **Section 1.9.1.3**, NOPSEMA will not accept an EP that is inconsistent with a recovery plan or threat abatement plan for a listed threatened species or ecological community. This section describes the assessment that Woodside has undertaken to demonstrate that the Petroleum Activities Program is not inconsistent with any relevant recovery plans or threat abatement plans. For the purposes of this assessment, the relevant Part 13 statutory instruments (recovery plans and threat abatement plans) are:

1. Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017)
2. 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 7-4 lists the objective 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 objective/action areas applicable to the Petroleum Activities Program, the relevant actions of each plan have been identified, and an evaluation has been conducted as to whether impacts and risks resulting from the activity are not inconsistent with that action. The results of this assessment against relevant actions are presented in **Table 7-5** and **Table 7-6**.

Table 7-4: 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	
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	
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	
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 harmful marine debris	Y	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 7-5: Assessment against actions of the Marine Turtle Recovery Plan relevant to the Petroleum Activities Program

Part 13 Statutory Instrument	Relevant Action/Objective	Relevant Actions	Evaluation	EPO, Controls and EPS
Marine Turtle Recovery Plan	**Action Area A3**. Reduce the impacts of marine debris.	**Action:** Support the implementation of the Marine Debris Threat Abatement Plan. Priority actions at stock level: Green Turtle – Understand the threat posed to this stock by marine debris. Loggerhead – Determine the extent to which marine debris is impacting loggerhead turtles.	Refer to **Section 7.6.3**. **Not inconsistent assessment:** The assessment of the discharges to the marine environment considered the potential risks to marine turtles. Given the quantity of material released (iron and negligible quantities of Viton), the contribution of material from the wellhead as a threat to marine turtles is considered to be insignificant. Iron will settle in the vicinity of the wellhead and approximately 500 g of plastics will be released, which will contribute to the overall microplastics in the ocean. The contribution of microplastics from the wellhead as a threat is considered insignificant in the context of other sources of microplastics in the ocean. Furthermore, plastics are expected to enter the marine environment over a long period of time (hundreds to thousands of years), reducing the concentration of plastics in the EMBA at any particular time. Leaving the wellhead *in situ* is not inconsistent with the recovery plan.	NA
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 7-6: Assessment against relevant actions of the Marine Debris Threat Abatement Plan

Part 13 Statutory Instrument	Relevant Action/Objective	Relevant Actions	Evaluation	EPO, Controls and PS
Marine Debris Threat Abatement Plan	**Objective 2:** Understand the scale of marine plastic and microplastic impact on key species, ecological communities and locations.	**Action 2.04**: Build understanding related to plastic and microplastic pollution.	Refer to **Section 7.6.3**. **Not inconsistent assessment:** Given the quantity of material released (iron and negligible quantities of Viton), the contribution of material from the wellhead as a threat to the marine environment is considered to be insignificant. Iron will settle in the vicinity of the wellhead and approximately 500 g of plastics will be released, which will contribute to the overall microplastics in the ocean. The contribution of microplastics from the wellhead as a threat is considered to be insignificant in the context of other sources of microplastics in the ocean. Furthermore, plastics are expected to enter the marine environment over a very long period of time (hundreds to thousands of years), reducing the concentration of plastics in the EMBA at any particular time. Leaving the wellhead *in situ* is not inconsistent with the threat abatement plan.	NA
Assessment Summary The Marine Debris Threat Abatement 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.				

8. IMPLEMENTATION STRATEGY

8.1 Overview

Regulation 14 of the OPGGS Environment Regulations requires an EP to contain an implementation strategy for the activity. The implementation strategy for the Petroleum Activities Program confirms fit-for-purpose systems, practices and procedures are in place to direct, review and manage the activities so environmental risks and impacts are continually being reduced to ALARP and are acceptable, and that EPOs and EPSs outlined in this EP are achieved.

Woodside, as Operator, is responsible for ensuring the Petroleum Activities Program is managed in accordance with this Implementation Strategy and the WMS (see **Section 1.9**).

8.2 Systems, Practices and Procedures

All operational activities are planned and performed in accordance with relevant legislation and standards, management measures identified in this EP and internal environment standards and procedures (**Section 7**).

The systems, practices and procedures that will be implemented are listed in the Performance Standards (PS) contained in this EP. Document names and reference numbers may change during the statutory duration of this EP and is managed through a change register and update process.

8.3 Roles and Responsibilities

Key roles and responsibilities for Woodside and Contractor personnel relating to implementing, managing and reviewing this EP are described in **Table 8-1**.

Table 8-1: Roles and responsibilities

Title (role)	Responsibilities related to EP
Office-based Personnel	
Woodside Development Lead Decommissioning	Ensures activity undertaken as per this EP. Provides sufficient resources to implement the management measures (in other words, controls, EPOs, EPSs and MC) in this EP.
Woodside Development Environment Adviser	Track compliance with performance outcomes and performance standards as per the requirements of this EP. Assist with the review, investigation and reporting of environmental incidents. 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.
Woodside Corporate Affairs Adviser	Prepare and implement the Stakeholder Consultation Plan. Report on stakeholder consultation. Perform liaison as required by **Section 1.8** and controls C 1.1 and C 1.2.

8.4 Training and Competency

No field-based personnel will be involved in the Petroleum Activities Program; no training requirements specific to the Petroleum Activities Program are required.

8.4.1 Inductions

No field-based personnel will be involved in the Petroleum Activities Program; no inductions specific to the Petroleum Activities Program are required.

8.5 Monitoring, Auditing, Management of Nonconformance and Review

8.5.1 Monitoring

The activity will end upon acceptance of the EP by NOPSEMA (**Section 4.5**). As such, monitoring is not considered relevant for this Petroleum Activities Program.

8.5.2 Auditing

The activity will end upon acceptance of the EP by NOPSEMA (**Section 4.5**). As such, auditing is not considered relevant for this Petroleum Activities Program.

8.5.3 Management of Non-conformance

Woodside classifies non-conformances with EPOs and EPSs in this EP as environmental incidents. Woodside employees are required to report all environmental incidents, which are managed as per Woodside's internal event recording, investigation and learning requirements.

However, as there are no activities associated with this EP, and the activity will end upon acceptance of the EP by NOPSEMA (**Section 4.5**), management of non-conformance is not considered relevant for this Petroleum Activities Program.

8.6 Environment Plan Management of Change and Revision

The activity will end upon acceptance of the EP by NOPSEMA (**Section 4.5**). As such, no management of change or revision will be required for this Petroleum Activities Program.

8.7 Record Keeping

Compliance records (outlined in MC in **Section 7**) will be maintained.

8.8 Reporting

To meet the EPOs and EPSs outlined in this EP, Woodside reports at a number of levels, as outlined in the next subsections.

8.8.1 Routine Reporting

8.8.1.1 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 during the life of the EP. Regulatory reporting requirements are summarised in **Table 8-2**.

Table 8-2: Routine external reporting requirements

Report	Recipient	Frequency	Content
Environmental Performance Report	NOPSEMA	The report will be submitted within six months of acceptance of the EP (as per the requirements of Regulation 14(2)). One report will be submitted to close the EP, in accordance with Regulation 25A.	In accordance with the Environment Regulations, the report will address compliance with EPOs, EPSs and controls outlined in this EP.

8.9 End of the Environment Plan

The EP will end when Woodside notifies NOPSEMA that the obligations identified in this EP have been completed, and NOPSEMA has accepted the notification, in accordance with Regulation 25A of the Environment Regulations.

8.9.1 Incident Reporting (Internal)

It is the responsibility of the Woodside Development Environment Adviser to ensure reporting of environmental incidents meets Woodside's and regulatory reporting requirements, as detailed in the Woodside Health, Safety and Environment Event Reporting and Investigation Procedure and this section of this EP.

8.9.2 Incident Reporting (External) – Reportable and Recordable

8.9.2.1 Reportable Incidents

Definition

A reportable incident is defined under Regulation 4 of the OPGGS 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 **Table 2-3**]).
- 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 **Table 2-3**]).

The environmental risk assessment (**Section 7**) for the Petroleum Activities Program does not identify any risks with a potential consequence level of C+ for environment. Additionally, there is no credible hydrocarbon spill for this activity. Should an unexpected event occur during the life of the EP that is classified as a reportable incident, it would be reported as below.

Any such incidents represent potential events which would be reportable incidents. Incident reporting 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.

Notification

NOPSEMA will be notified of all reportable incidents that occur during the life of the EP, according to the requirements of Regulations 26, 26B and 26AA of the Environment Regulations. Woodside will:

- report all reportable incidents to the regulator (orally) as soon as practicable, but within two hours of the incident or of its detection by Woodside
- provide a written record of the reported incident to NOPSEMA, National Offshore Petroleum Titles Administrator (NOPTA) and the Department of the responsible State Minister (Department of Mines, Industry Regulation and Safety (DMIRS)) as soon as practicable after the oral reporting of the incident
- complete a written report for all reportable incidents using a format consistent with the NOPSEMA Form FM0929 – Reportable Environment Incident (**Appendix G**) which must be submitted to NOPSEMA as soon as practicable, but within three days of the incident or of its detection by Woodside
- provide a copy of the written report to NOPTA and DMIRS, within seven days of the written report being provided to NOPSEMA.

8.9.2.2 Recordable Incidents

Definition

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

Notification

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

- 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.

8.10 Emergency Preparedness and Response

Under Regulations 14(8) the Implementation Strategy must contain an oil pollution emergency plan and provide for the updating of the OPEP. Regulation 14(8AA) outlines the requirements for the OPEP which must include adequate arrangements for responding to and monitoring of oil pollution.

As there is no credible hydrocarbon spill risk for this Petroleum Activities Program (**Section 7.5.4**), no OPEP has been developed for inclusion in the Implementation Strategy.

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10. GLOSSARY AND ABBREVIATIONS

10.1 Glossary

Term	Meaning
(the) Regulator	The Government Agency (State or Commonwealth) that is the decision-maker for approvals and undertakes ongoing regulation of the approval once granted.
3D seismic data	A set of numerous closely-spaced seismic lines that provide a high spatially sampled measure of subsurface reflectivity and 3D image.
Acceptability	The EP must demonstrate that the environmental impacts and risks of an activity will be of an acceptable level as per Regulation 10A(c).
ALARP	A legal term in Australian safety legislation, it is taken here to mean that all contributory elements and stakeholders have been considered by assessment of costs and benefits, and which identifies a preferred course of action.
API (gravity)	A measure of how heavy or light a petroleum liquid is compared to water.
Australian Standard	An Australian Standard that provides criteria and guidance on design, materials, fabrication, installation, testing, commissioning, operation, maintenance, re-qualification and abandonment.
Ballast	Extra weight taken on to increase a ship's stability to prevent rolling and pitching. Most ships use seawater as ballast. Empty tank space is filled with inert (non-combustible) gas to prevent the possibility of fire or explosion.
Bathymetry	Related to water depth, a bathymetry map shows the depth of water at a given location on the map.
Benthos/Benthic	Relating to the seabed, and includes organisms living in or on sediments/rocks on the seabed.
Biodiversity	Relates to the level of biological diversity of the environment. The EPBC Act defines biodiversity as: 'the variability among living organisms from all sources (including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part) and includes: (a) diversity within species and between species; and (b) diversity of ecosystems'.
Biota	The animal and plant life of a particular region, habitat or geological period.
Cetacean	Whale and dolphin species.
Consequence	The worst-case credible outcome associated with the selected event, assuming some controls (prevention and mitigation) have failed. Where more than one impact applies (such as environmental and legal/compliance), the consequence level for the highest severity impact is selected.
Corals	Anthozoa that are characterised by stone-like, horny or leathery skeletons (external or internal). The skeletons of these animals are also called coral.
Coral Reef	A wave-resistant structure resulting from skeletal deposition and cementation of hermatypic corals, calcareous algae and other calcium carbonate-secreting organisms.
Crustacean	A large and variable group of mostly aquatic invertebrates which have a hard external skeleton (shell), segmented bodies, with a pair of often very modified appendages on each segment, and two pairs of antennae (such as crabs, crayfish, shrimps, wood lice, water fleas and barnacles).
Cyclone	A rapidly-rotating storm system characterised by a low-pressure centre, strong winds, and a spiral arrangement of thunderstorms that produce heavy rain.
Datum	A reference location or elevation that is used as a starting point for subsequent measurements.
dB	Decibel – this is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (that is, 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Term	Meaning
dB re 1 μPa^2	Measure of underwater noise, in terms of sound pressure. Because the dB is a relative measure, rather than an absolute measure, it must be referenced to a standard 'reference intensity', in this case 1 micro Pascal (1 mPa), which is the standard reference that is used. The dB is also measured over a specified frequency, which is usually either a one Hertz bandwidth (expressed as dB re 1 mPa2/Hz), or over a broadband that has not been filtered. Where a frequency is not specified, it can be assumed that the measurement is a broadband measurement.
dB re 1μPa².s	Normal unit for sound exposure level.
Demersal	Living close to the floor of the sea (typically of fish).
Drill casing	Tubing that is set inside the drilled well to protect and support the well stream.
Drilling fluids	The main functions of drilling fluids include providing hydrostatic pressure to prevent formation fluids from entering into the well bore, keeping the drill bit cool and clean during drilling, carrying out drilled cement, and suspending the drilled cement while drilling is paused and when the drilling assembly is brought in and out of the hole. The drilling fluid used for a particular job is selected to avoid formation damage and to limit corrosion. The three main categories of drilling fluids are water-based muds (which can be dispersed and non-dispersed), non-aqueous muds, usually called oil-based mud, and gaseous drilling fluid, in which a wide range of gases can be used.
DRIMS	Woodside's internal document management system.
Dynamic positioning	Refers to a marine vessel that uses satellite navigation and radio transponders in conjunction with thrusters to maintain its position.
EC_{50}	The concentration of a drug, antibody or toxicant which induces a response halfway between the baseline and maximum after a specified exposure time.
Echinoderms	Any of numerous radially symmetrical marine invertebrates of the phylum Echinodermata, which includes the starfishes, sea urchins and sea cucumbers that have an internal calcareous skeleton and often covered with spines.
Endemic	A species that is native to or confined to a certain region.
Environment	The surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelations (Source: ISO 14001).
Environment Plan	Prepared in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009, which must be assessed and accepted by the Designated Authority (NOPSEMA) before any petroleum-related activity can be performed.
Environment Regulations	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Commonwealth).
Environmental approval	The action of approving something that has the potential to have an adverse impact on the environment. Environmental impact assessment is generally required before environmental approval is granted.
Environmental hazard	The characteristic of an activity or event that could potentially cause damage, harm or adverse effects on the environment.
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services (Source: HB 203:2006).
Environmental impact assessment	An orderly and systematic process for evaluating a proposal or scheme (including its alternatives), and its effects on the environment, and mitigation and management of those effects (Source: Western Australian *Environmental Impact Assessment Administrative Procedures 2010*).
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth legislation designed to promote the conservation of biodiversity and protection of the environment.
Epifauna	Benthic animals that live on the surface of a substrate.

Term	Meaning
Fauna	Collectively, the animal life of a particular region.
Flora	Collectively, the plant life of a particular region.
IC_{50}	A measure of the effectiveness of a compound in inhibiting biological or biochemical function.
Habitat Critical	Species or habitats identified as habitat critical to the survival of the species.
Infauna	Aquatic animals that live in the substrate of a body of water, especially in a soft sea bottom.
ISO 14001	ISO 14001 is an international standard that specifies a process (called an Environmental Management System) for controlling and improving a company's environmental performance. An Environmental Management System provides a framework for managing environmental responsibilities so they become more efficient and more integrated into overall business operations.
Jig Fishing	Fishing with a jig, which is a type of fishing lure. A jig consists of a lead sinker with a hook moulded into it and usually covered by a soft body to attract fish.
LC_{50}	The concentration of a substance that is lethal to 50% of the population exposed to it for a specified time.
Likelihood	The description that best fits the chance of the selected consequence actually occurring, assuming reasonable effectiveness of the prevention and mitigation controls.
MARPOL (73/78)	The International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978. MARPOL 73/78 is one of the most important international marine environmental conventions. It was designed to minimise pollution of the seas, including dumping, oil and exhaust pollution. Its stated objective is to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimisation of accidental discharge of such substances.
Meteorology	The study of the physics, chemistry and dynamics of the earth's atmosphere, including the related effects at the air–earth boundary over both land and the oceans.
Mitigation	Management measures that minimise and manage undesirable consequences.
NOHSC (1008:2004)	National Occupational Health and Safety Commission – Approved Criteria for Classifying Hazardous Substances.
Oligotrophic	Low in plant nutrients and having a large amount of dissolved oxygen throughout.
pH	Measure of the acidity or basicity of an aqueous solution.
Protected Species	Threatened, vulnerable or endangered species which are protected from extinction by preventive measures. Often governed by special federal or state laws.
Putrescible	Refers to food scraps and other organic waste associated with food preparation that will be subject to decay and rot (putrefaction).
Risk	The combination of the consequences of an event and its associated likelihood. For guidance, see Environmental Guidance on Application of Risk Management Procedure.
S-BRUVS	Stereo-baited remote underwater video systems.
Sessile	Organism that is fixed in one place; immobile.
Syngnathids	Family of fish that includes the seahorses, the pipefishes, and the weedy and leafy sea dragons.
Teleost	A fish belonging to the Teleostei or Teleostomi, a large group of fishes with bony skeletons, including most common fishes. The teleosts are distinct from the cartilaginous fishes such as sharks, rays and skates.
The Program	Streamlining Offshore Petroleum Environmental Approvals Program.
Thermocline	A temperature gradient in a thermally stratified body of water.

Term	Meaning
Zooplankton	Plankton consisting of small animals and the immature stages of larger animals.

10.2 Abbreviations

Abbreviation	Meaning
µm	Micrometre
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
AMC	Australian Maritime College
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AHS	Australian Hydrographic Service
AHV	Anchor handling vessels
AIMS	Australian Institute of Marine Science
ALARP	As low as reasonably practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
API	American Petroleum Institute
APPEA	Australian Petroleum Production and Exploration Association
AS (NZS)	Australian Standard (New Zealand Standard)
ASAP	As soon as practicable
ASL	Above sea level
ATSB	Australian Transport Safety Bureau
bbl	Oil barrel
BIA	Biologically important area
BoM	Bureau of Meteorology
BOP	Blow-out preventer
CCP	Cyclone Contingency Plan
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CFA	Commonwealth Fisheries Association
CICC	Corporate Incident Communication Centre
CoA	Commonwealth of Australia
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CV	Company values
DAA	Department of Aboriginal Affairs
DAWE	Department of Agriculture, Water and Environment
dB	Decibel
DEC	Department of Environment and Conservation
DEWHA	Department of Environment, Water, Heritage and the Arts
DMIRS	Department of Mines, Industry Regulation and Safety

Abbreviation	Meaning
DMP	Department of Mines and Petroleum
DNP	Director of National Parks
DoD	Department of Defence
DoEE	Department of the Environment and Energy
DoF	Department of Fisheries
DoT	Department of Transport
DP	Dynamic positioning
DPIRD	Department of Primary Industries and Regional Development
DPAW	Department of Parks and Wildlife
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EC_{50}	half maximal effective concentration
EEZ	Exclusive economic zone
EMBA	Environment that may be affected
EMS	Environmental management system
ENVID	Environmental hazard identification
EP	Environment Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*.
EPO	Environmental performance outcome
EPS	Environmental performance standard
ERP	Emergency Response Plans
ESD	Ecologically sustainable development
FPSO	Floating production, storage and offtake vessel
FRDC	Fisheries Research and Development Centre
g/m^2	Grams per square metre
GDSF	Gascoyne Demersal Scalefish Fishery
GP	Good practice
GPS	Global positioning system
HAZID	Hazard identification
HOCNF	Harmonised Offshore Chemical Notification Format
HQ	Hazard quotient
HS	Health and safety
HSE	Health, safety and environment
HZ	Hertz
IAP	Incident Action Plan
IAPP	International Air Pollution Prevention
IC_{50}	Half maximal inhibitory concentration
IMO	International Marine Organization
IMS	Invasive marine species
ISPP	International Sewage Pollution Prevention Certificate

Abbreviation	Meaning
ITF	Indonesian Through Flow
IUCN	International Union for Conservation of Nature
JHA	Job hazard assessment
KCl	Potassium chloride
KEF	Key ecological feature
kHz	Kilohertz
km	Kilometre
kPa	Kilopascal
KPI	Key performance indicator
L	Litres
LC_{50}	Lethal concentration, 50%
LCS	Legislation, codes and standards
LNG	Liquefied natural gas
MC	Measurement criteria
MMscf	Million standard cubic feet
MNES	Matters of national environmental significance
MODU	Mobile Offshore Drilling Unit
MoU	Memorandum of Understanding
MPA	Marine protected areas
MPRA	Marine Parks and Reserves Authority
ms^{-1}	Metres per second
NCDSF	North Coast Demersal Scalefish Fishery
nm	Nautical mile (1,852 m) a unit of distance on the sea
NOAA	National Oceanic and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NWBM	Non-water based mud
NWMR	North-west Marine Region
NWP	Northwest Province
NWS	North West Shelf
NWSTF	North West Slope Trawl Fishery
OBM	Oil-based mud
OCNS	Offshore Chemical Notification Scheme
OIM	Offshore Installation Manager
OOC	Oil on cuttings
OPEP	Oil Pollution Emergency Plan
OPGGS Act	*Offshore Petroleum and Greenhouse Gas Storage Act*
OSPAR	Oslo and Paris Commission for the Convention for the Protection of the Marine Environment of the North-East Atlantic
Permit Area	Petroleum activities area

Abbreviation	Meaning
PGB	Permanent Guide Base
PJ	Professional judgement
PLONOR	OSPAR definition of a substance that poses little or no risk to the environment
PMST	Protected matters search tool
PPA	Pearl Producers Association
ppb	Parts per billion
ppm	Parts per million
psi	Pounds per square inch
PTW	Permit to Work
PS	Performance standard
RBA	Risk-based analysis
RCC	Rescue Coordination Centre
RMS	Root mean square
RO	Reverse osmosis
ROV	Remotely operated vehicle
SBTF	Southern Bluefin Tuna Fishery
SCE	Solids control equipment
SPL	Sound pressure levels
Stb	Stock tank barrel
SV	Societal values
TPH	Total petroleum hydrocarbons
TSS	Total suspended solids
TTS	Temporary threshold shift
UK	United Kingdom
VOC	Volatile organic compounds
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WBM	Water-based mud
WCC	Woodside Communication Centre
WDTF	Western Deepwater Trawl Fishery
WHA	World Heritage Area
WMP	Waste Management Plan
WMS	Woodside Management System
Woodside	Woodside Energy Ltd

APPENDIX A: ENVIRONMENT AND RISK MANAGEMENT POLICIES

WOODSIDE POLICY

Woodside

Health, Safety and Environment Policy

OBJECTIVES

Strong health, safety and environment (HSE) performance is essential for the success and growth of our business. Our aim is to be recognised as an industry leader in HSE through managing our activities in a sustainable manner with respect to our workforce, our communities and the environment.

At Woodside we believe that process and personal safety related incidents, and occupational illnesses, are preventable. We are committed to managing our activities to minimise adverse health, safety or environmental impacts.

PRINCIPLES

Woodside will achieve this by:

- implementing a systematic approach to HSE risk management
- complying with relevant laws and regulations and applying responsible standards where laws do not exist
- setting, measuring and reviewing objectives and targets that will drive continuous improvement in HSE performance
- embedding HSE considerations in our business planning and decision-making processes
- integrating HSE requirements when designing, purchasing, constructing and modifying equipment and facilities
- maintaining a culture in which everybody is aware of their HSE obligations and feels empowered to speak up and intervene on HSE issues
- undertaking and supporting research to improve our understanding of HSE and using science to support impact assessments and evidence-based decision making
- taking a collaborative and pro-active approach with our stakeholders
- requiring contractors to comply with our HSE expectations in a mutually beneficial manner
- publicly reporting on HSE performance

APPLICATION

Responsibility for the application of this Policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control. Woodside managers are also responsible for promotion of this Policy in non-operated joint ventures.

Updated by the Board in April 2021

APPROVED

WOODSIDE POLICY

Woodside

Risk Management Policy

OBJECTIVES

Woodside recognises that risk is inherent in our business and the effective management of risk is vital to deliver our strategic objectives, continued growth and success. We are committed to managing risks in a proactive and effective manner as a source of competitive advantage.

Our approach protects us against potential negative impacts, enables us to take risk for reward and improves our resilience against emerging risks. The objective of our risk management framework is to provide a single consolidated view of risks across the company to understand our full risk exposure and prioritise risk management and governance.

The success of our approach lies in the responsibility placed on everyone at all levels to proactively identify, assess and treat risks relating to the objectives they are accountable for delivering.

PRINCIPLES

Woodside achieves these objectives by:

- Applying a structured and comprehensive framework for the identification, assessment and treatment of current risks and response to emerging risks;
- Ensuring line of sight of financial and non-financial risks at appropriate levels of the organisation;
- Demonstrating leadership and commitment to integrating risk management into our business activities and governance practices;
- Recognising the value of stakeholder engagement, best available information and proactive identification of potential changes in external and internal context;
- Embedding risk management into our critical business processes and control framework;
- Understanding our exposure to risk and tolerance for uncertainty to inform our decision making and assure that Woodside is operating with due regard to the risk appetite endorsed by the Board; and
- Evaluating and improving the effectiveness and efficiency our approach.

APPLICATION

The Managing Director of Woodside is accountable to the Board of Directors for ensuring this policy is effectively implemented.

Managers are responsible for promoting and applying the Risk Management Policy. Responsibility for the effective application of this policy rests with all Woodside employees, contractors and joint venturers engaged in activities under Woodside operational control.

This policy will be reviewed regularly and updated as required.

Revised by the Woodside Petroleum Ltd Board on 4 December 2020.

APPENDIX B: RELEVANT REQUIREMENTS

This appendix refers to Commonwealth Legislation related to the project. Western Australian State Legislation relevant to an accidental release of hydrocarbons in WA State waters is outlined in the Julimar Phase 2 Drilling and Subsea Installation Oil Pollution Emergency Plan.

Commonwealth Legislation	Legislation Summary
Air Navigation Act 1920 • *Air Navigation Regulations 1947* • *Air Navigation (Aerodrome Flight* • *Corridors) Regulations 1994* • *Air Navigation (Aircraft Engine* • *Emissions) Regulations 1995* • *Air Navigation (Aircraft Noise)* • *Regulations 1984* • *Air Navigation (Fuel Spillage) Regulations 1999*	This Act relates to the management of air navigation.
Australian Maritime Safety Authority Act 1990	This Act establishes a legal framework for the Australian Maritime Safety Authority (AMSA), which represents the Australian Government and international forums in the development, implementation and enforcement of international standards including those governing ship safety and marine environment protection. AMSA is responsible for administering the Marine Orders in Commonwealth waters.
Australian Radiation Protection and Nuclear Safety Act 1998	This Act relates to the protection of the health and safety of people, and the protection of the environment from the harmful effects of radiation.
Biosecurity Act 2015 • *Quarantine Regulations 2000* • *Biosecurity Regulation 2016* • *Australian Ballast Water Management Requirements 2017*	This Act provides the Commonwealth with powers to take measures of quarantine, and implement related programs as are necessary, to prevent the introduction of any plant, animal, organism or matter that could contain anything that could threaten Australia's native flora and fauna or natural environment. The Commonwealth's powers include powers of entry, seizure, detention and disposal. This Act includes mandatory controls on the use of seawater as ballast in ships and the declaration of sea vessels voyaging out of and into Commonwealth waters. The Regulations stipulate that all information regarding the voyage of the vessel and the ballast water is declared correctly to the quarantine officers.
Environment Protection and Biodiversity Conservation Act 1999 • *Environment Protection and Biodiversity Conservation Regulations 2000*	This Act protects matters of national environmental significance (NES). It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and culturally significant places. Under this Act, actions that may be likely to have a significant impact on matters of NES must be referred to the Commonwealth Environment Minister.
Environment Protection (Sea Dumping) Act 1981 • *Environment Protection (Sea Dumping) Regulations 1983*	This Act provides for the protection of the environment by regulating dumping matter into the sea, incineration of waste at sea and placement of artificial reefs.
Industrial Chemicals (Notification and Assessment Act) 1989 • *Industrial Chemicals (Notification and Assessment) Regulations 1990*	This Act creates a national register of industrial chemicals. The Act also provides for restrictions on the use of certain chemicals which could have harmful effects on the environment or health.

Commonwealth Legislation	Legislation Summary
National Environment Protection Measures (Implementation) Act 1998 • *National Environment Protection Measures (Implementation) Regulations 1999*	This Act and Regulations provide for the implementation of National Environment Protection Measures (NEPMs) to protect, restore and enhance the quality of the environment in Australia and ensure that the community has access to relevant and meaningful information about pollution. The National Environment Protection Council has made NEPMs relating to ambient air quality, the movement of controlled waste between states and territories, the national pollutant inventory, and used packaging materials.
National Greenhouse and Energy Reporting Act 2007 • *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*	This Act and associated Rule establishes the legislative framework for the NGER scheme for reporting greenhouse gas emissions and energy consumption and production by corporations in Australia.
Navigation Act 2012 • *Marine order 12 – Construction – subdivision and stability, machinery and electrical installations* • *Marine order 30 - Prevention of collisions* • *Marine order 47 - Mobile offshore drilling units* • *Marine order 57 - Helicopter operations* • *Marine order 60 - Floating offshore facilities* • *Marine order 91 - Marine pollution prevention—oil* • *Marine order 93 - Marine pollution prevention—noxious liquid substances* • *Marine order 94 - Marine pollution prevention—packaged harmful substances* • *Marine order 96 - Marine pollution prevention—sewage* • *Marine order 97 - Marine pollution prevention—air pollution*	This Act regulates navigation and shipping including Safety of Life at Sea (SOLAS). The Act will apply to some activities of the MODU and project vessels. This Act is the primary legislation that regulates ship and seafarer safety, shipboard aspects of marine environment protection and pollution prevention.
Offshore Petroleum and Greenhouse Gas Storage Act 2006 • *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* • *Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011* • *Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009*	This Act is the principal Act governing offshore petroleum exploration and production in Commonwealth waters. Specific environmental, resource management and safety obligations are set out in the Regulations listed.
Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 • *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995*	This Act provides for measures to protect ozone in the atmosphere by controlling and ultimately reducing the manufacture, import and export of ozone depleting substances (ODS) and synthetic greenhouse gases, and replacing them with suitable alternatives. The Act will only apply to Woodside if it manufactures, imports or exports ozone depleting substances.

Commonwealth Legislation	Legislation Summary
Protection of the Sea (Powers of Intervention) Act 1981	This Act authorises the Commonwealth to take measures for the purpose of protecting the sea from pollution by oil and other noxious substances discharged from ships and provides legal immunity for persons acting under an AMSA direction.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 *Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994* • *Marine order 91 - Marine pollution prevention—oil* • *Marine order 93 - Marine pollution prevention—noxious liquid substances* • *Marine order 94 - Marine pollution prevention—packaged harmful substances* • *Marine order 95 - Marine pollution prevention—garbage* • *Marine order 96 - Marine pollution prevention—sewage* *Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007* MARPOL Convention	This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. Under this Act, discharge of oil or other harmful substances from ships into the sea is an offence. There is also a requirement to keep records of the ships dealing with such substances. The Act applies to all Australian ships, regardless of their location. It applies to foreign ships operating between 3 nautical miles (nm) off the coast out to the end of the Australian Exclusive Economic Zone (200 nm). It also applies within the 3 nm of the coast where the State/Northern Territory does not have complementary legislation. All the Marine Orders listed, except for Marine Order 95, are enacted under both the *Navigation Act 2012* and the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. This Act is an amendment to the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. This amended Act provides the protection of the sea from pollution by oil and other harmful substances discharged from ships.
Protection of the Sea (Harmful Antifouling Systems) Act 2006 • *Marine order 98—(Marine pollution prevention—anti-fouling systems)*	This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the application or reapplication of harmful anti-fouling compounds on Australian ships or foreign ships that are in an Australian shipping facility.

APPENDIX C: PROTECTED MATTERS SEARCH

Australian Government

Department of Agriculture, Water and the Environment

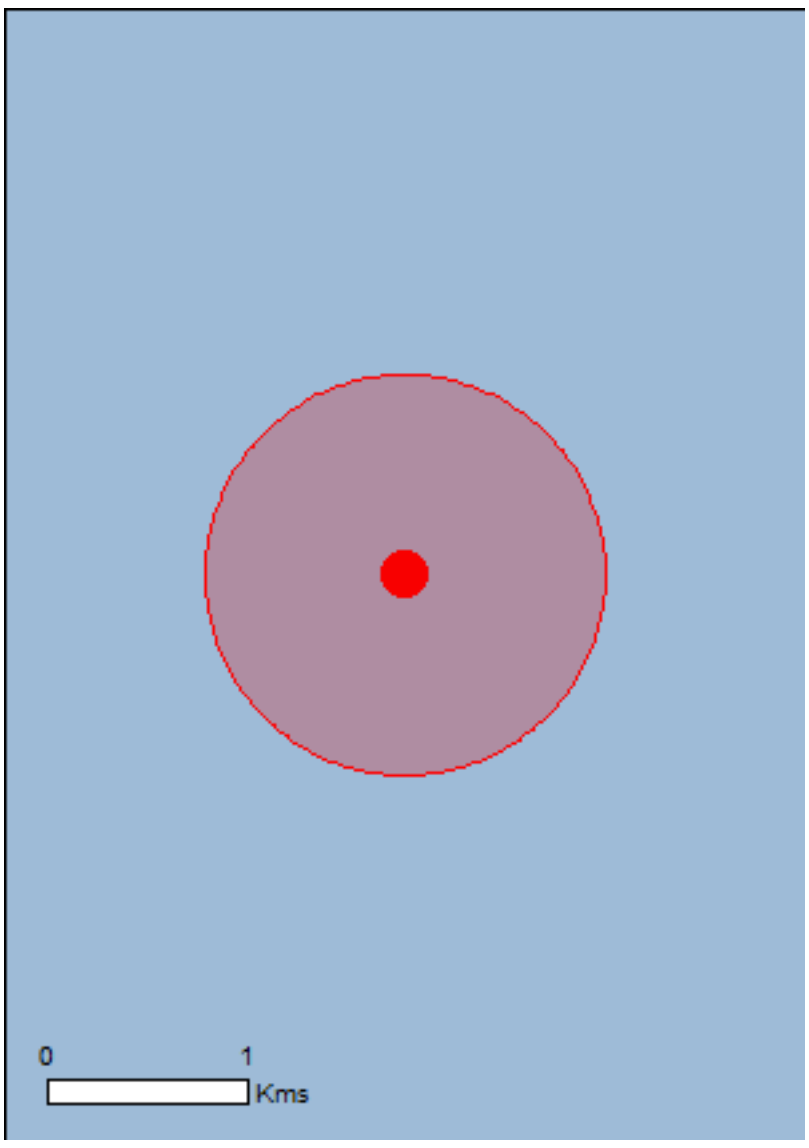
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

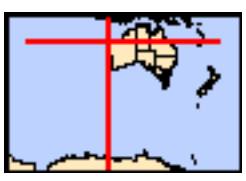
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 03/04/21 12:34:41



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:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	17
Listed Migratory Species:	30

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:	22
Whales and Other Cetaceans:	27
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	None
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	2

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Sharks		
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
[Anous stolidus](#) Common Noddy [825]		Species or species habitat may occur within area
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Migratory Marine Species		
[Balaena glacialis australis](#) Southern Right Whale [75529]	Endangered*	Species or species habitat may occur within area
[Balaenoptera bonaerensis](#) Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Species or species habitat likely to occur 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

Name	Threatened	Type of Presence
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
[Pterodroma mollis](#) Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Reptiles		
[Aipysurus laevis](#) Olive Seasnake [1120]		Species or species habitat may occur within area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
[Disteira kingii](#) Spectacled Seasnake [1123]		Species or species habitat may occur within area
[Disteira major](#) Olive-headed Seasnake [1124]		Species or species habitat may occur within area
[Ephalophis greyi](#) North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
[Hydrophis elegans](#) Elegant Seasnake [1104]		Species or species habitat may occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
[Pelamis platurus](#) Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
[Balaenoptera acutorostrata](#) Minke Whale [33]		Species or species habitat may occur within area
[Balaenoptera bonaerensis](#) Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat likely to occur within area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Migration route known to occur within area

Name	Status	Type of Presence
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
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
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

Name	Status	Type of Presence
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Canyons linking the Cuvier Abyssal Plain and the Continental Slope Demersal Fish Communities	North-west
	North-west

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-21.56556 113.8375

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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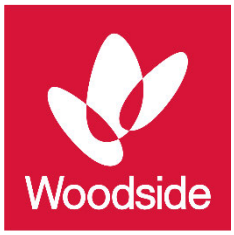
APPENDIX D: STAKEHOLDER CONSULTATION



Calthorpe-1 Exploration Wellhead Decommissioning Environment Plan

Date: July 2022

Revision: 2

TABLE OF CONTENTS

1. CONSULTATION WITH RELEVANT PERSONS

1.1 Email sent to DISER, DBCA, DMIRS, APPEA, Recfishwest, Marine Tourism WA, WA Game Fishing Association, Exmouth Charter Boat, Tourism and Dive Operators, Protect Ningaloo and Nganhurra Thanardi Garrbu Aboriginal Corproation (12 July 2021)

Dear Stakeholder,

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.2 Email sent to Exmouth Community Reference Group (12 July 2021)

Dear Community Reference Group

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.3 Email sent to Cape Conservation Group (12 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.4 Email sent to Exmouth Game Fishing Club (12 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.5 Email sent to Exmouth Chamber of Commerce and Industry (12 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risk and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.6 Email sent to Shire of Exmouth (12 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.7 Email sent to Ningaloo Coast World Heritage Advisory Committee (12 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.8 Email sent to Australian Fishing Management Authority and Commonwealth Fisheries Association (12 July 2021)

Dear Stakeholder

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

You are being contacted as you've been identified as a relevant stakeholder based on fishing licence overlap with the activity area, assessment of government fishing effort data (including AFMA) from recent years, fishing methods and water depth.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.9 Email sent to Western Deepwater Trawl Fishery (12 July 2021)

Dear Western Deepwater Trawl Fishery

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

You are being contacted as you've been identified as a relevant stakeholder based on fishing licence overlap with the activity area, assessment of government fishing effort data (including AFMA) from recent years, fishing methods and water depth.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.10 Email sent to Australian Hydrographic Office and Australian Maritime Safety Authority (12 July 2021)

Dear AHO / AMSA

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

An information sheet (also on our website), and shipping lane map is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.11 Email sent to the Department of Agriculture, Water and Environment (12 July 2021)

Dear DAWE

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

We have also assessed biosecurity matters which are considered below.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m

Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Biosecurity:

With respect to the biosecurity matters, please note the following information below:

Environment description:

The two wells are located in the Northwest Marine Bioregion. Calthorpe-1 is located in approximately 820 m water depth and approximately 50 km north-west of Exmouth. Thebe-1 is located in approximately 1170 m water depth and approximately 300 km north-west of Exmouth. Both wellheads are proposed to be left *in situ* . Seabed in the immediate vicinity of the wells is comprised of soft sediments. However, each of the wells are situated within a Key Ecological Feature (KEF). Thebe-1 lies within the Exmouth Plateau KEF and Calthorpe-1 within the Canyons, linking the Cuvier Abyssal Plain KEF and the Cape Range Peninsula and Continental Slope Demersal Fish Communities KEF.

Potential IMS risk

No credible IMS risk given wellheads are proposed to be left *in situ*.

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.12 Email sent to Department of Defence (12 July 2021)

Dear DoD

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L, respectively.

An information sheet (also on our website), and defence zone maps are attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.13 Email sent to Department of Primary Industries and Regional Development and Western Australian Fishing Industry Council (12 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L, respectively.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.14 Email sent to Pearl Producers Association (12 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L, respectively.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

or
displacement

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.15 Email sent to Pilbara Line Fishery (12 July 2021)

Dear Pilbara Line Fishery

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L, respectively.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Fisheries have been identified as being relevant based on fishing licence overlap with the activity area, assessment of government fishing effort data (including Fishcube and AFMA) from recent years, fishing methods and water depth.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*

Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.16 Email sent to BHP (12 July 2021)

Dear Titleholder

As operator of adjacent titles, we are sending this information to you.

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L, respectively.

An information sheet (also on our website), and Titleholder map is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).
Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.17 Additional email sent to Nganhurra Thanardi Garrbu Aboriginal Corporation (20 July 2021)

Dear YMAC,

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

A Consultation Information Sheet is attached, which provides background on the proposed activity, including a summary of potential key risks and associated management measures. The Information Sheet is also available on our website.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Kind Regards,

1.18 Email sent to Southern Bluefin Tuna fishery (26 July 2021)

Dear Southern Bluefin Tuna fishery,

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) to consult all fishery licence holders who have entitlements to fish within the proposed area.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
*Additional Fisheries (*Consultation based on AFMA advice to consult all fisheries with entitlements to fish in the area)*	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area

Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.19 Email sent to Western Tuna and Billfish Fishery (26 July 2021)

Dear Western Tuna and Billfish Fishery

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) to consult all fishery licence holders who have entitlements to fish within the proposed area.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
*Additional Fisheries (*Consultation based on AFMA advice to consult all fisheries with entitlements to fish in the area)*	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures

Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:
If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.20 Email sent to Western Skipjack Fishery (26 July 2021)

Dear Western Skipjack Fishery

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) to consult all fishery licence holders who have entitlements to fish within the proposed area.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth

Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
*Additional Fisheries (*Consultation based on AFMA advice to consult all fisheries with entitlements to fish in the area)*	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.21 Email sent to Southern Bluefin Tuna Industry Association (26 July 2021)

Dear [redacted]

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

You are being contacted on advice from the Australian Fisheries Management Authority (AFMA) to consult all fishery licence holders who have entitlements to fish within the proposed area.

We have identified potential impacts to active commercial fishers and the environment, which are summarised below. We have endeavoured to reduce these risks to an as low as reasonably practicable level.

An information sheet (also on our website), and a map of relevant fisheries is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery

*Additional Fisheries (*Consultation based on AFMA advice to consult all fisheries with entitlements to fish in the area)*	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead Locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Potential risks to commercial fishing and proposed mitigation measures:

Thebe-1 and Calthorpe-1 wellheads remaining in situ

Potential Risk	Risk Description	Mitigation And / Or Management Measures
Planned		
Physical presence of infrastructure on seafloor causing interference or displacement	Physical presence of infrastructure on the seafloor causing temporary interference / displacement	Wellhead location marked on marine charts

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

1.22 Email sent to Director of National Parks (17 August 2021)

Dear Director of National Parks

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L respectively.

We note Australian Government Guidance on consultation activities and confirm that:

- The wellheads are outside the boundaries of a proclaimed Australian Marine Parks, with the Thebe-1 wellhead located approximately 141 km north, and the Calthorpe-1 wellhead approximately 9 km east, of the Gascoyne Marine Park Multiple Use Zone (Cwlth).
- We have assessed potential risks to Australian Marine Parks (AMPs) in the development of the proposed Environment Plan and believe that there are no credible risks as part of planned activities that have potential to impact the values of the Marine Parks as the wellheads are proposed to be left *in situ*.
- As the wells have been previously permanently plugged and abandoned and are proposed to be left *in situ*, there are no credible oil spill risks or associated spill response plans or monitoring programs for the EPs. There are also no planned or unplanned impacts associated with any vessel operations, such as light, air emissions, noise, discharges etc.

An information sheet (also on our website) is attached for your information.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Wellhead locations:

Wellheads	Water depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area

Thebe-1	~1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	~820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 3 September 2021.

Regards

2. ADDITIONAL CONSULTATION WITH RELEVANT PERSONS

2.1 Email sent to Commonwealth Fisheries Association (26 July 2021)

Dear CFA

Further to the below information regarding Woodside's intent to submit Environment Plans for the decommissioning of the Scarborough (Thebe-1) and Australia Oil (Calthorpe-1) wellheads, please be advised the Australian Fisheries Management Authority (AFMA) has requested all Commonwealth Fisheries with an entitlement in the area be consulted.

On AFMA advice, in addition to Western Deepwater Trawl fishery, Woodside will consult all fishery licence holders from:

- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Skipjack Fishery

Please see Activity table below for more information and updated maps of relevant fisheries attached.

Please let me know if you have any further comment or questions regarding the additional information provided.

Kind regards,

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
*Additional Fisheries (*Consultation based on AFMA advice to consult all fisheries with entitlements to fish in the area)*	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

2.2 Email sent to Western Australian Fishing Industry Council (26 July 2021)

Dear [redacted]

Further to the below information regarding Woodside's intent to submit Environment Plans for the decommissioning of the Scarborough (Thebe-1) and Australia Oil (Calthorpe-1) wellheads, as previously discussed, please be advised the Australian Fisheries Management Authority (AFMA) has requested all Commonwealth Fisheries with an entitlement in the area be consulted.

On AFMA advice, in addition to Western Deepwater Trawl fishery, Woodside will consult all fishery licence holders from:

- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Skipjack Fishery

Please see Activity table below for more information and updated maps of relevant fisheries attached.

Please let me know if you have any further comment or questions regarding the additional information provided.

Kind regards,

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
*Additional Fisheries (*Consultation based on AFMA advice to consult all fisheries with entitlements to fish in the area)*	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

2.3 Email sent to Department of Agriculture, Water and Environment (26 July 2021)

Dear DAWE

Further to the below information regarding Woodside's intent to submit Environment Plans for the decommissioning of the Scarborough (Thebe-1) and Australia Oil (Calthorpe-1) wellheads, please be advised the Australian Fisheries Management Authority (AFMA) has requested all Commonwealth Fisheries with an entitlement in the area be consulted.

On AFMA advice, in addition to Western Deepwater Trawl fishery, Woodside will consult all fishery licence holders from:

- Southern Bluefin Tuna Fishery
- Western Tuna and Billfish Fishery
- Western Skipjack Fishery

Please see Activity table below for more information and updated maps of relevant fisheries attached.

Please let me know if you have any further comment or questions regarding the additional information provided.

Kind regards,

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Relevant Fisheries	**Commonwealth:** Western Deepwater Trawl Fishery	**State:** Pilbara Line Fishery **Commonwealth:** Western Deepwater Trawl Fishery
*Additional Fisheries (*Consultation based on AFMA advice to consult all fisheries with entitlements to fish in the area)*	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery	**Commonwealth:** Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

2.4 Presentation to the Exmouth Community Reference Group (19 August 2021)

Enfield Plug and Abandonment

- We are planning to permanently plug and abandon (P&A) 18 wells around 38 km north of the North West Cape in ~400-600 m water depth
- The P&A activity is planned to commence during 2022 and be completed by mid 2024
- The Xmas trees, flowbases and wellheads will be removed following the P&A by end 2024
- We circulated a Consultation Information Sheet to the CRG in February 2021 seeking feedback. The EP was submitted to NOPSEMA in June 2021 for assessment

Enfield Subsea Decommissioning

- We are developing an Environment Plan to cover decommissioning of the remaining subsea infrastructure, which includes manifolds, flowlines, umbilicals and mooring chains
- All remaining subsea infrastructure above the seabed is planned to be removed
- Consultation is expected to commence in Q3 2021

Thebe-1 & Calthorpe-1 Exploration Wellheads

- We are planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1)
- Thebe-1 is located around 300 km north of Exmouth in ~1170 m water depth and Calthorpe-1 around 50 km northwest of Exmouth in ~820 m water depth
- Both wellheads are proposed to be left *in situ*. We circulated a Consultation Information Sheet to the CRG seeking feedback by 26 August

2.5 Woodside Consultation Information Sheet (sent to all relevant persons)

Woodside

STAKEHOLDER CONSULTATION

INFORMATION SHEET

July 2021

THEBE-1 AND CALTHORPE-1 EXPLORATION WELLHEAD DECOMMISSIONING ENVIRONMENT PLANS

EXMOUTH PLATEAU SUB-BASIN, NORTH-WEST AUSTRALIA

Woodside is planning to decommission two exploration wellheads: Scarborough (Thebe-1) and Australia Oil (Calthrope-1).

The Thebe-1 wellhead is located in permit WA-63-R around 300 km north of Exmouth at a water depth of approximately 1170 m and is proposed to be left *in situ*. Woodside Energy Ltd is Operator (75%) with BHP Petroleum (North West Shelf) Pty Ltd a joint venture participant (25%).

The Calthorpe-1 wellhead is located in permit WA-59-L around 50 km northwest of Exmouth at a water depth of approximately 820 m and is proposed to be left *in situ*. Woodside Energy Ltd is Operator (60%) with Mitsui E&P Australia Pty Ltd a joint venture participant (40%).

Table 1. Activity Summary

Exploration wellhead activities		
	Thebe-1	**Calthorpe-1**
Commencement date	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Approximate estimated duration	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Water depth	- 1170 m	- 820 m
Infrastructure	Exploration wellhead	Exploration wellhead
Vessels	Not required	Not required
Distance to nearest town	-300 km northwest of Exmouth	-50 km northwest of Exmouth
Distance to nearest marine park	-141 km north of the Gascoyne Marine Park - Multiple Use Zone (Cwlth)	-9 km east of the Gascoyne Marine Park - Multiple Use Zone (Cwlth)

Table 2. Approximate Locations

Wellheads	Water Depth (m)	Latitude	Longitude	Exclusion Zones	Permit Area
Thebe-1	- 1170	19° 25' 24.489" S	113° 5' 19.440" E	None	WA-63-R
Calthorpe-1	- 820	21° 33' 56.323" S	113° 50' 15.381" E	None	WA-59-L

Table 3. Summary of key risks and/or impacts and management measures for wellheads (Thebe-1 and Calthorpe-1) remaining in situ

Potential Risk and/or Impact	Mitigation and/or Management Measure
Planned	
Physical presence of infrastructure on seafloor causing interference or displacement	Wellhead location marked on marine charts.
Interests of relevant stakeholders including: • Defence activities • Petroleum activities • Commercial and recreational fishing activities • Shipping activities	Consultation with relevant petroleum titleholders, commercial fishers and their representative organisations, and Government departments and agencies to inform decision making for the proposed activity and development of the Environment Plan.

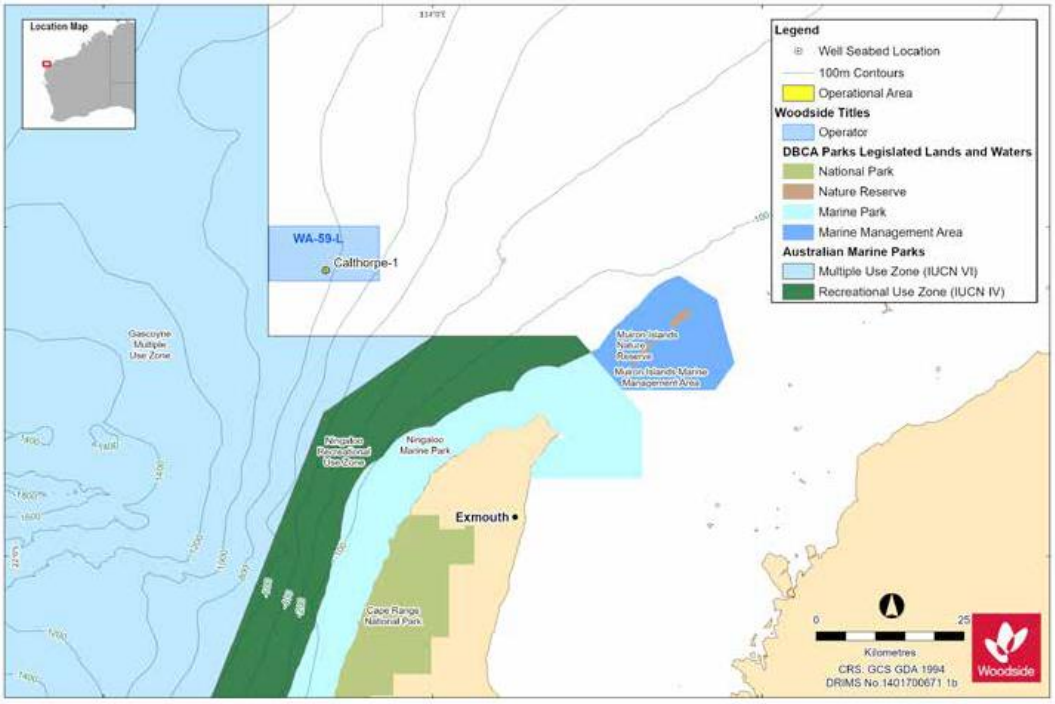


Figure 1. Calthorpe-1 Wellhead Location

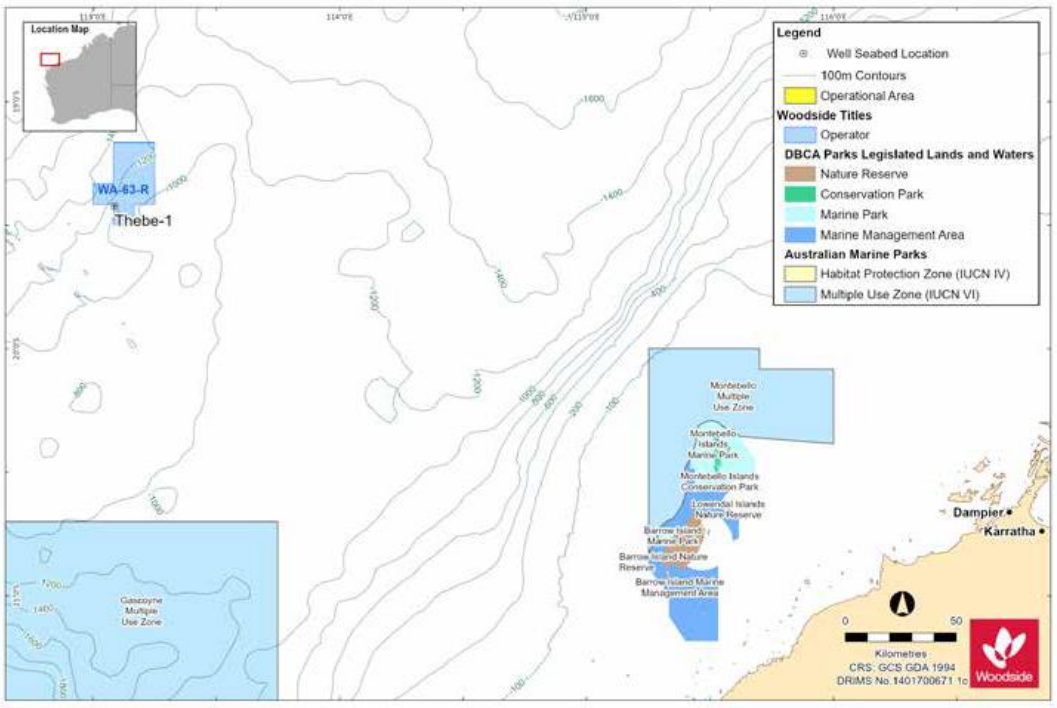


Figure 2. Thebe-1 Wellhead Location

Proposed activity

Woodside has undertaken a comprehensive assessment of all decommissioning options for these wellheads considering water depth, interaction with other marine users, previous removal attempts, international and Australian standards and a comparison of the impacts and risks associated with executing the decommissioning options.

All wells have been permanently plugged for abandonment to eliminate the possibility of hydrocarbon release to the environment. No activities are required for the Thebe-1 and Calthorpe-1 wellheads which are proposed to be left *in situ*. These wells will continue to be marked on navigational charts.

Implications for Stakeholders

Woodside will consult relevant stakeholders whose interests, functions and activities may be affected by the proposed activities. We will also keep other stakeholders who have identified an interest in the activities informed about our planned activities.

Woodside has undertaken an assessment to identify potential risks to the marine environment and relevant stakeholders considering timing, duration, location and potential impacts arising from the permanent plugging activities.

A number of mitigation and management measures for the Thebe-1 and Calthorpe-1 wellheads remaining *in situ* is outlined in Table 3. Further details will be provided in the Environment Plan.

Providing Feedback

Our intent is to minimise environmental and social impacts associated with the proposed activities, and we are seeking any interest or comments you may have to inform our decision making.

If you would like to comment on the proposed activities outlined in this information sheet, or would like additional information, please contact Woodside before 26 August 2021.

Please note that your feedback and our response will be included in our Environment Plan for the proposed activity, which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

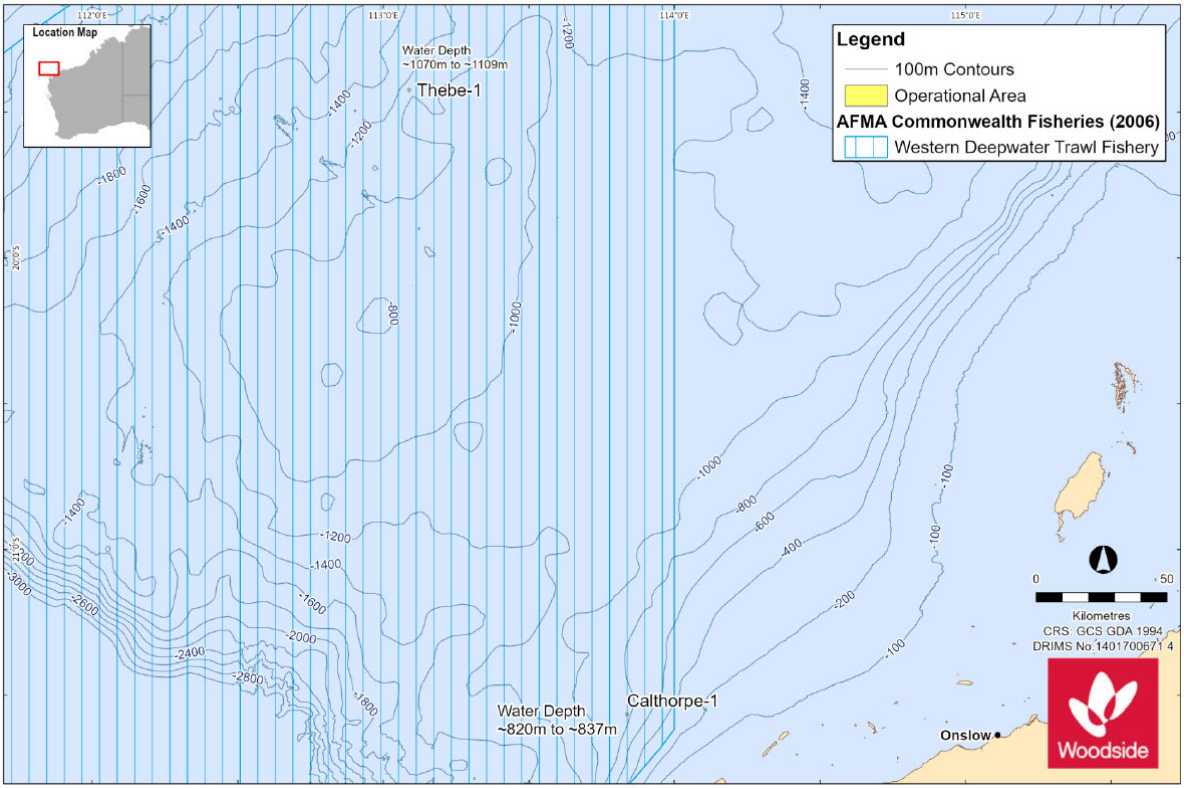
www.woodside.com.au

Shannen Wilkinson, Senior Corporate Affairs Adviser
Woodside Energy Ltd
E: Feedback@woodside.com.au | Toll free: 1800 442 977

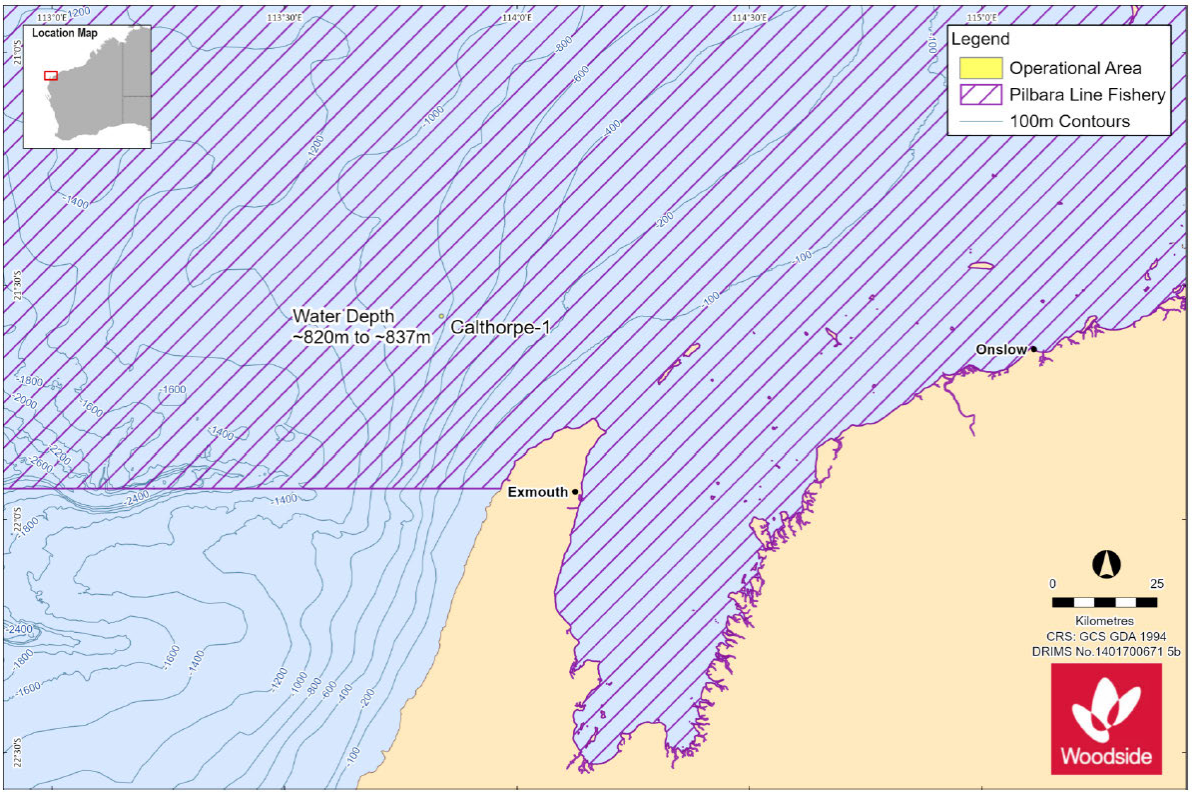
Please note that stakeholder feedback will be communicated to NOPSEMA as required under legislation. Woodside will communicate any material changes to the proposed activity to affected stakeholders as they arise.

Woodside

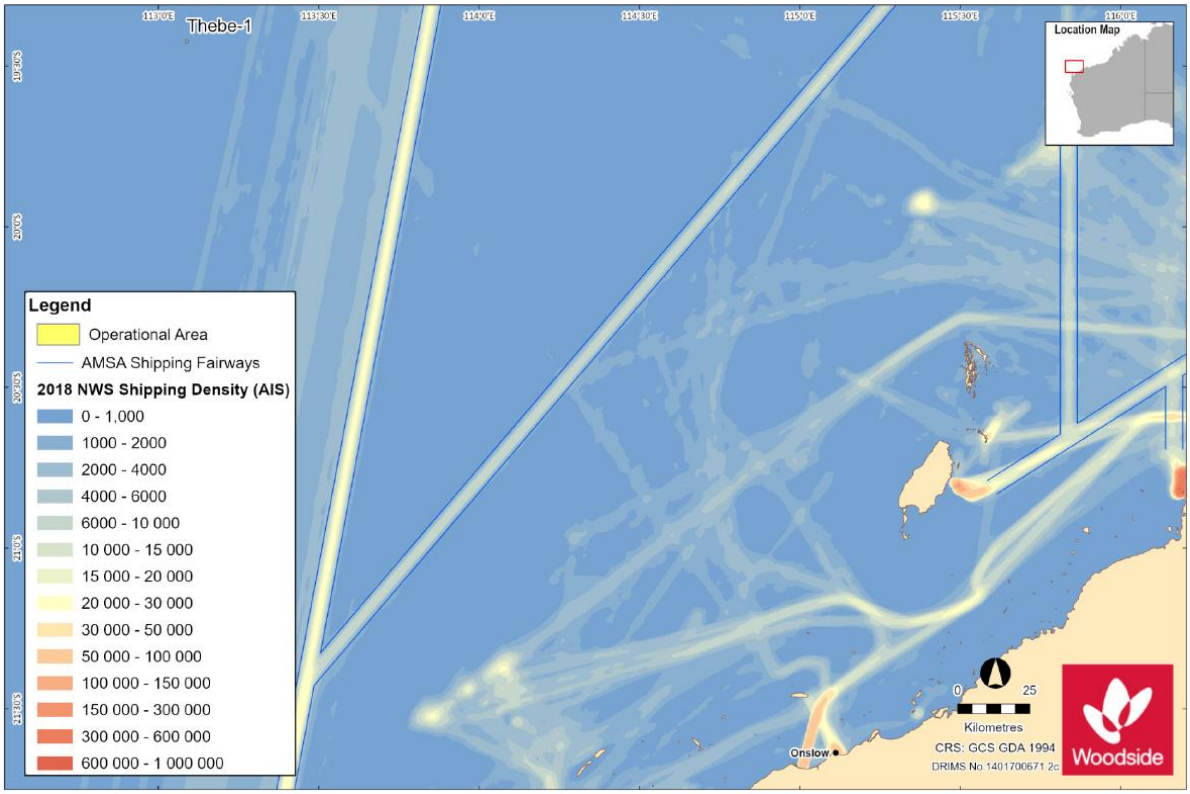
2.6 Fisheries map sent to AFMA, DAWE, DPIRD, WAFIC, CFA, Western Deepwater Trawl (12 July 2021)

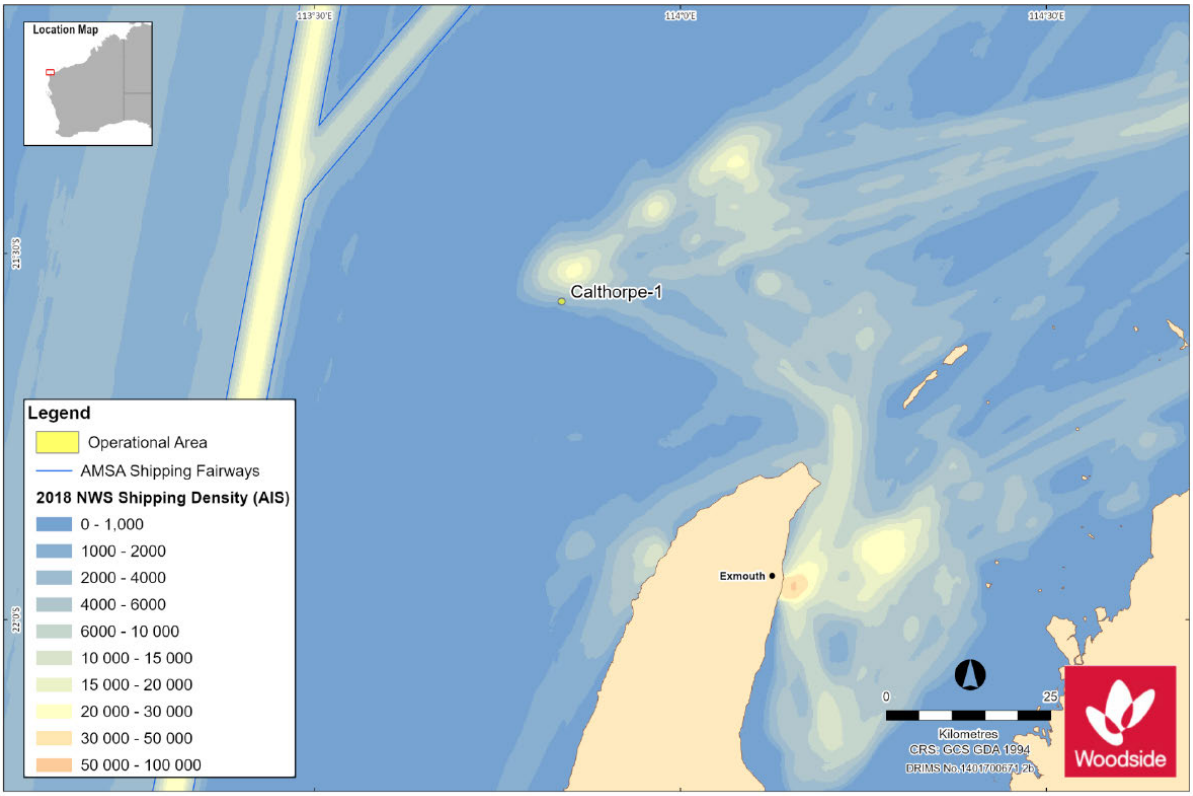


2.7 Fisheries map sent to DPIRD, WAFIC, PPA, Pilbara Line Fishery (12 July 2021)

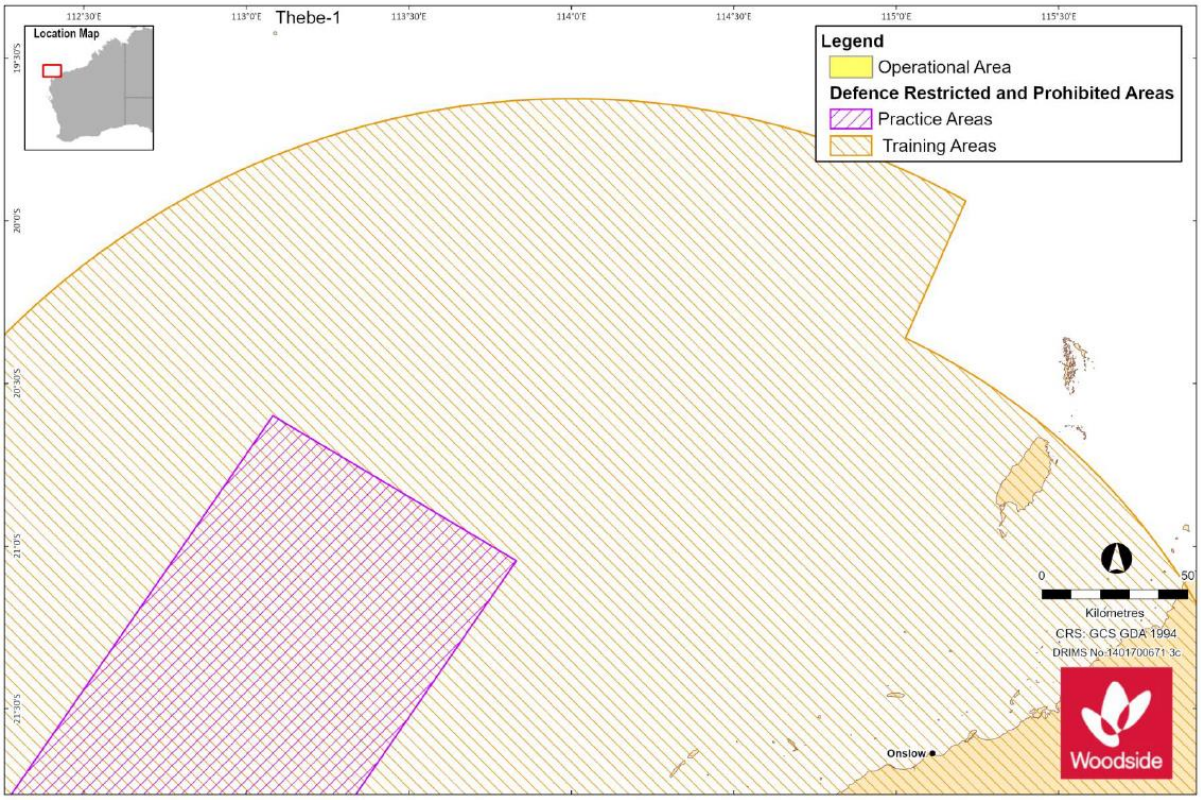


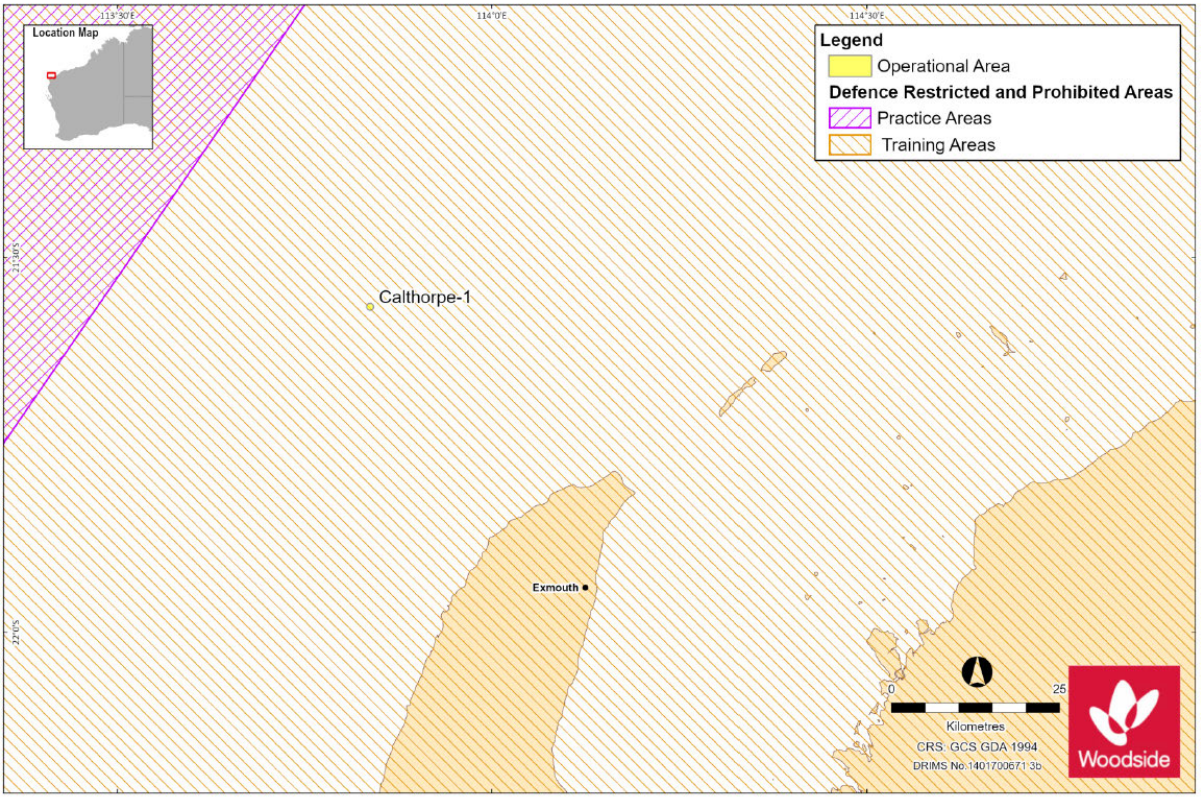
2.8 Shipping lane map sent to AHO and AMSA (12 July 2021)



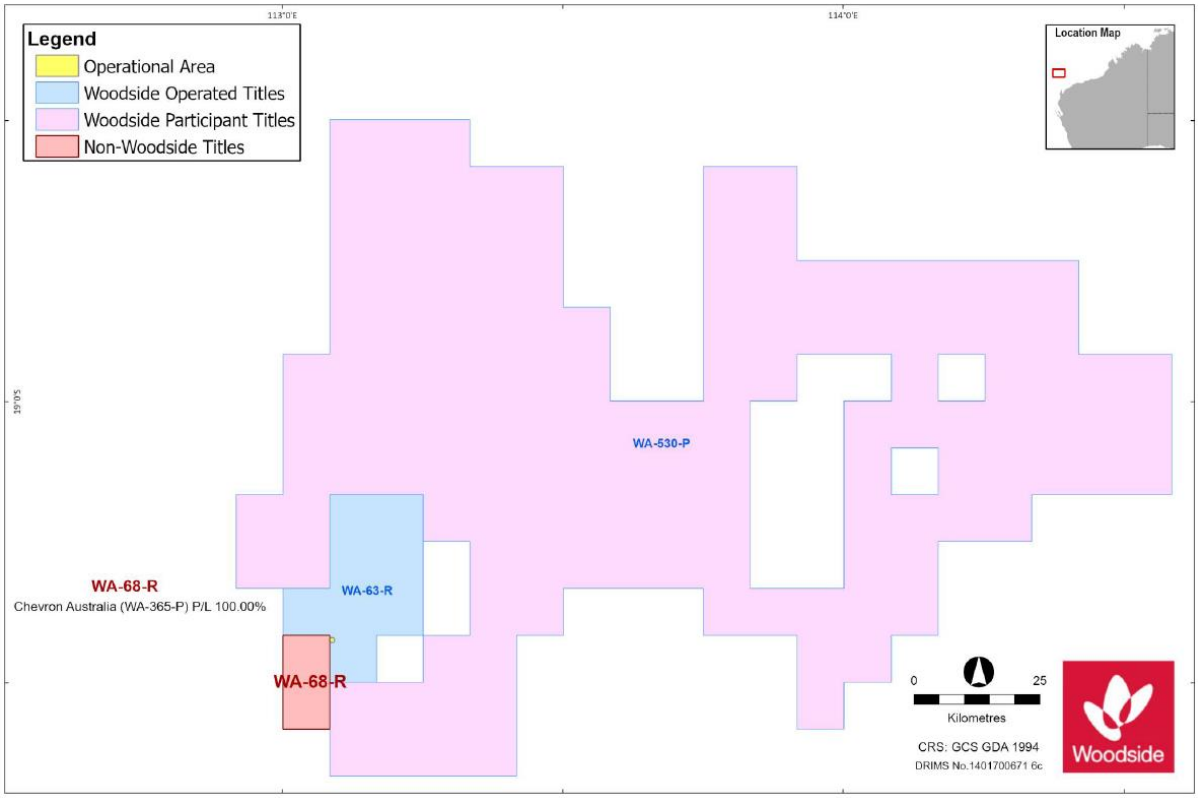


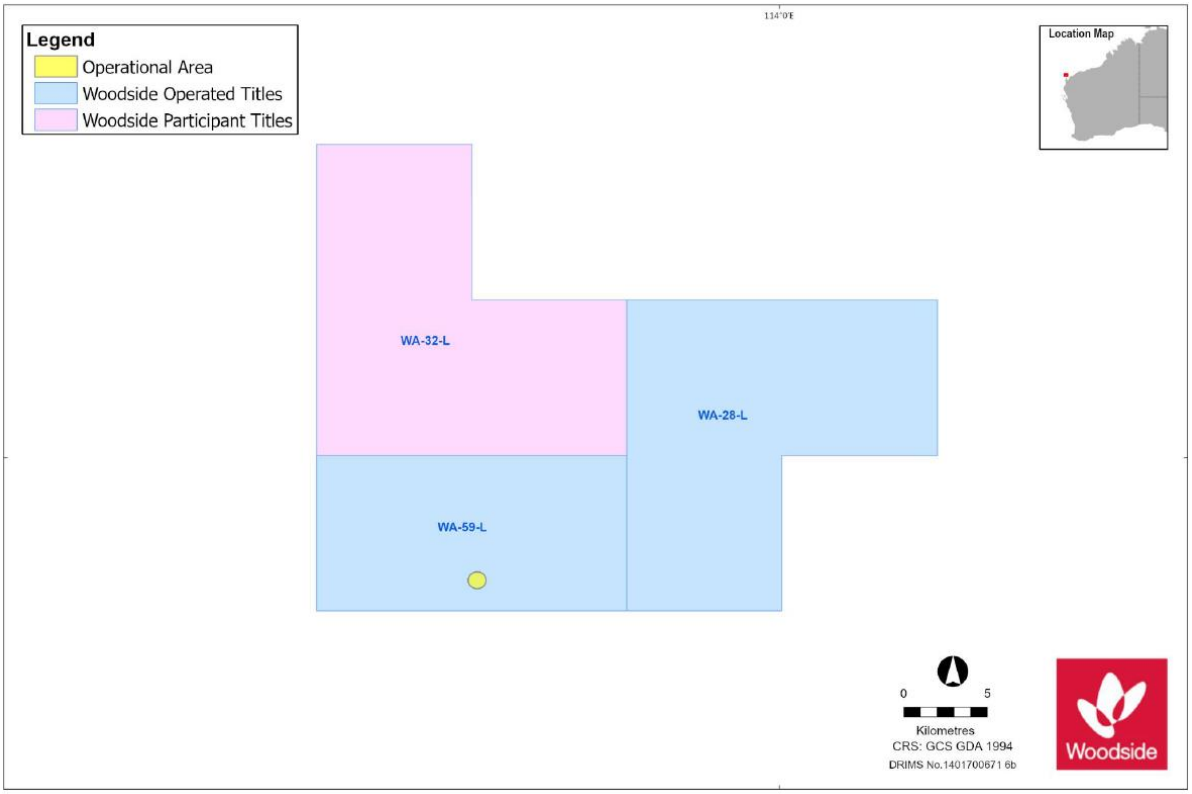
2.9 Defence zone map sent to DoD (12 July 2021)



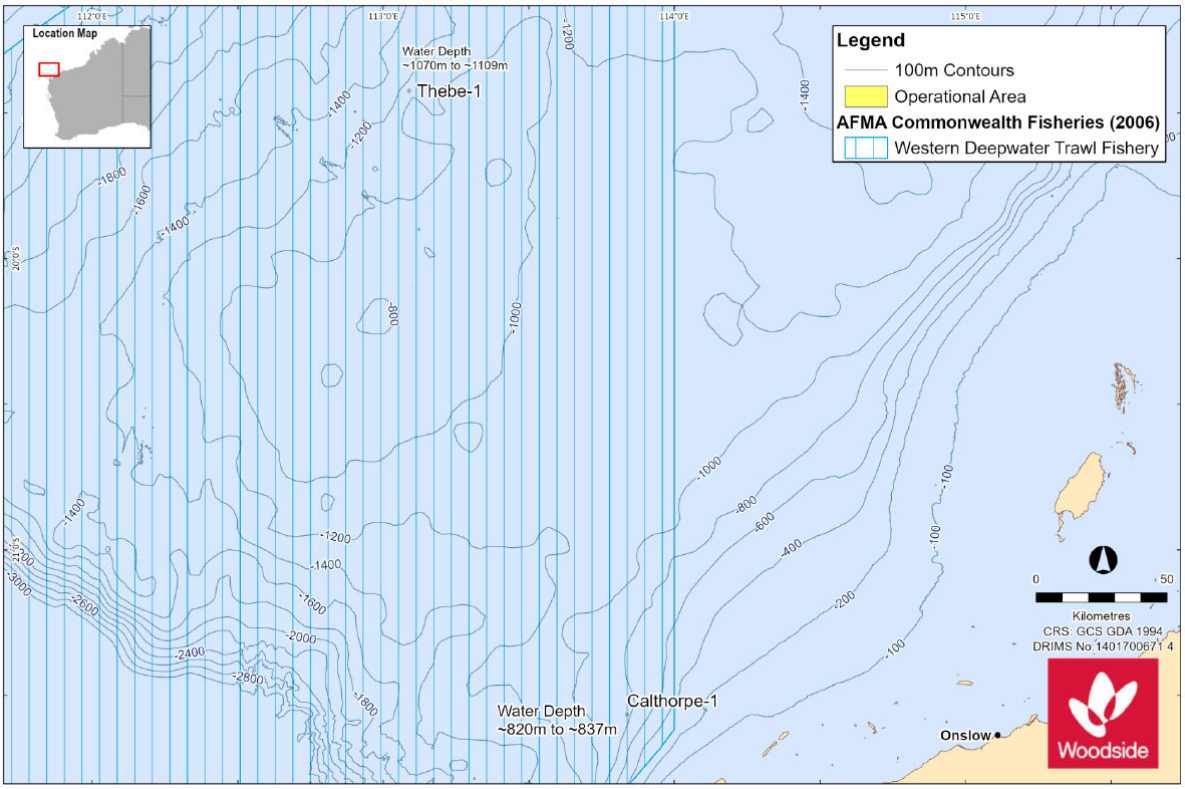


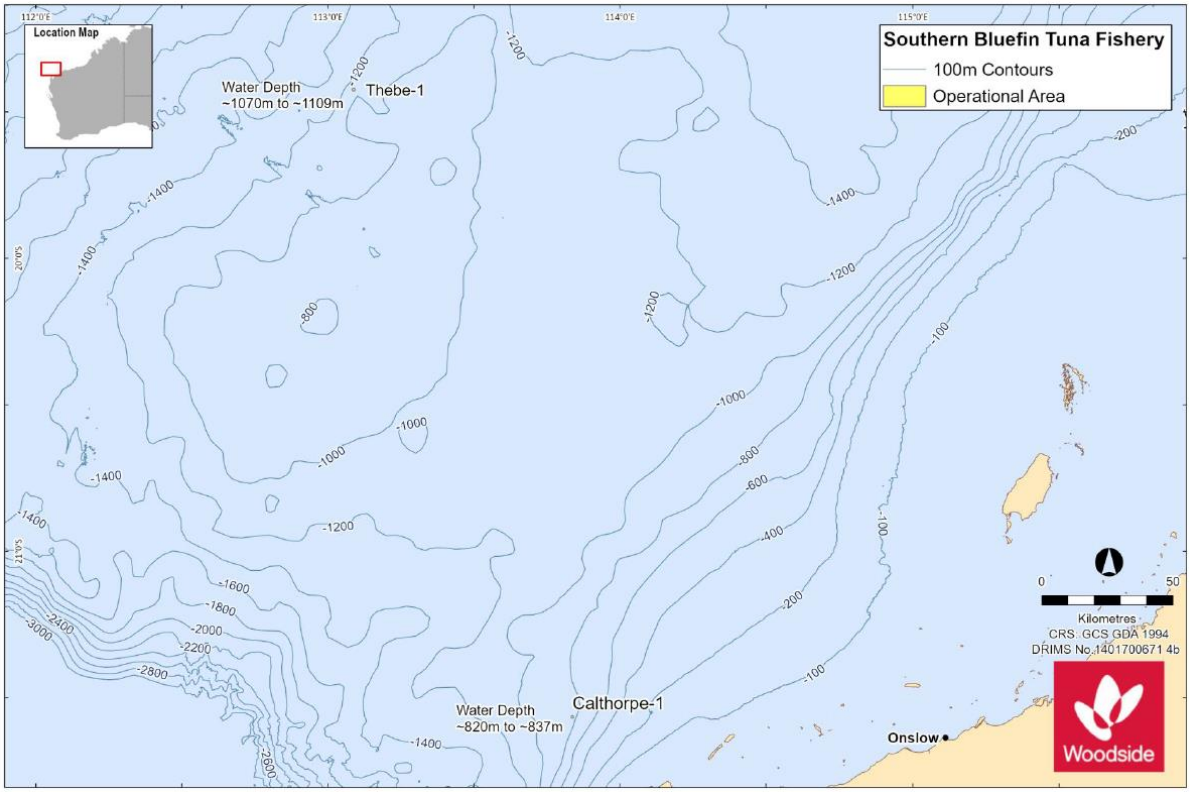
2.10 Titleholder map sent to BHP and Chevron (12 July 2021)

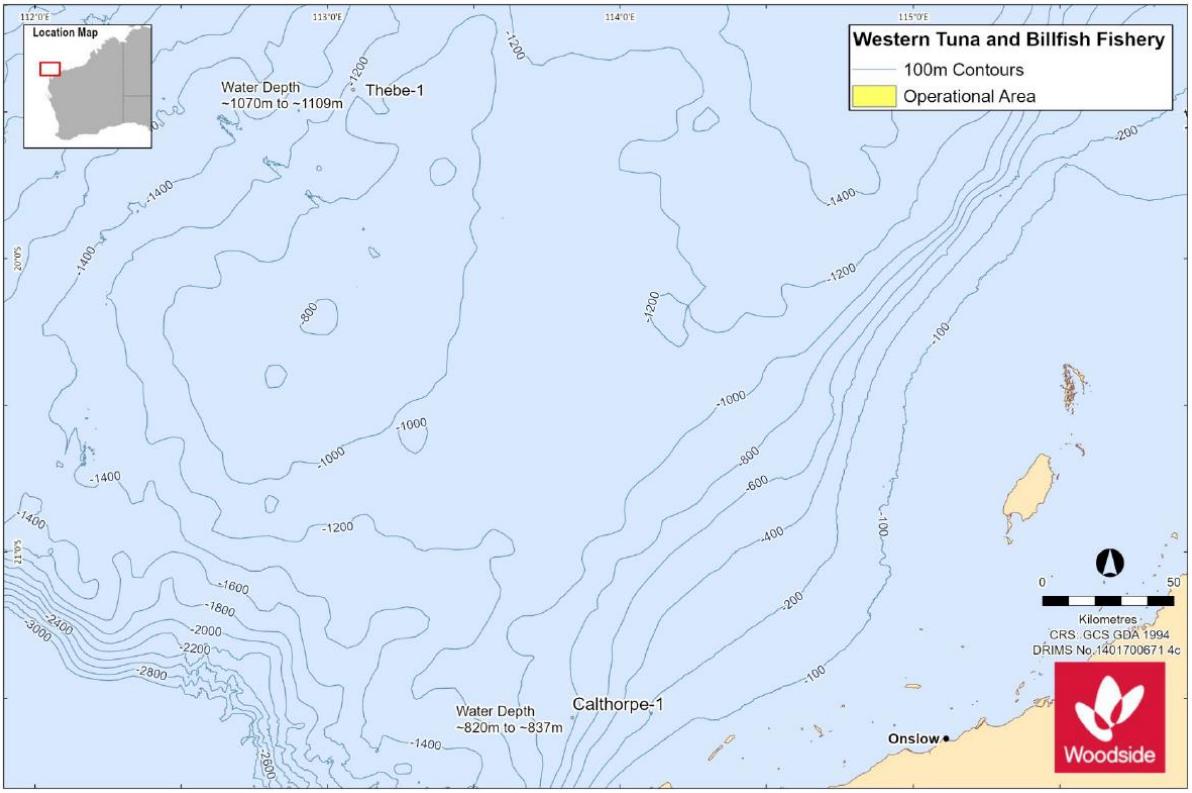


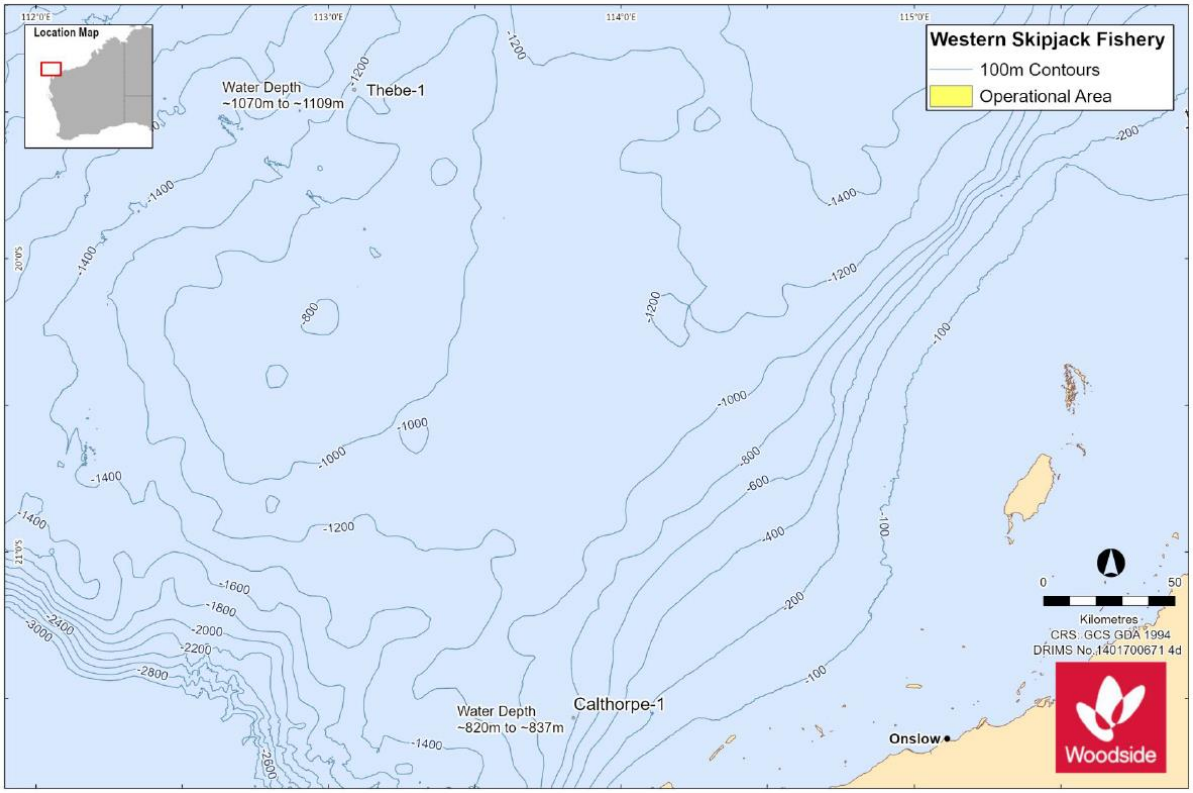


2.11 Fisheries map sent to DAWE, CFA, WAFIC, Southern Bluefin Tuna fishery, Western Tuna and Billfish Fishery, Western Skipjack Fishery and ASBTIA (26 July 2021)






Location Map
Western Tuna and Billfish Fishery
100m Contours
Operational Area
Water Depth
~1070m to ~1109m
Thebe-1
Water Depth
~820m to ~837m
Calthorpe-1
Onslow
0
50
Kilometres
CRS: GCS GDA 1994
DRIMS No.1401700671 4c
Woodside


Location Map
Western Skipjack Fishery
100m Contours
Operational Area
Water Depth
~1070m to ~1109m
Thebe-1
Water Depth
~820m to ~837m
Calthorpe-1
Onslow
0
50
Kilometres
CRS: GCS GDA 1994
DRIMS No.1401700671 4d
Woodside

3. CONSULTATION WITH STAKEHOLDERS VIA JOINT CONSULTATION WITH THE THEBE-1 EXPLORATION WELLHEAD DECOMMISSIONING ENVIRONMENT PLAN

3.1 Email sent to Chevron (12 July 2021)

Dear Titleholder

As operator of adjacent titles, we are sending this information to you.

Woodside is planning to submit separate Environment Plans for the decommissioning of two wellheads: Scarborough (Thebe-1) and Australia Oil (Calthorpe-1). The wellheads are located in permit WA-63-R and WA-59-L, respectively.

An information sheet (also on our website), and Titleholder map is attached.

Activity:

	Thebe-1	**Calthorpe-1**
Summary:	Wellhead to be left *in situ*	Wellhead to be left *in situ*
Location:	~300 km northwest of Exmouth	~50 km northwest of Exmouth
Approx. Water Depth (m):	~ 1170 m	~820 m
Schedule:	No activities – wellhead to be left *in situ*	No activities – wellhead to be left *in situ*
Duration:	No duration – wellhead to be left *in situ*	No duration – wellhead to be left *in situ*
Exclusionary/Cautionary Zone:	None	None
Vessels:	Not required	Not required

Feedback:

If you have any issues or concerns with these activities, or any other issues relevant to this location then please respond to Woodside at: Feedback@woodside.com.au or +61 438 173 562

Your feedback and our response will be included in our Environment Plans which will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Please provide your views by 26 August 2021.

Regards

4. ADDITIONAL CONSULTATION

4.1 Email sent to Western Deepwater Trawl Fishery (8 December 2021)

Dear Western Deepwater Trawl Fishery,

Consultation feedback – *In situ* decommissioning of Calthorpe-1 and Thebe-1 exploration wellheads

Woodside previously consulted you (below) on the proposed *in situ* decommissioning of two exploration wellheads;

- Scarborough Thebe-1 wellhead located in permit WA-63-R approximately 300 km north of Exmouth at a water depth of approximately 1170m.
- Australia Oil Calthorpe-1 wellhead located in permit WA-59-L approximately 50 km northwest of Exmouth at a water depth of approximately 820 m.

The *in situ* decommissioning of these wellheads means there will be no additional activity over these sites, there will not be an exclusion zone around the wellheads, the area will still be accessible to commercial fishers and the wellheads will continue to be marked on navigational charts.

Woodside has prepared an Environment Plan for each of these activities in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Cth)*, and would welcome your feedback.

An information sheet (also on our website), and a map of relevant fisheries is attached for your reference.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **7 January 2022**.

All correspondence relating to these Environment Plans will be submitted to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth). The Environment Plans will also contain a summary of comments received. Please let us know if your feedback is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for this information to remain confidential to NOPSEMA.

Meeting request

Separately to feedback on the above activities, Woodside would appreciate the opportunity to meet with Western Deepwater Trawl licence holders to provide an overview of our proposed upcoming decommissioning activities.

We understand that this is a busy time of year and your availability is limited. If you're interested in attending this meeting, we would be grateful for your advice regarding availability in January 2022, with the meeting to be held at WAFIC's office.

Kind regards,
Shannen

4.1.1 Email sent to Western Deepwater Trawl Fishery (30 December 2021)

Dear Western Deepwater Trawl Fishery,

Consultation feedback – *In situ* decommissioning of Calthorpe-1 and Thebe-1 exploration wellheads

Woodside is following up on the below consultation on the proposed *in situ* decommissioning of two exploration wellheads:

- Scarborough Thebe-1 wellhead located in permit WA-63-R approximately 300 km north of Exmouth at a water depth of approximately 1170m.
- Australia Oil Calthorpe-1 wellhead located in permit WA-59-L approximately 50 km northwest of Exmouth at a water depth of approximately 820 m.

The *in situ* decommissioning of these wellheads means there will be no additional activity over these sites, there will not be an exclusion zone around the wellheads, the area will still be accessible to commercial fishers and the wellheads will continue to be marked on navigational charts.

Should you require additional information or have a comment to make about the proposed activity, please provide your feedback by **7 January 2022**.

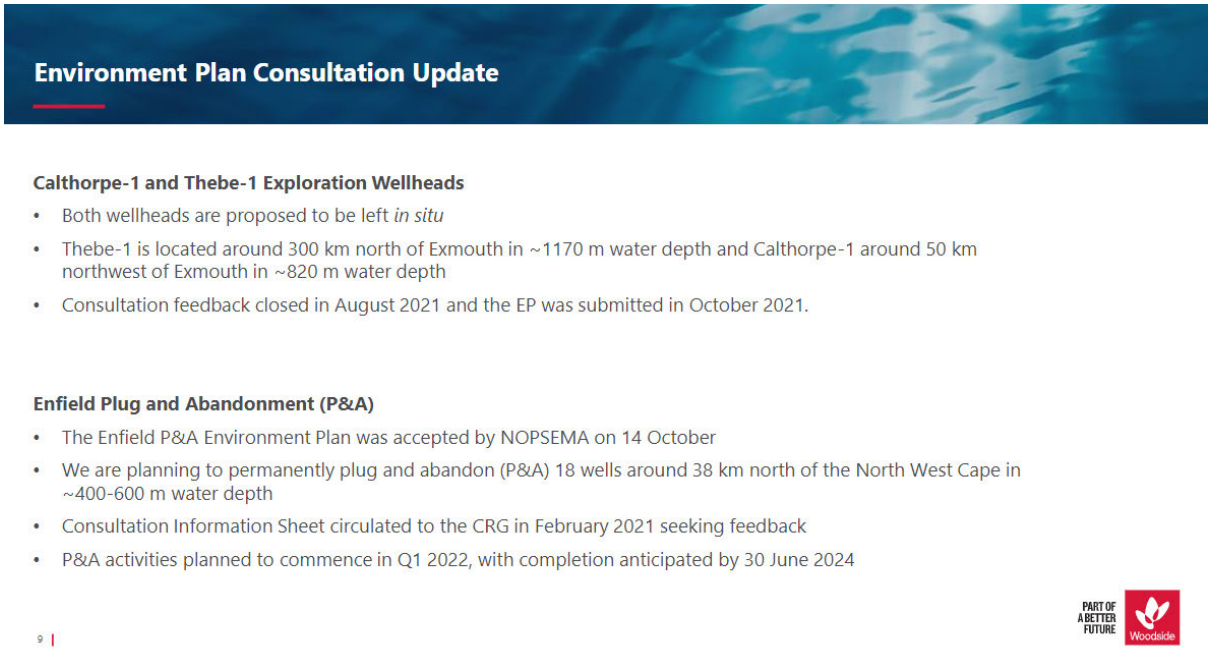
Meeting request

Separately to feedback on the above activities, Woodside would appreciate the opportunity to meet with Western Deepwater Trawl licence holders to provide an overview of our proposed upcoming decommissioning activities.

If you're interested in attending this meeting, we would be grateful for your advice regarding availability in January 2022, with the meeting to be held at WAFIC's office.

Kind regards,

4.2 Presentation to the Exmouth Community Reference Group (4 November 2021)



5. OTHER PERSON CONSULTATION

5.1 Letter sent from the Maritime Union of Australia (MUA) to NOPSEMA (22 June 2022) (*Letter received by Woodside via NOPSEMA (28 June 2022))*

Good afternoon [redacted]

NOPSEMA has received correspondence from the Maritime Union of Australia (attached). Matters are raised in the correspondence that may be relevant to the Calthorpe-1 Wellhead Decommissioning activity. NOPSEMA must have regard to information that may be relevant to decision making, such as that received from third parties where the information relates, or may relate, to the activity. As part of due process, NOPSEMA has provided Woodside this correspondence where it is not clear whether the information has been provided to the titleholder and has not yet been considered and incorporated in the EP.

If you have any questions regarding this matter, please contact [redacted] or myself.

regards

[redacted]

The Maritime Union of Australia | National Office
A Division of Construction, Forestry, Maritime, Mining & Energy Union

Paddy Crumlin - National Secretary | **Warren Smith** - Deputy National Secretary
Adrian Evans & Jamie Newlyn - Assistant National Secretaries

22 June 2022

NOPSEMA
Attention: Environment Plan Submissions
Level 8, 58 Mounts Bay Road,
Perth, WA
6000

By email: [redacted]

RE: Woodside's Calthorpe-1 Wellhead Decommissioning

The Maritime Union of Australia (MUA) represents approximately 13,000 workers in the Australian maritime industry's shipping, offshore oil and gas, stevedoring, port services, and commercial diving sectors. As decommissioning commences in the offshore oil and gas sector, the MUA will play a crucial role in ensuring our member's work in this field of work is performed safely and efficiently.

The MUA has significant concerns regarding the environment plan submitted to NOPSEMA by Woodside on the 8th of October 2021. This application requests to leave the Calthorpe-1 wellhead in situ in perpetuity rather than the current legislation's requirement of full decommissioning and removal.

Woodside's environment plan claims that leaving the Calthorpe-1 in place "provides a better health and safety option, as there are no offshore activities associated with it; therefore, there would be no health and safety risks" (p.38). A risk analysis which compares the decommissioning and removal work to be done in accordance with the titleholder's obligations under the OPGGS Act with leaving infrastructure in situ wilfully confuses the issue of the appropriate end state for the wellhead, and risk management of the removal work to be carried out. The motivation for such a comparison appears to be for the titleholder to make a case to avoid their responsibilities for removal under the OPGGS Act. We question whether Woodside includes the health and safety option of not conducting the work when applying for permission to construct new projects.

We understand that the titleholder may wish to avoid expenditure on decommissioning and removal, but this should not be a reason for NOPSEMA to grant this environment plan application. Granting applications such as this would make a mockery of the OPGGS Act. The union believes that all titleholders shall adhere to the base case outlined in the Australian

Government's offshore petroleum decommissioning guidelines, and total removal of infrastructure shall always be the best practice.

The MUA urges NOPSEMA to reject Woodside's proposal for abandonment of the Calthorpe-1 wellhead to ensure Woodside complies with their obligations to remove all structures, infrastructure, and property as per the OPGGS Act.

In terms of the safety of the work to be done on the Calthorpe-1 wellhead, we look forward to Woodside engaging with the MUA about the safest way to carry out this work.

Please feel free to contact our [redacted] for further information, at [redacted]

Yours Sincerely,

[redacted]

Email and letter to MUA – 1 July 2022

Dear [redacted],

NOPSEMA has provided Woodside with the attached correspondence from the Maritime Union of Australia (MUA) with respect to the Calthorpe-1 Wellhead Decommissioning Environment Plan.

Please see Woodside's response attached.

Regards,

Please direct all responses/queries to:
Woodside Feedback
T: 1800 442 977
E: Feedback@woodside.com.au

Woodside Energy Group Ltd
ACN 004 898 962
Mia Yellagonga
11 Mount Street
Perth WA 6000
Australia
T: +61 8 9348 4000

www.woodside.com

1 July 2022

Dear [redacted]

RE: Woodside's Calthorpe-1 Wellhead Decommissioning

Woodside refers to the Maritime Union of Australia's (MUA) letter, dated 22 June 2022 (attached), to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) in relation to the Calthorpe-1 Wellhead Decommissioning Environment Plan (Calthorpe-1 EP). NOPSEMA provided a copy of the letter to us.

Woodside notes the views set out in your letter regarding the OPGGS Act and decommissioning provisions and refer you to wider decommissioning provisions in the legislation. We also refer you to decommissioning information available on NOPSEMA's website and information from the Department of Industry, Science, Energy and Resources (DSIER) which confirms that removal of the wellhead is not the only available decommissioning option. The Calthorpe-1 EP includes information on this in Section 1.9.1.

Woodside also notes the comments around the inclusion of health and safety risk in the options assessment to determine the preferred decommissioning approach for the Calthorpe-1 wellhead. Health and safety of workers is a priority for Woodside and Woodside takes health and safety very seriously. We confirm the health and safety aspect of the options assessment was completed in accordance with the relevant legislation and is consistent with guidance from NOPSEMA and DISER.

We confirm that the activities and content of the EP is consistent with the requirements of the legislation.

An activity specific information sheet for the Calthorpe-1 EP was made available on the Woodside website on 12 July 2021. The Calthorpe-1 EP was submitted to NOPSEMA for assessment in October 2021 and is publicly available on its website.

Please be advised that your feedback and our response will be included in our Environment Plan which will be submitted to NOPSEMA for acceptance in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (Cth).

Please let us know if your feedback for this activity is sensitive and we will make this known to NOPSEMA upon submission of the Environment Plan in order for the sensitive information to remain confidential to NOPSEMA.

Regards,

Woodside Feedback

Woodside Energy
Mia Yellagonga
Karlak, 11 Mount Street
Perth WA 6000
Australia

T: 1800 442 977
E: feedback@woodside.com.au
www.woodside.com

6. Summary – NOPSEMA – Woodside evidence to confirm Calthorpe-1 well approved as permanently abandoned with wellhead *in situ*

Abandonment of Calthorpe-1 Page 1 of 1 34

[redacted]

From: [redacted]
Sent:
To:
Cc:
Subject: Abandonment of Calthorpe-1
Attachments: Scan0601.pdf

[redacted]

Due to the problems encountered on Calthorpe-1 relating to the leaking casing below the high pressure housing, we have concluded that we will abandon Calthorpe-1 and re-spud the well.

Please find attached a proposed well abandonment schematic and program for your approval.

<<Scan0601.pdf>>
We expect to have completed the pulling of the BOP by tomorrow morning and then, with your approval, will proceed with cutting the wellhead.

I am sending this e-mail copy to you in view of the imminent requirement to commence abandonment operations. The hard copy documents will be posted today.

Regards

[redacted]

FAX : +618-92223799
TEL : +618-92223799

DATE,TIME	04/04 10:10
FAX NO./NAME	092142900
DURATION	00:00:38
PAGE(S)	02
RESULT	OK
MODE	STANDARD ECM

WOODSIDE

Please direct all responses/queries to:
T: +61 (8) 9348 4817
F: +61 (8) 9214 2900
E: tony.quinn@woodside.com.au

Woodside Energy Ltd.
ACN 005 482 986
Woodside Plaza
240 St Georges Terrace
Perth, Western Australia, 6000
GPO Box D188
Perth, Western Australia, 6840
T: +61 (8) 9348 4000
F: +61 (8) 9214 2777
www.woodside.com.au

Our reference: [redacted]

03 April 2008

Director
Petroleum and Royalties Division
Department of Industry and Resources
Mineral House
100 Plain Street
East Perth
[redacted]

Dear [redacted]

Well Abandonment – WA-271-P, Calthorpe-1

We request your approval under Regulation 17, Part 4 (1) (d) of the Petroleum (Submerged Lands) (Management of Well Operations) Regulations 2004 to abandon Calthorpe-1 as described in the following attachments:

1. Proposed Abandonment Programme
2. Well Abandonment Schematic

It is proposed to prematurely abandon the Calthorpe-1 well due to a leaking wellhead assembly. The leak was observed when trying to execute the BOP wellhead connector to wellhead pressure test.

No hydrocarbons or permeable zones were encountered in the well. The 244mm (9-5/8") casing shoe track still intact.

If you have any queries relating to this submission, please contact me on the above telephone

38

WOODSIDE

Please direct all responses/queries to:
T: +61 (8) 9348 4917
F: +61 (8) 9214 2900
E: tony.quinn@woodside.com.au

Our reference: [redacted]

Woodside Energy Ltd.
ACN 005 482 986
Woodside Plaza
240 St Georges Terrace
Perth, Western Australia, 6000
GPO Box D188
Perth, Western Australia, 6840
T: +61 (8) 9348 4000
F: +61 (8) 9214 2777
www.woodside.com.au

03 April 2008

Director
Petroleum and Royalties Division
Department of Industry and Resources
Mineral House
100 Plain Street
[redacted]

Dear [redacted]

Well Abandonment – WA-271-P, Calthorpe-1

We request your approval under Regulation 17, Part 4 (1) (d) of the Petroleum (Submerged Lands) (Management of Well Operations) Regulations 2004 to abandon Calthorpe-1 as described in the following attachments:

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No hydrocarbons or permeable zones were encountered in the well. The 244mm (9-5/8") casing shoe track still intact.

If you have any queries relating to this submission, please contact me on the above telephone number.

Yours sincerely

[redacted]

Department of Industry & Resources

MINERAL HOUSE, 100 PLAIN STREET,
EAST PERTH WESTERN AUSTRALIA 6004

PETROLEUM & ROYALTIES DIVISION

SENT TO: [redacted]

ORGANISATION: WOODSIDE DRILLING.

FAX : [redacted]

TONY

ABANDONMENT APPROVAL FOR THE

CALTHORPE #1 WELL WA-271-P FOLLOWS:-

REGARDS

[redacted]

SENT FROM: [redacted]

NO. OF PAGES: 2

DATE: 4/4/08

FAX : (08) [redacted] **PHONE :** [redacted]

WOODSIDE ENERGY LTD DRILLING & COMPLETIONS		Abandonment Programme Calthorpe-1

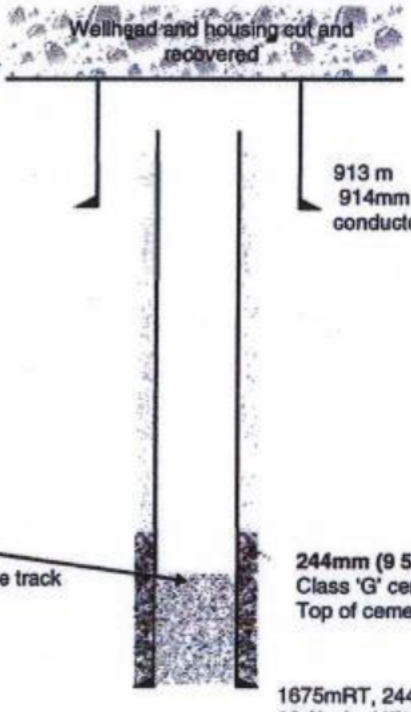
Calthorpe-1
DRY HOLE ABANDONMENT SCHEMATIC

Well: Calthorpe-1
Permit: WA-271-P

Prepared by: [redacted]
Date: 01 April 2008

ALL DEPTHS ARE IN METRES (TVD) AND RELATE TO THE ROTARY TABLE (JACK BATES) AT ZERO TIDE

RKB Elev.	0 m
Sea Level.	29.0 mRT
Water Depth	824.3 m
Seabed	854mRT



Reference: DRIMS# 3467881

Woodside Calthorpe MoC

[redacted]

From: [redacted]
Sent:
To:
Subject: Woodside Calthorpe MoC
Attachments: Scan0847.tif

[redacted]

Please find attached an internal MoC to cover the change to the abandonment plan to leave the wellhead behind. We have made several attempts to remove the wellhead with various tool configurations, but ultimately have been unsuccessful.

<<Scan0847.tif>>
Regards

[redacted]

28/04/2008

ATTACHMENT ONLY
RE PAGE 52

H0152/2007 S

DRILLING & COMPLETIONS ENGINEERING CHANGE CONTROL

Well:	Calthorpe-1	Originator:	[redacted]	Date:	23/04/2008
Change Request No.:	8	Ref Ind:		DRIMS #	[redacted]

SECTION A: CHANGE DETAILS

Type of Change (Tick): Technical: ■ Schedule: ☐ HSER: ☐ Cost: ■

Document that Change Applies to: Calthorpe-1 Drilling & Abandonment Programme

Description of Change:

Calthorpe-1 will be abandoned with the wellhead in place due to operational difficulties with cutting the wellhead. It is already understood that WEL may be required to return and remove the wellhead in future.

Reason for Change:

Operational difficulties were encountered with cutting the wellhead and LP housing system with the Weatherford MOST tool.

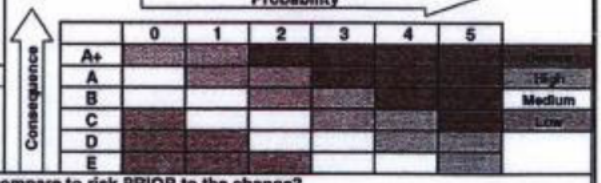
SECTION B: IMPACT — RISK ASSOCIATED WITH PROPOSED CHANGE *(if applicable)*

Type	Description	C	L	R	HAZID / QRA?	Reference
People						
Environment						
Value						
Schedule						
Reputation						

Probability Justification:

Consequence Justification:

Plot each Consequence Category (P,E,A,R) on Matrix below:



How does the risk associated with the change compare to risk PRIOR to the change?

The change control reduces operational and financial risk.

SECTION C: APPROVAL & SIGN-OFF *(All Risks considered to be ALARP as per SP06)*

Authority	[redacted]
Author	
Reviewer	
Reviewer	
Concurrence (eg Asset if required)	
Approver	

SECTION D: DISTRIBUTION OF CHANGE NOTIFICATION

1. Original document + supporting (risk assessment) documentation to be filed in the Well Design Workbook
2. Well site (where applicable)
3. Signatories of the original document (Author, Reviewers, Concurrers, Approver)
4. Original Document Recipients (only if appropriate)

Template Created: 9/02/04; Steve Trench — *Template DRIMS Location: 2129563v1*

Department of Industry and Resources **Basin** WAPIMS database

Calthorpe 1

Well ID: W002959
S file:

24 Apr 2008

Latitude: 21° 33' 56.10" S
Longitude: 113° 50' 15.18" E
Water depth: 824.90 LAT
RT = 29.00 metres
Seismic line: HCAIND 3D inline2311 xline 12503
Spud date: 16/06/2007
Completed: 16/04/2008
Released: 23/04/2008
Operator: Woodside Energy Ltd
Driller: Transocean Sedco Forex International Inc.

Classification: NFW
Title: WA-271-P R1
Status: P&A

Drillers TD: 2080
Loggers TD:
TVD:

Rig: [redacted]

SECTIONS DRILLED

Type	Name	Start Depth (m)	End Depth (m)
ORIGINAL	Calthorpe 1 Top Hole	0.0	1,681.0
RE SPUD	Calthorpe 1A	0.0	2,080.0

HOLE SECTIONS

MUD

CORES & SWC

SWC top depth): 0.00
SWC base depth: 0.00
Total shot: 0.00 **Recovered:** 0.00

FORMATION TOPS

FORMATION EVALUATION DATA

VELOCITY DATA:

TESTING:

Type	Test number	Top	Base

COMMENTS:

Date	Comment
17/07/2007	Top hole section drilled by Chikyu

*All data are extracted from Well Completion Reports submitted to this Department

Department of Industry and Resources

Department of Industry and Resources

Northern Carnarvon Basin

WAPIMS database

Calthorpe 1

Well ID: W002959
S file: W21189

24 Apr 2008

Date	Comment
23/04/2008	Calthorpe 1 unable to recover wellhead, Calthorpe 1A wellhead recovered ok.

APPENDIX E: HERITAGE INQUIRY SYSTEM SEARCH RESULTS

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

Search Criteria

No Registered Aboriginal Sites in Petroleum Title - WA-59-L

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

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Copyright

Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

APPENDIX F: 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.

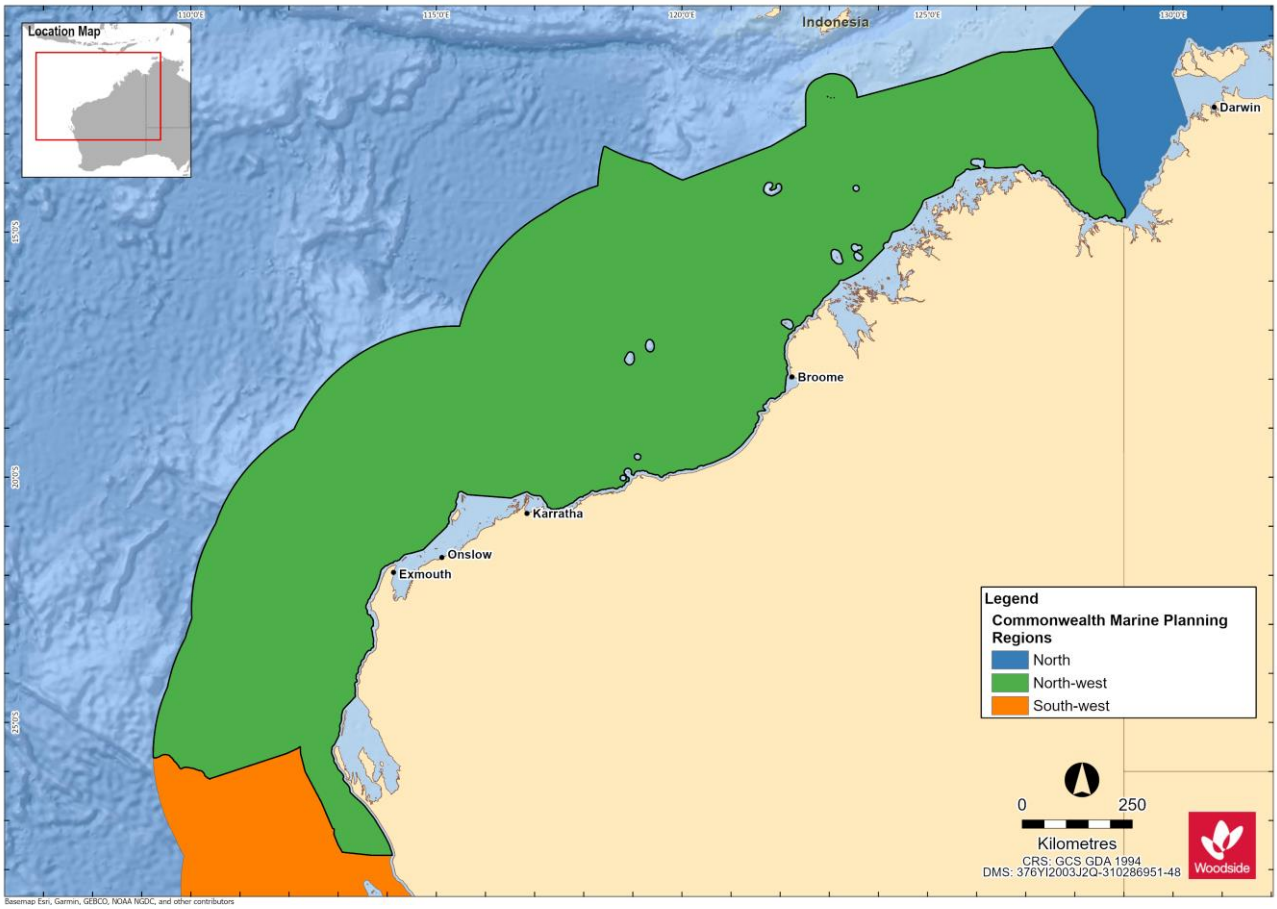

Figure 1-1. Marine Bioregions: North-west (NWMR), South-west (SWMR) and North (NMR)

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**.

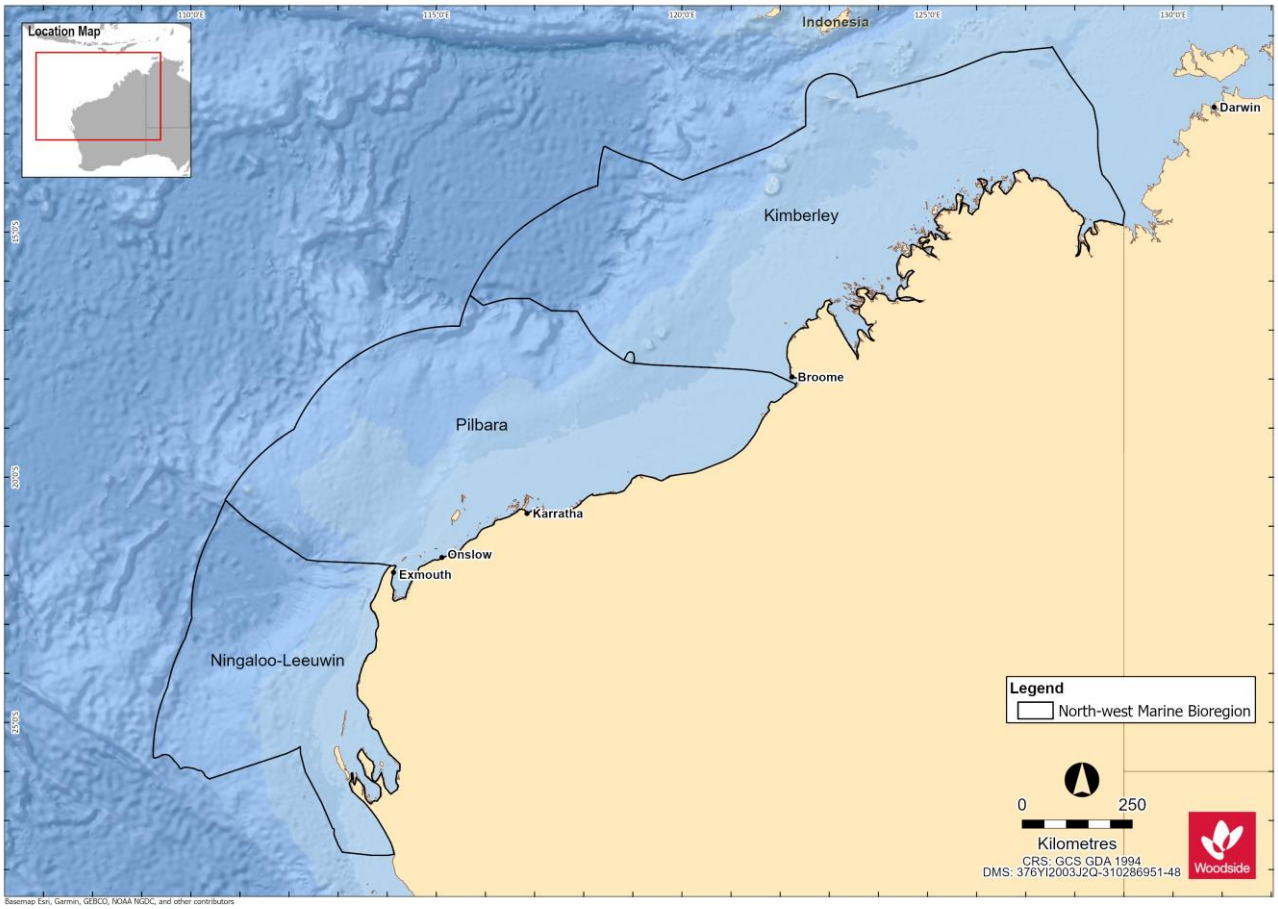

Figure 2-1. The marine systems of the North-west Marine Region (NWMR)

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).

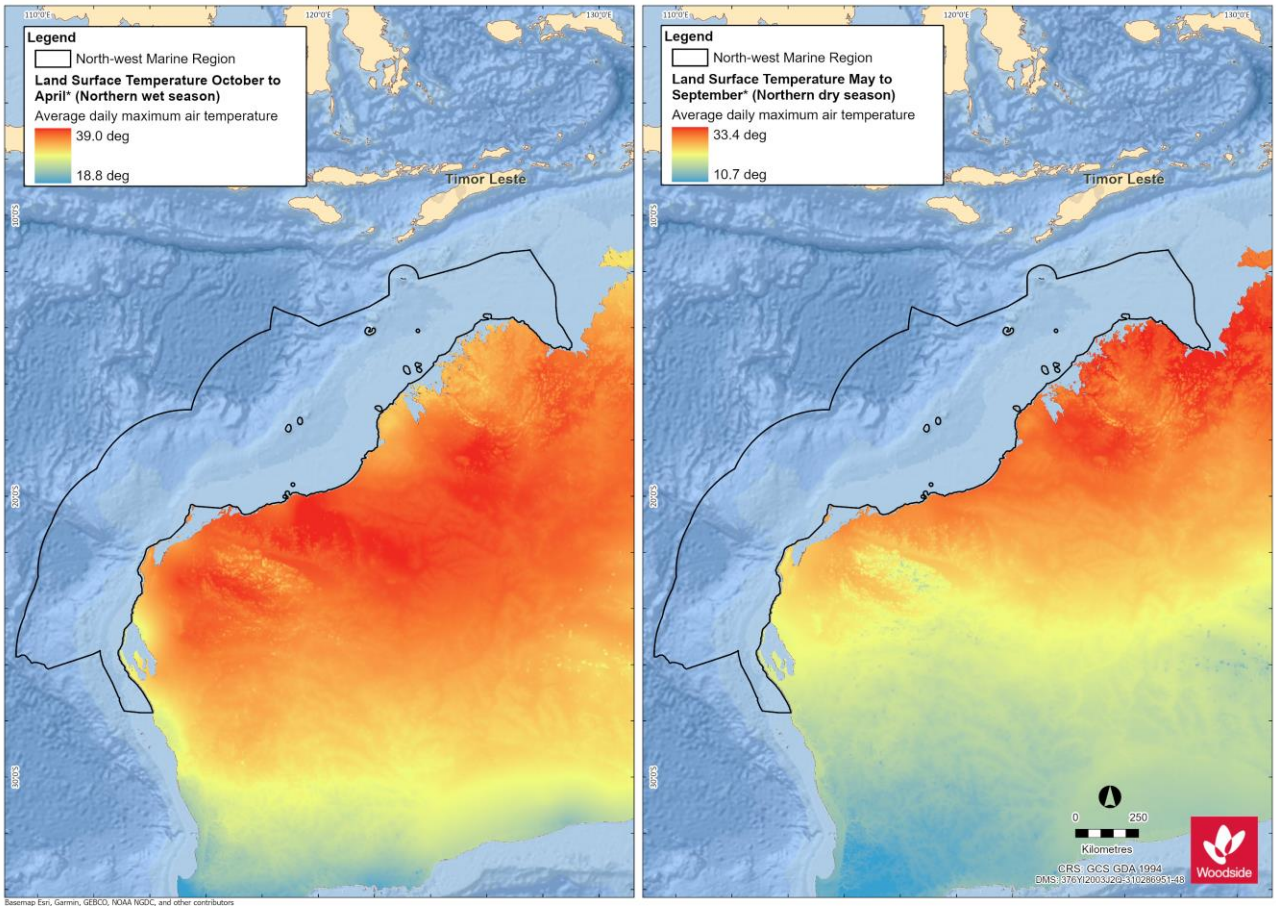

Figure 2-2. Average daily maximum air temperature for land surface adjacent to NWMR: (a) summer (northern wet season) and (b) winter (northern dry season)

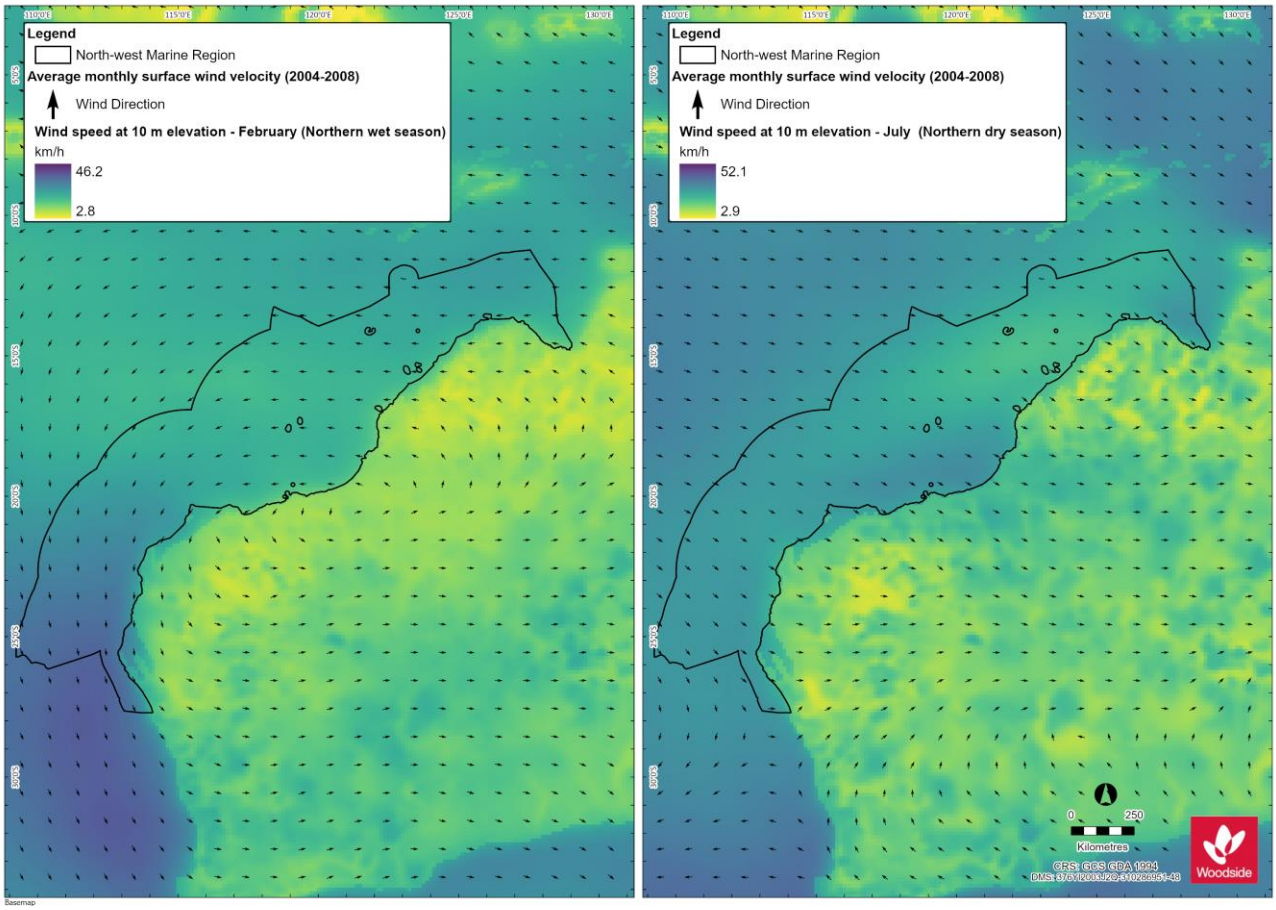

Figure 2-3. Average monthly surface wind direction and velocity for NWMR: (a) summer (February, northern wet season) and (b) winter (July, northern dry season)

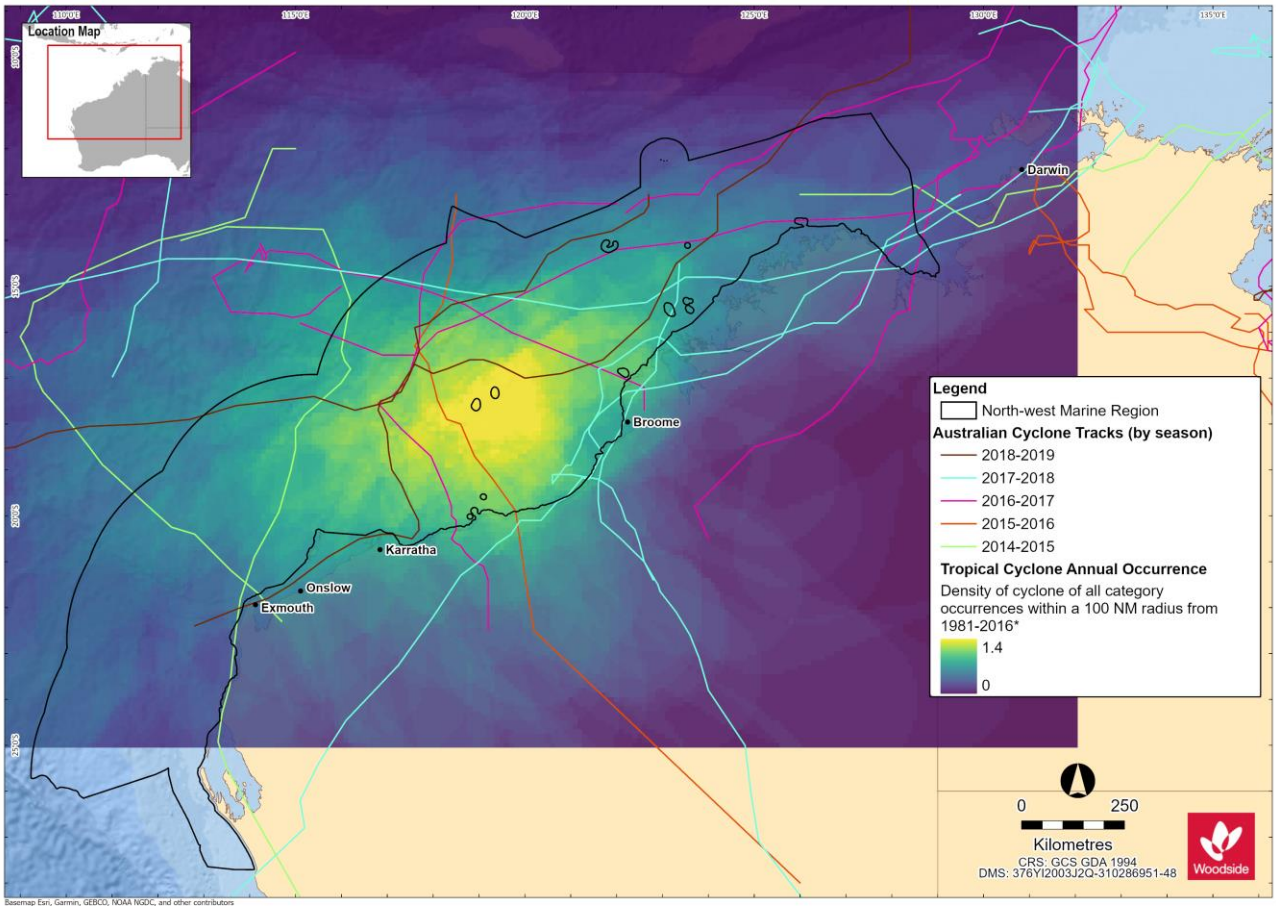

Figure 2-4. Tropical cyclone annual occurrence and cyclone tracks for NWMR

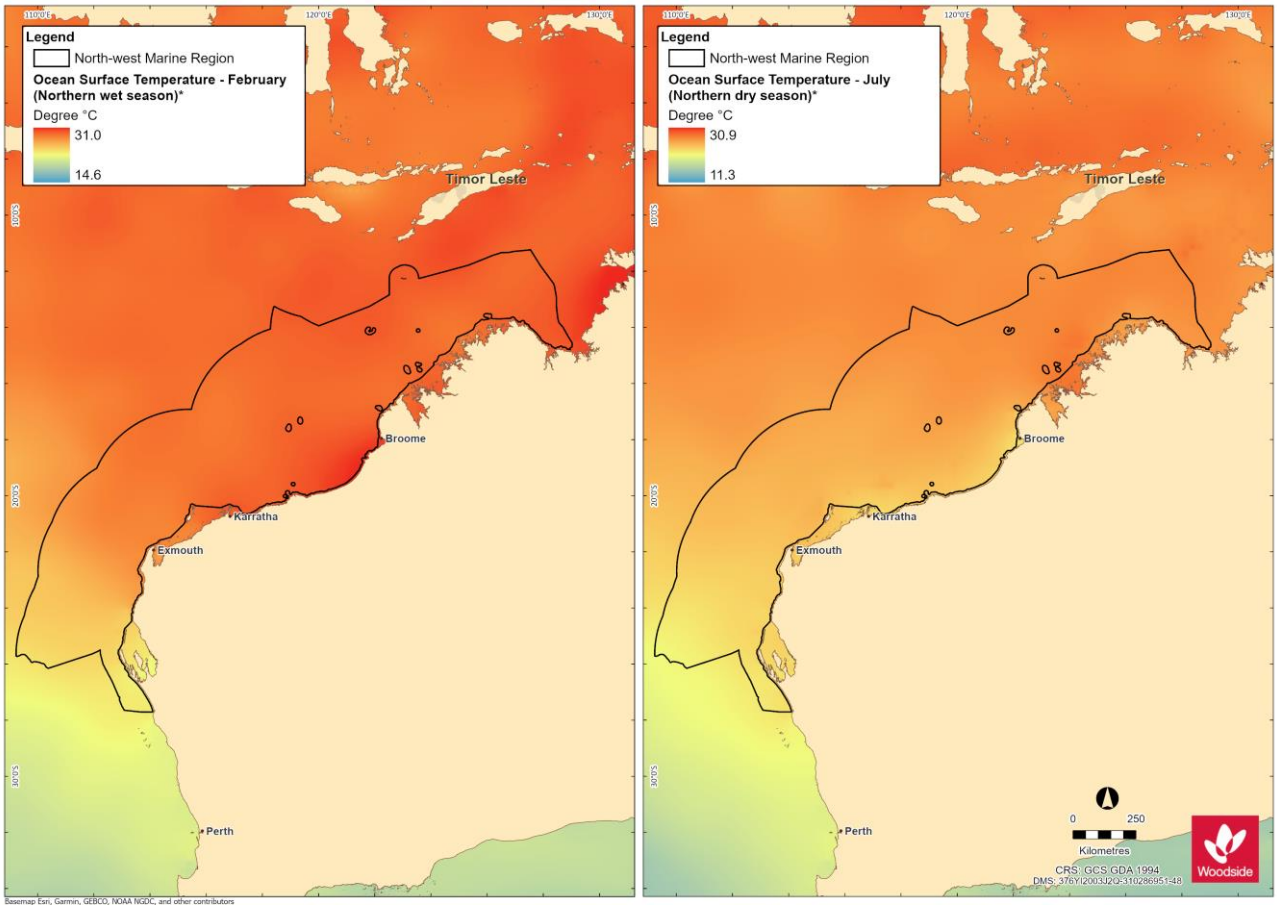

Figure 2-5. Ocean surface temperature for NWMR: (a) summer (February, northern wet season) and (b) winter (July, northern dry season)

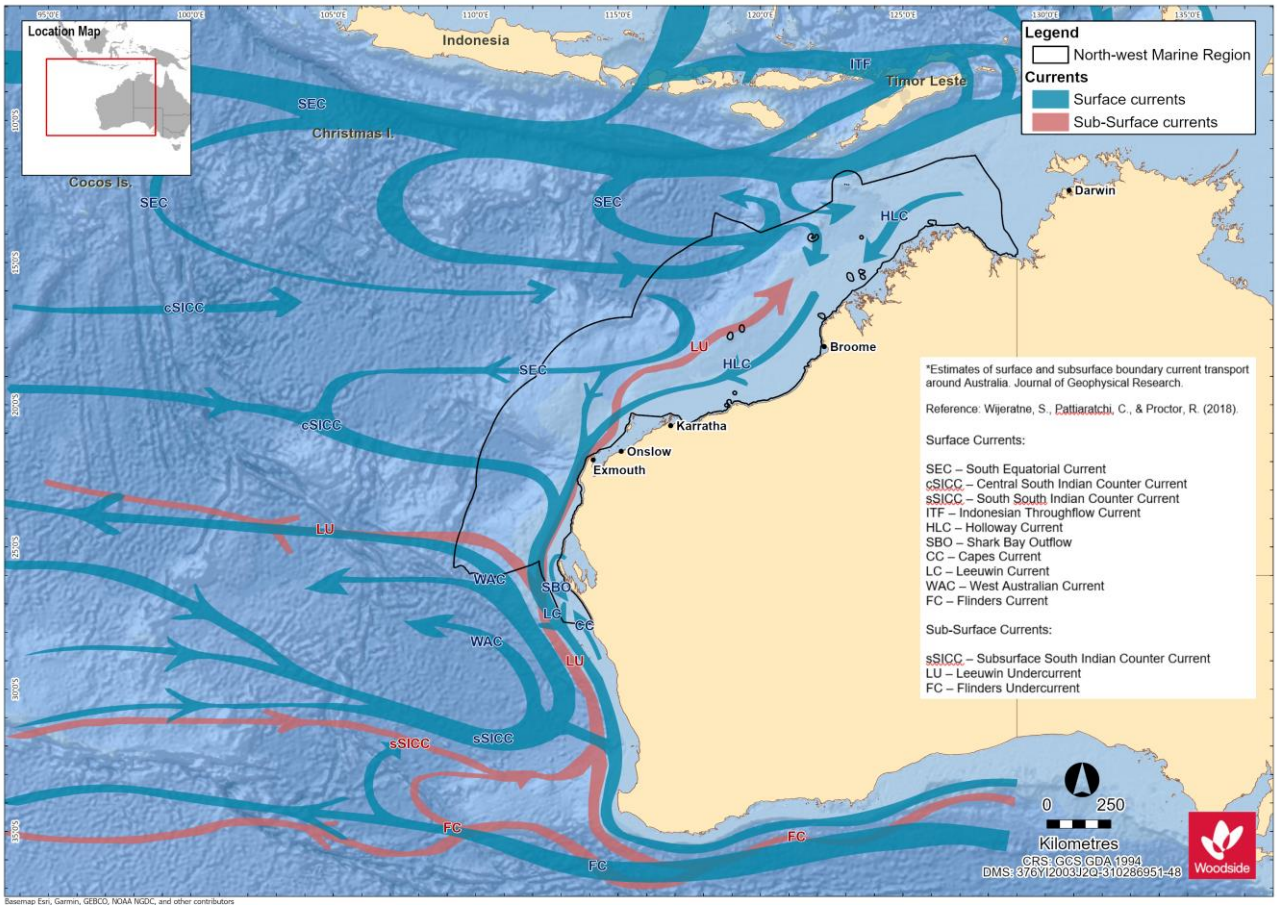

Figure 2-6. Ocean surface and sub-surface currents of the NWMR and wider region

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.

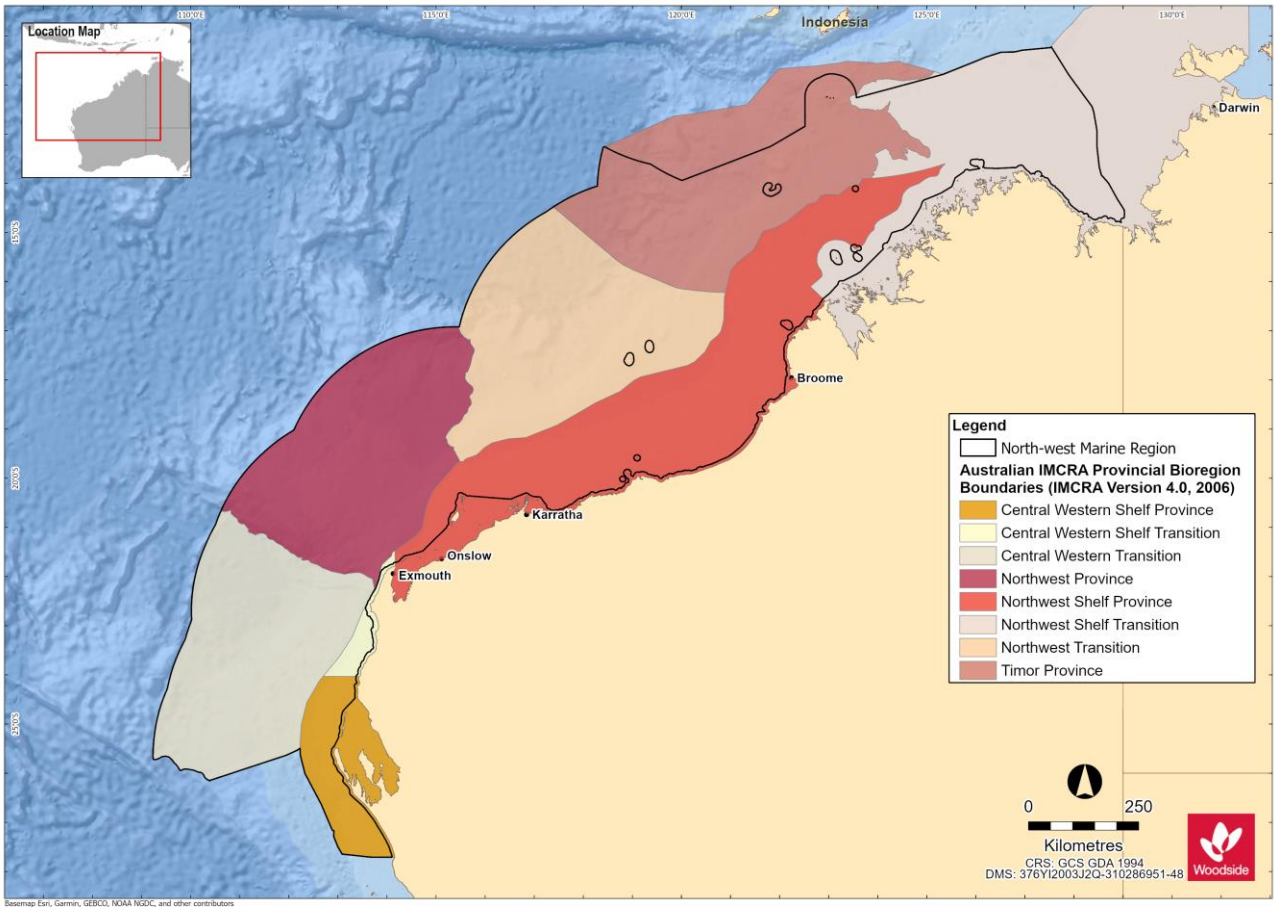

Figure 2-7. The eight provincial bioregions of the NWMR (Commonwealth of Australia, 2006)

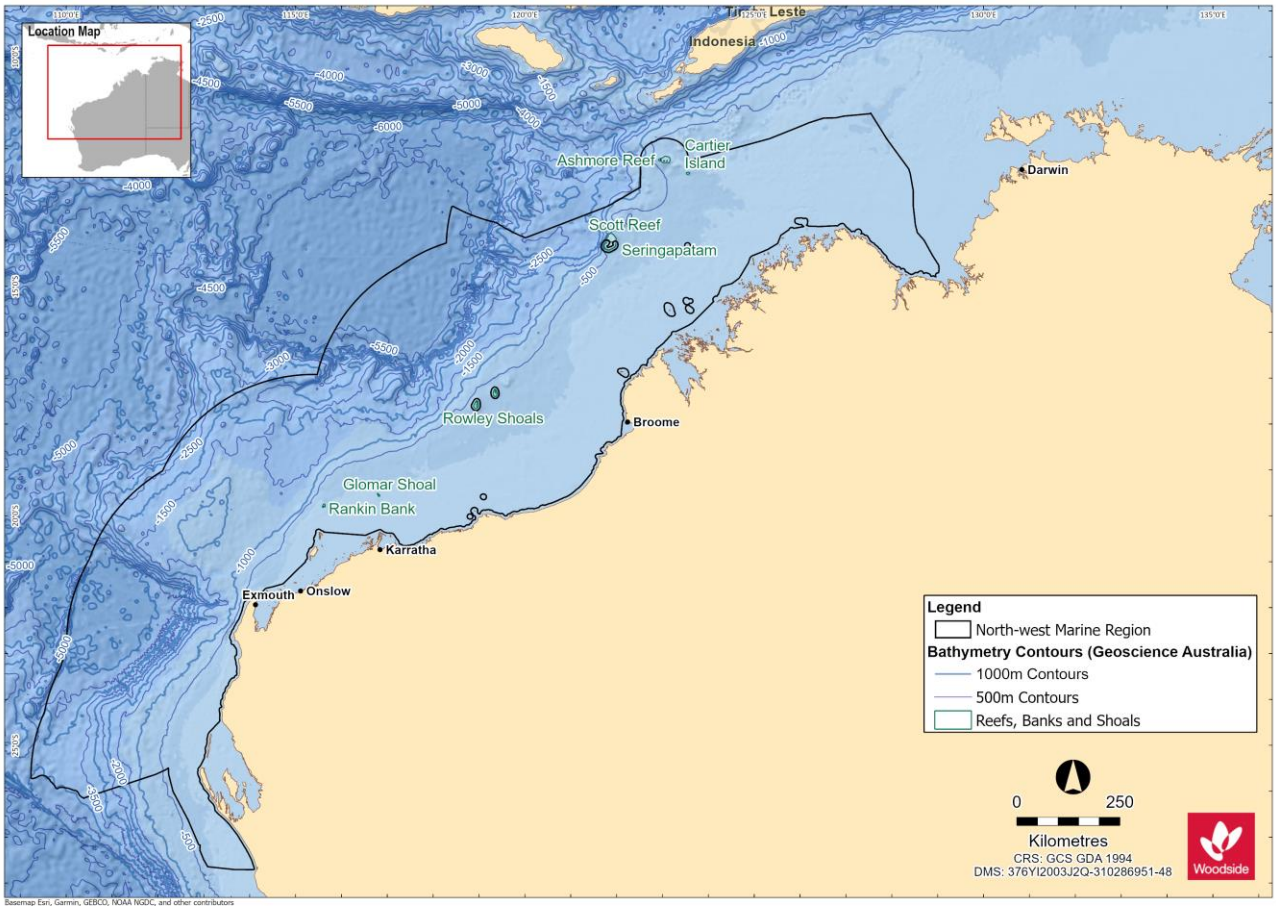

Figure 2-8. Bathymetry of the NWMR

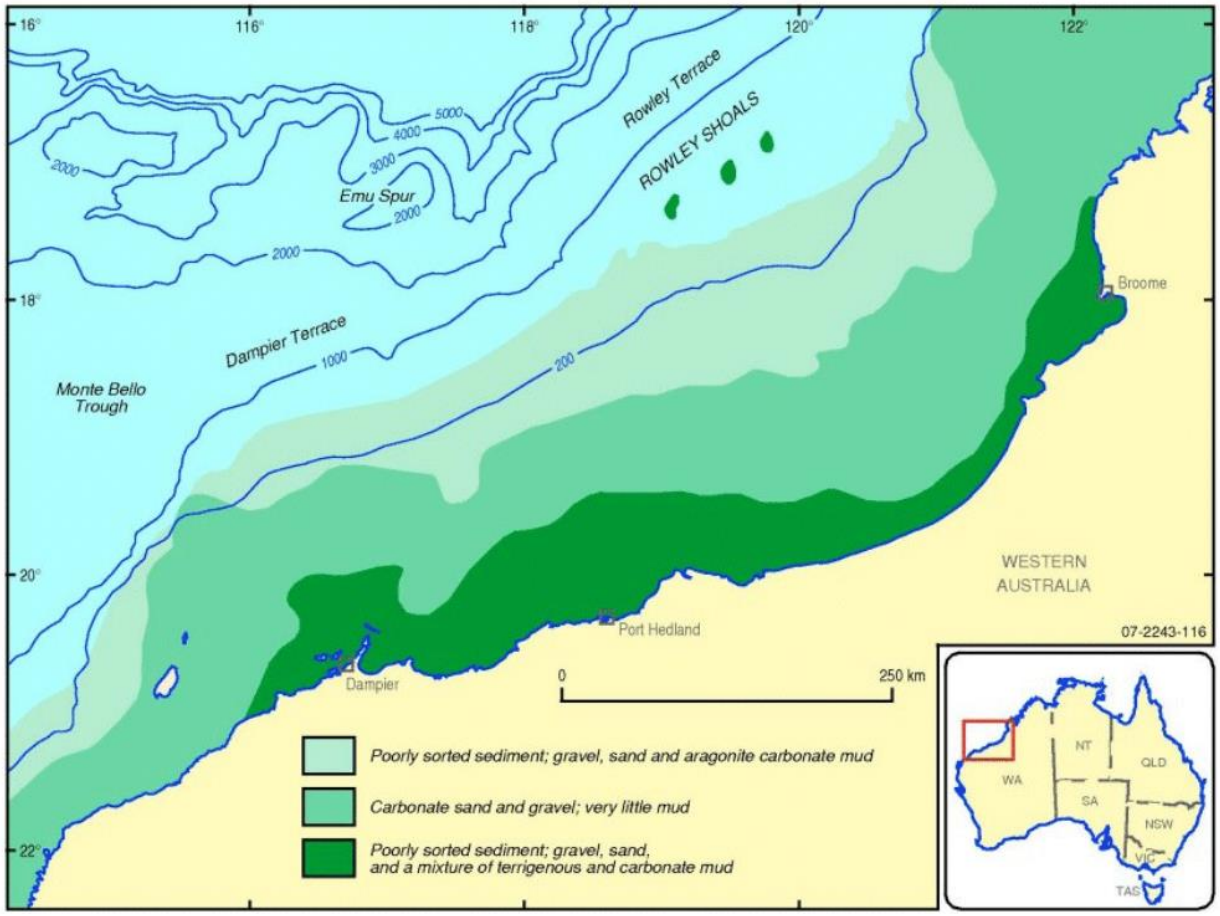

Figure 2-9. Overview of the seabed sediments of the NWMR (Baker *et al*., 2008)

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

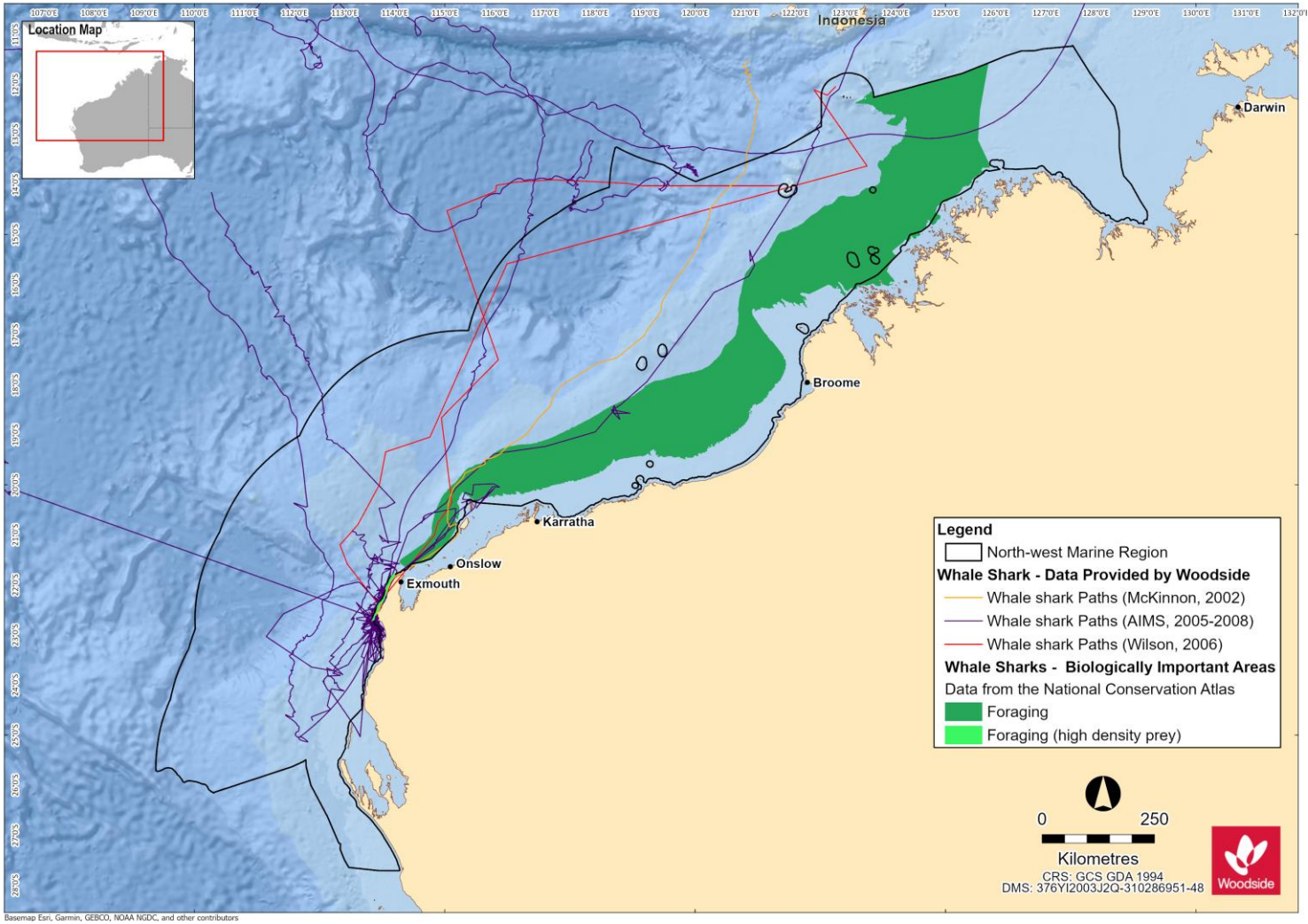

Figure 5-1 Whale shark BIAs for the NWMR and tagged whale shark tracks

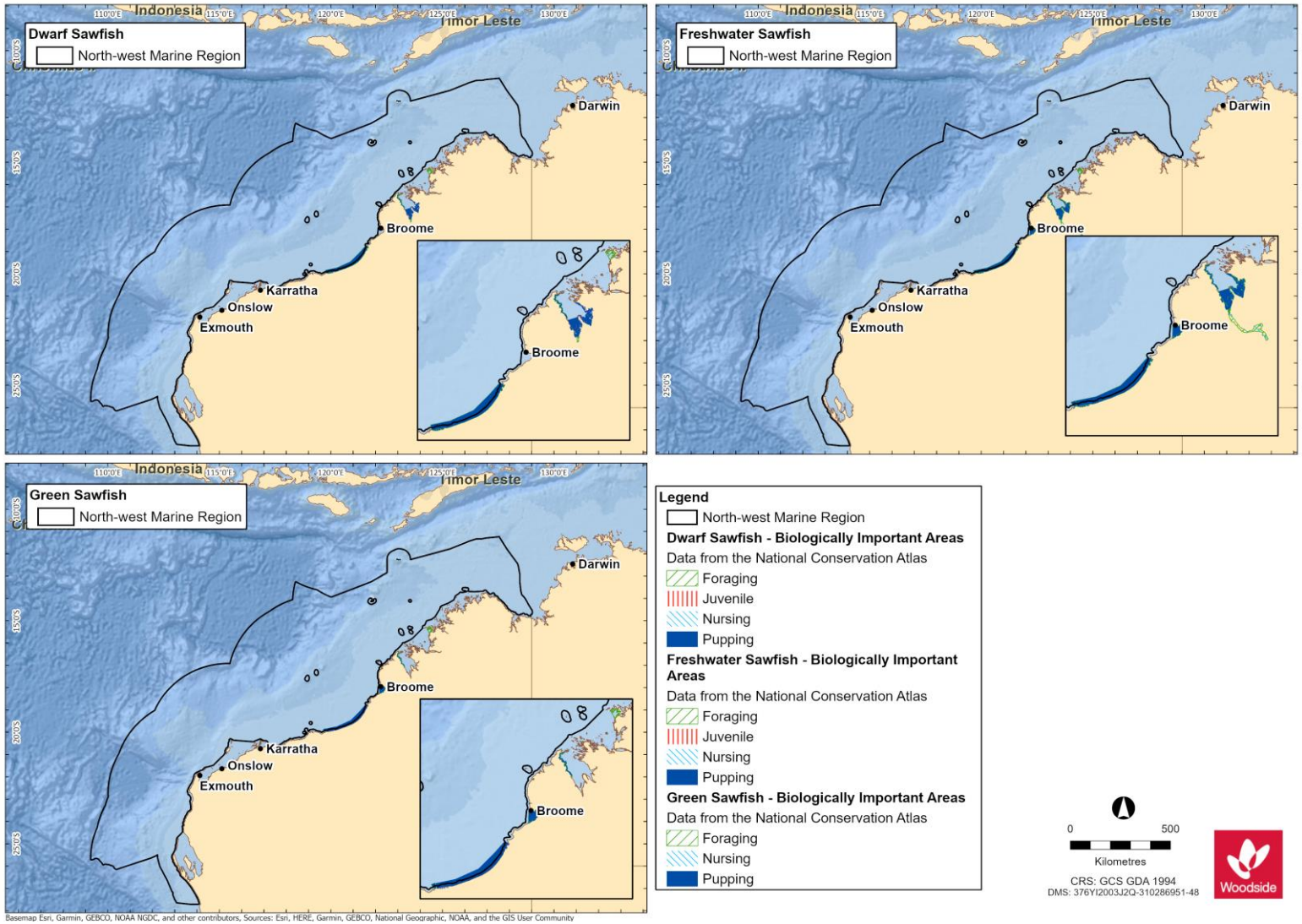

Figure 5-2 Sawfish BIAs for the NWMR

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).

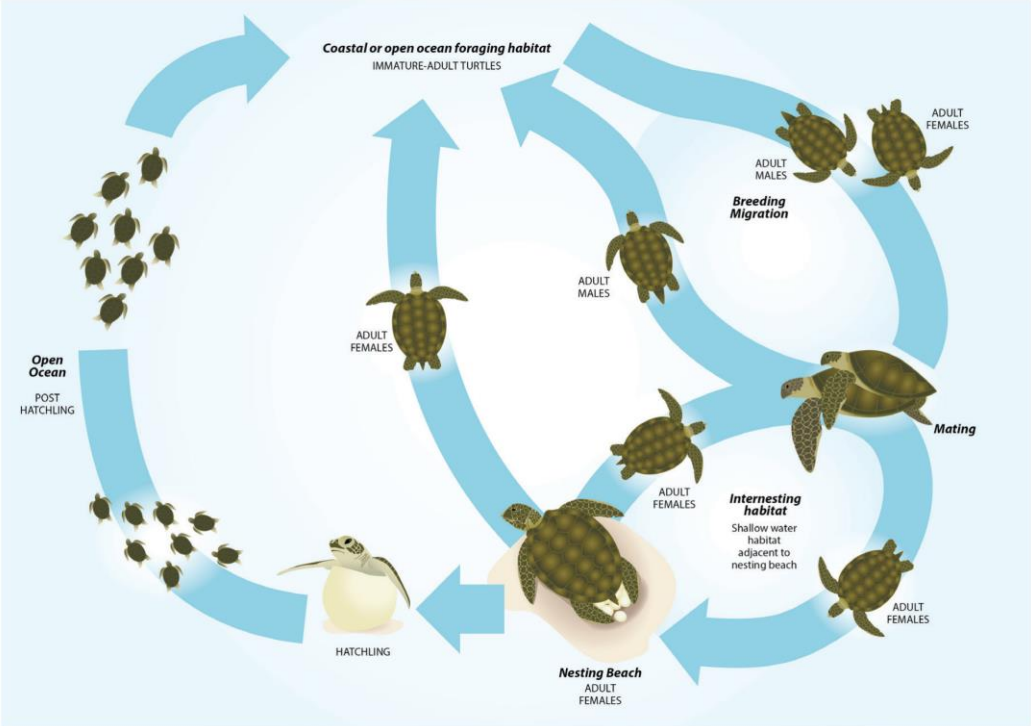

Figure 6-1 Generalised life cycle of marine turtles (Commonwealth of Australia, 2017)

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)*

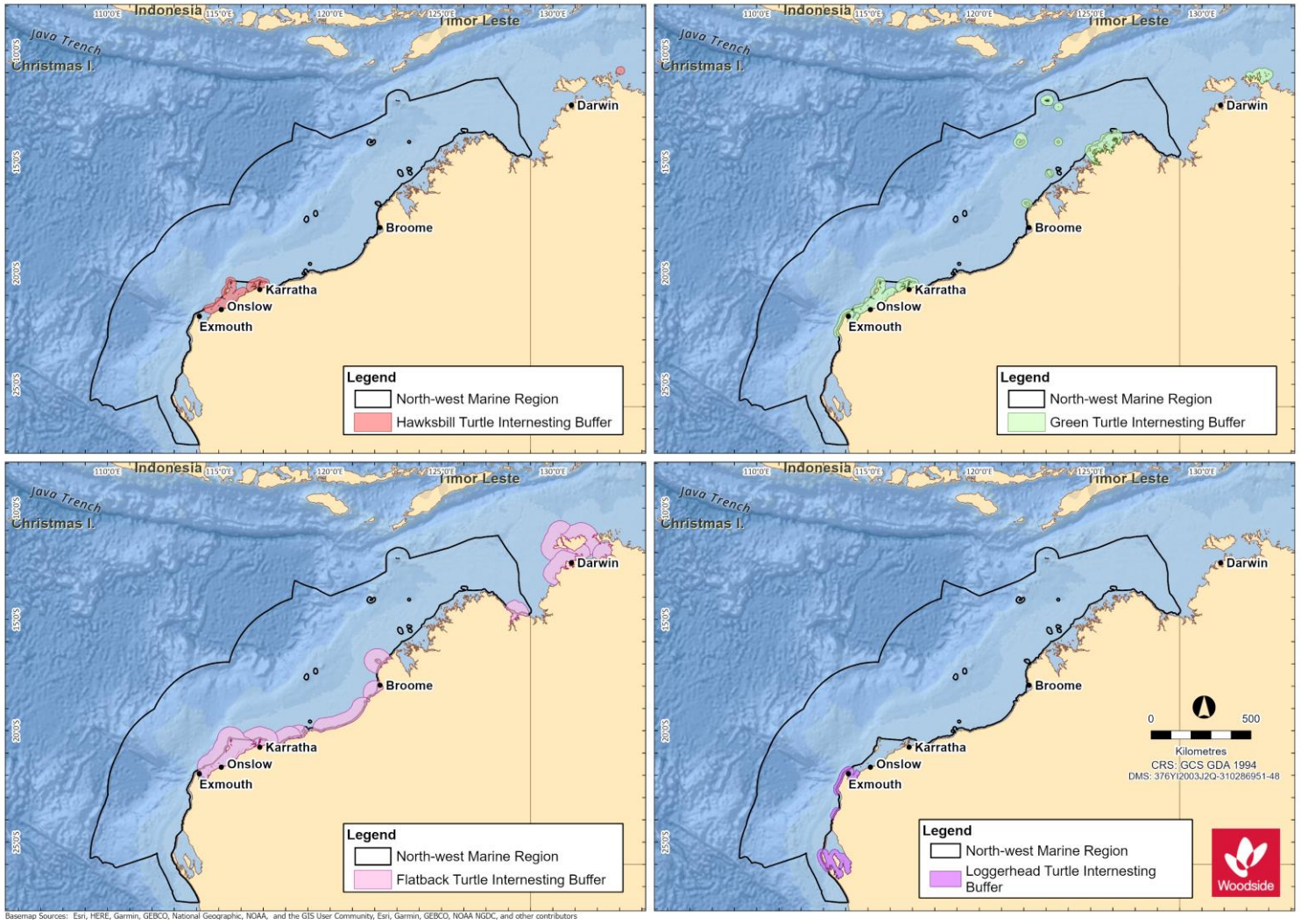

Figure 6-2 Marine turtle species habitat critical to survival (nesting beaches and internesting buffers) for the NWMR

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.

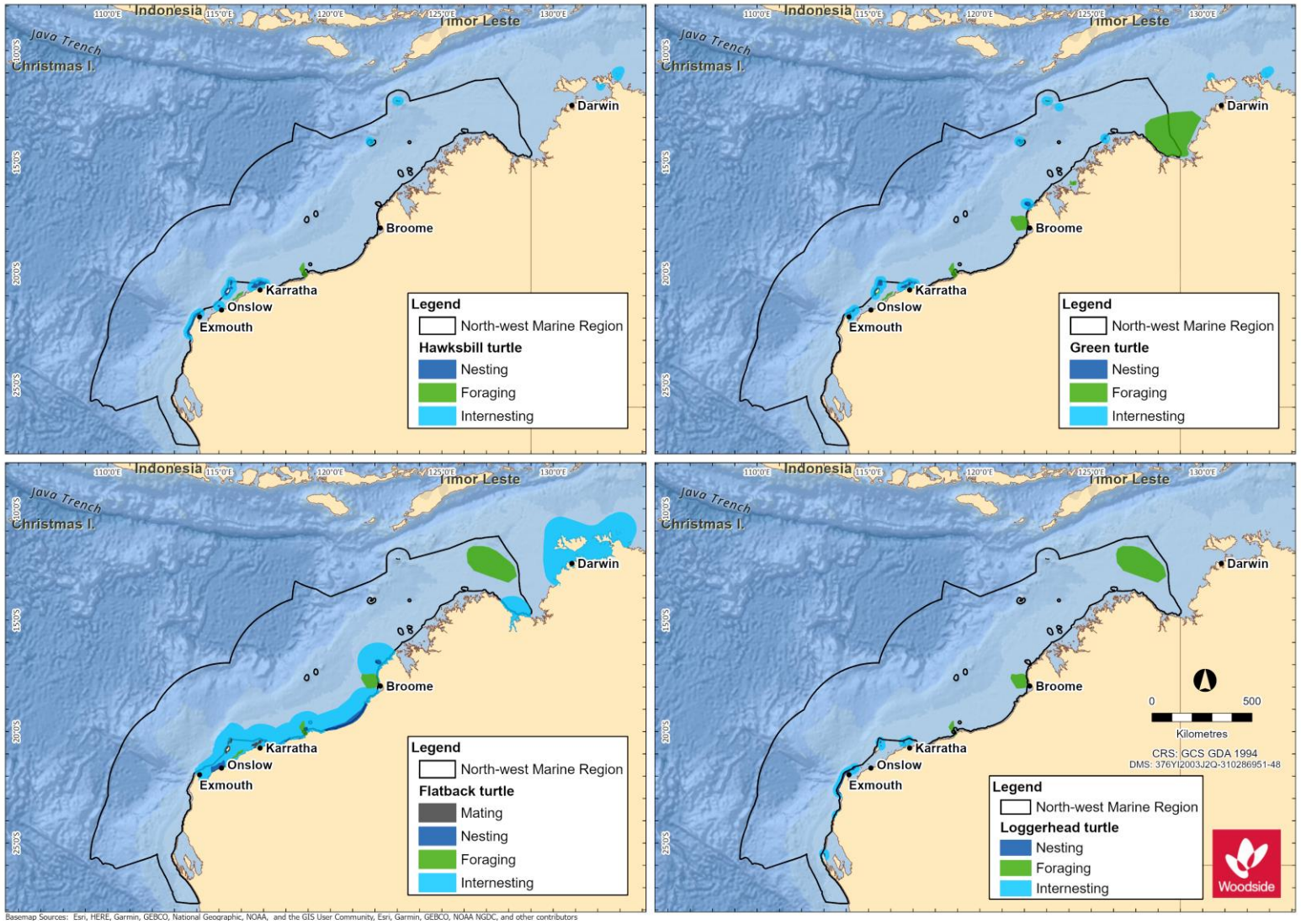

Figure 6-3 Marine turtle species BIAs within the NWMR

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)*

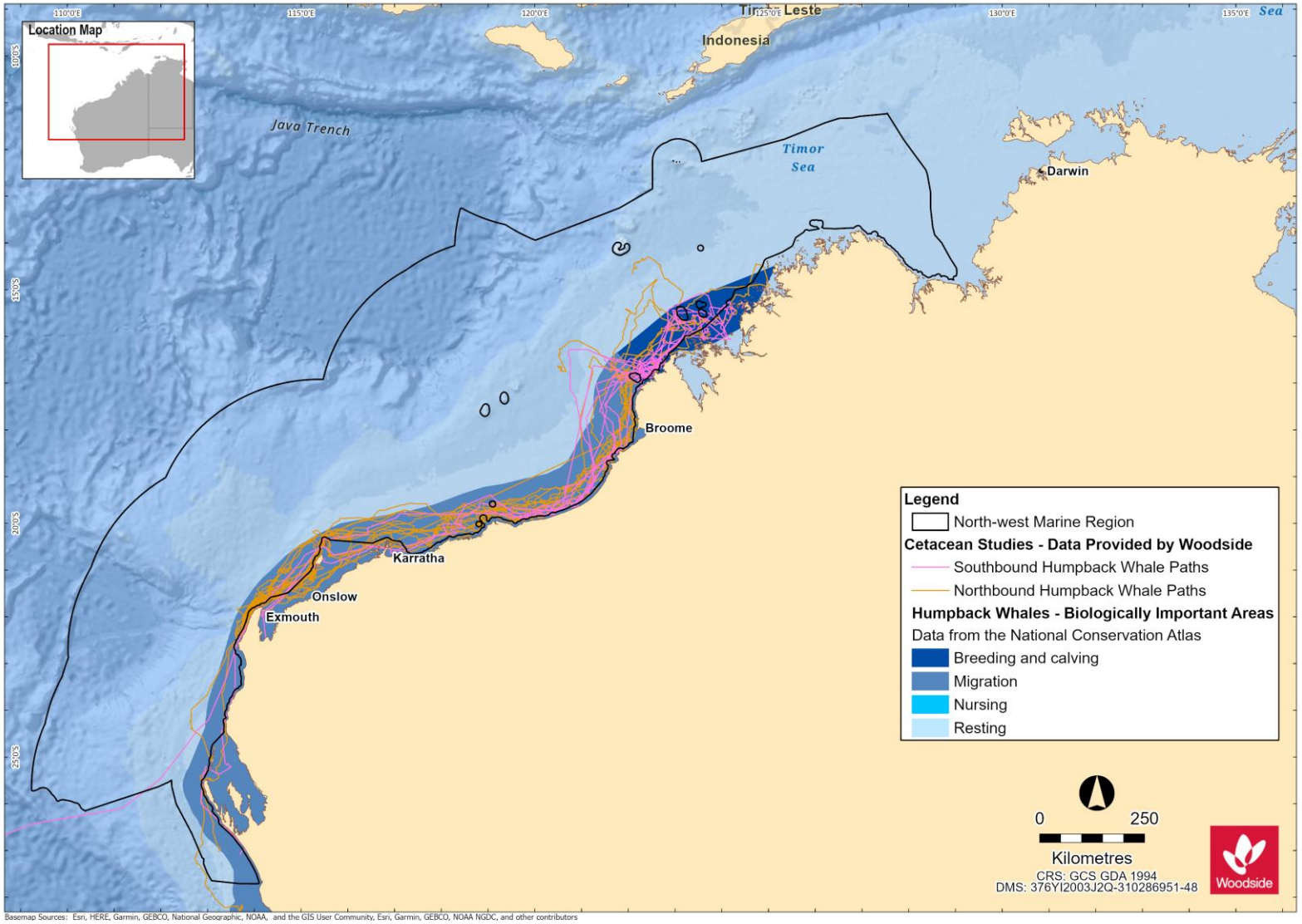

Figure 7-1 Humpback whale BIAs for the NWMR and tagged tracks for north and south bound migrations

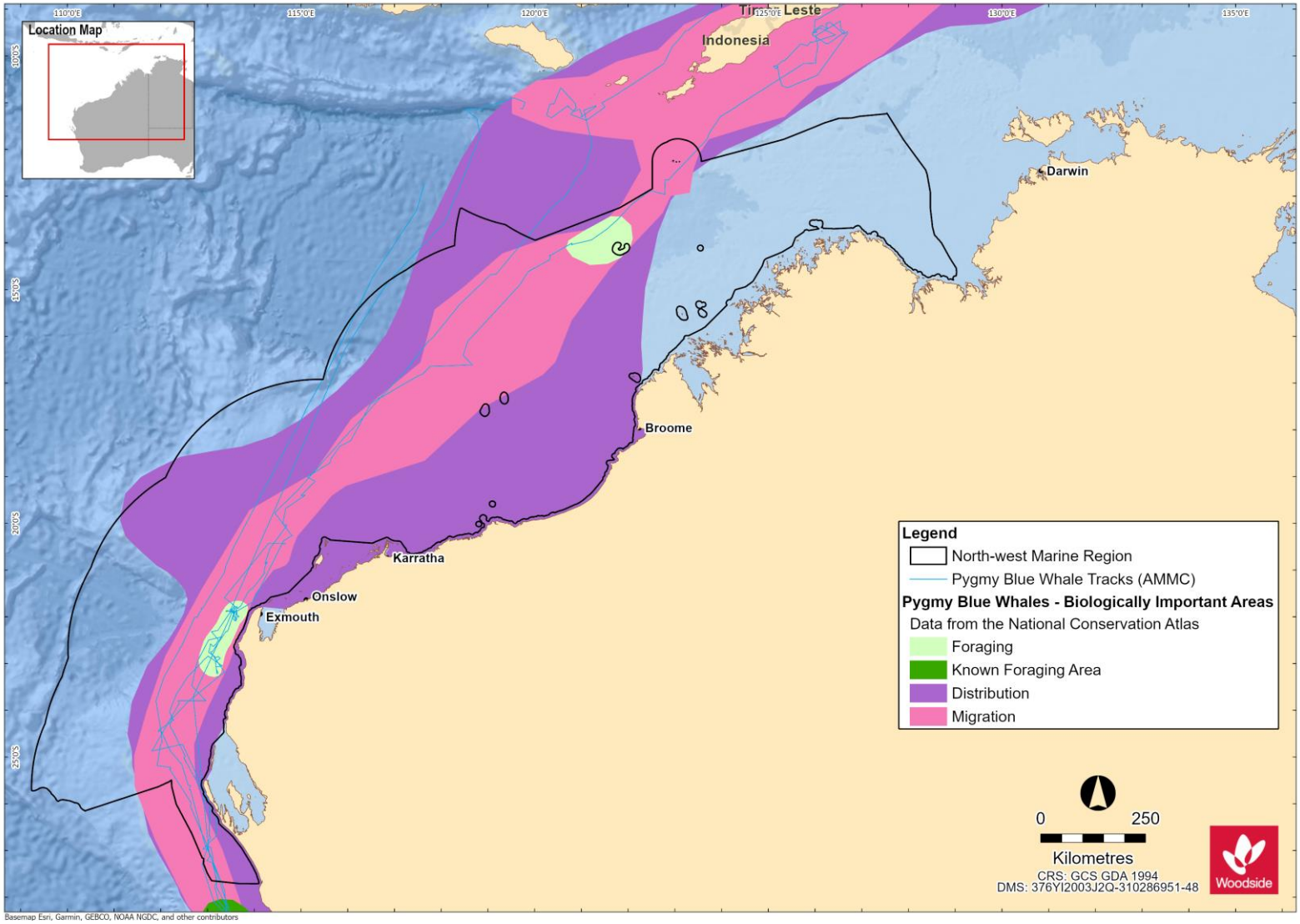

Figure 7-2 Pygmy blue whale BIAs for the NWMR and tagged whale tracks for northbound migration

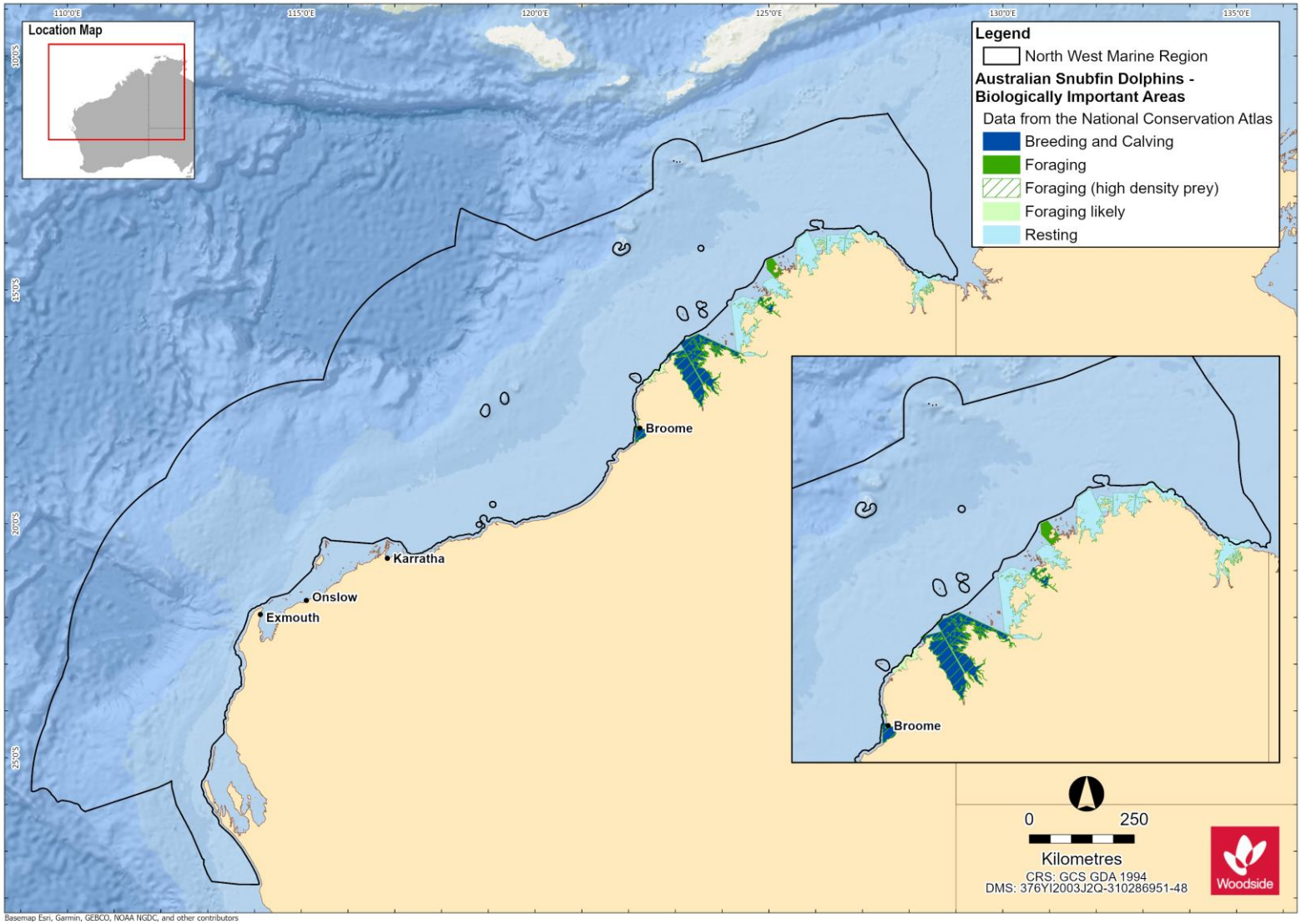

Figure 7-3 Australian snubfin dolphin BIAs for the NWMR

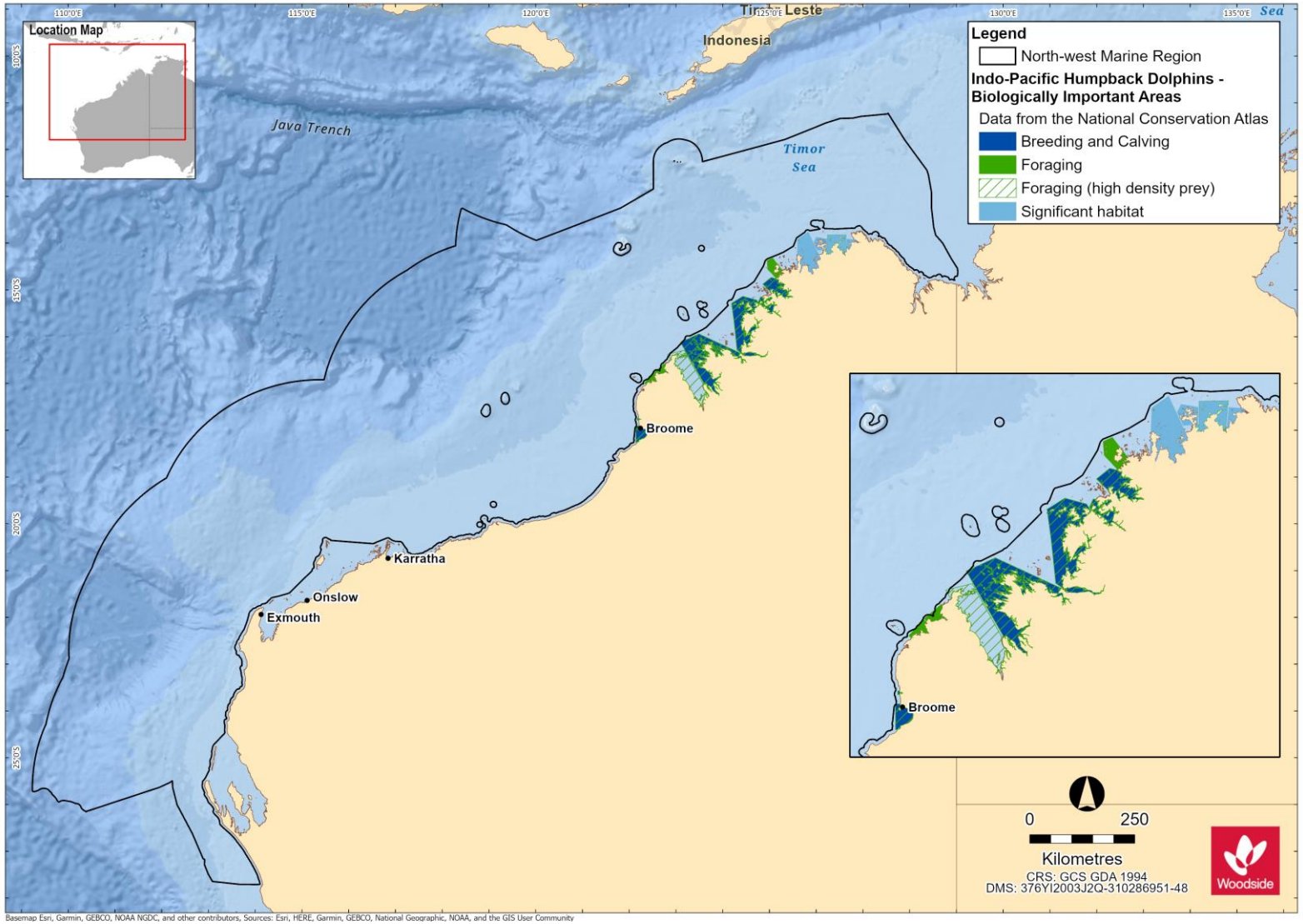

Figure 7-4 Indo-Pacific humpback dolphin BIAs for the NWMR

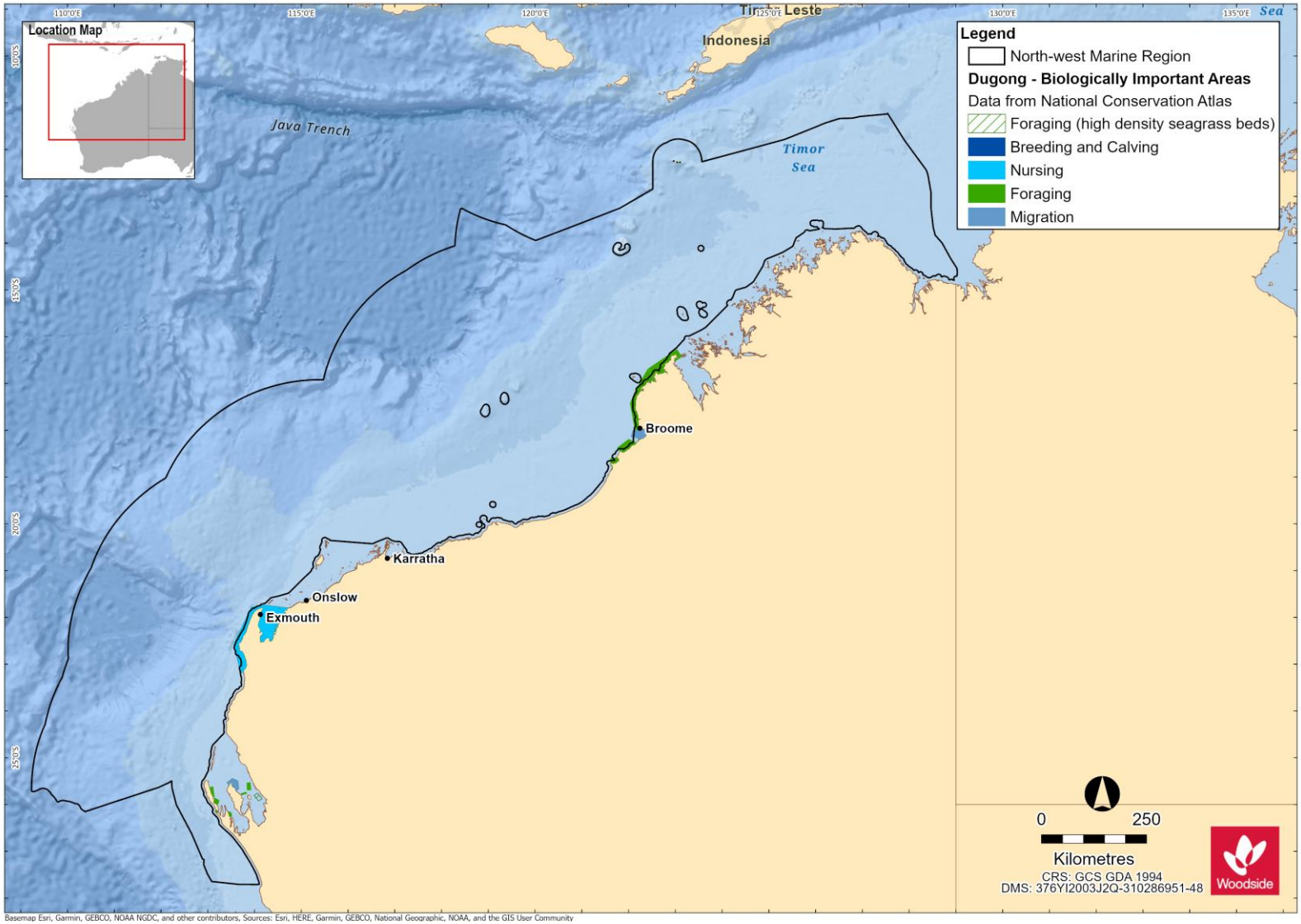

Figure 7-5 Dugong BIAs for the NWMR

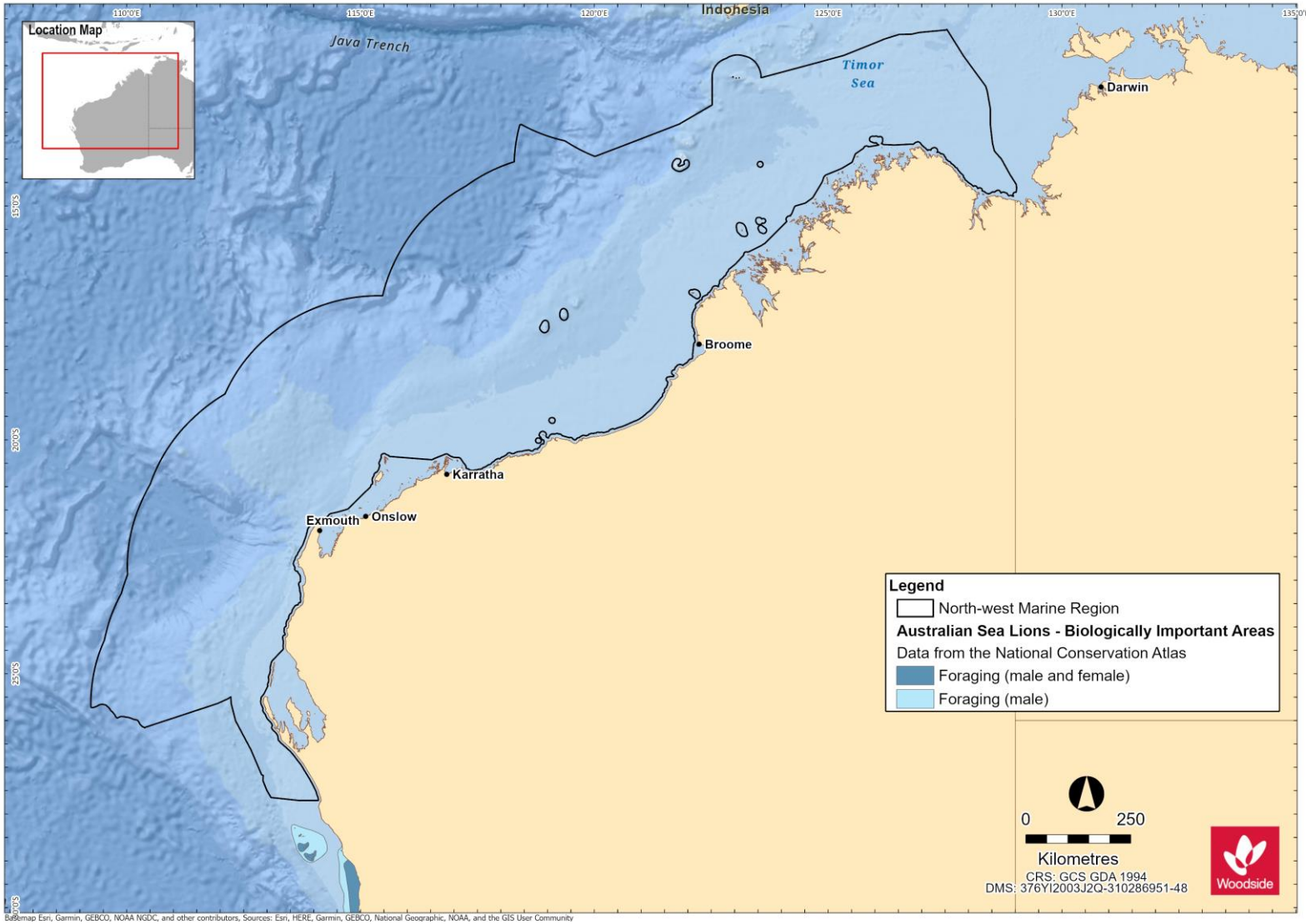

Figure 7-6 Australian sea lion BIAs in the northern extent of the SWMR closest to the NWMR

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	

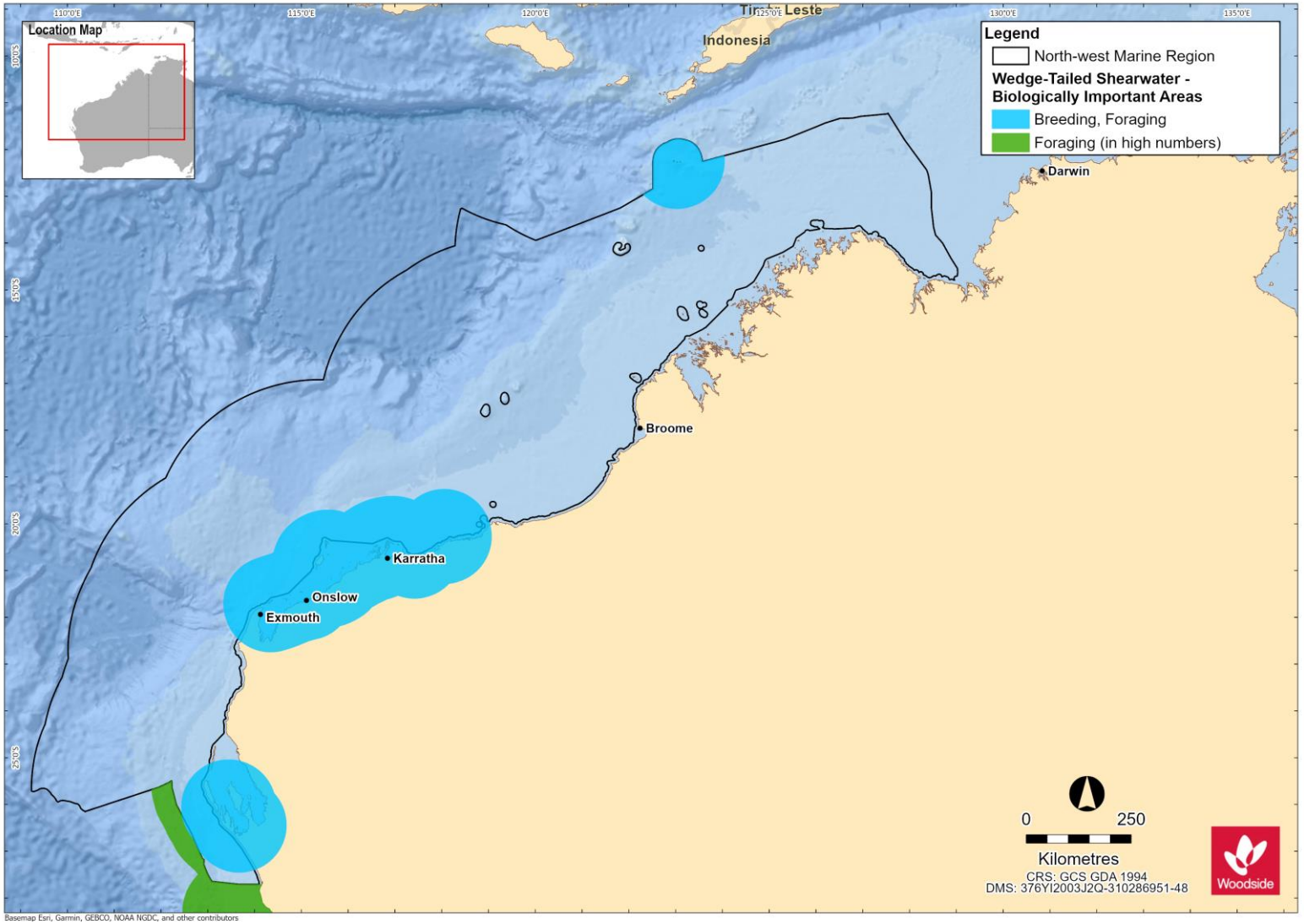

Figure 8-1 Wedge-tailed shearwater BIAs for the NWMR

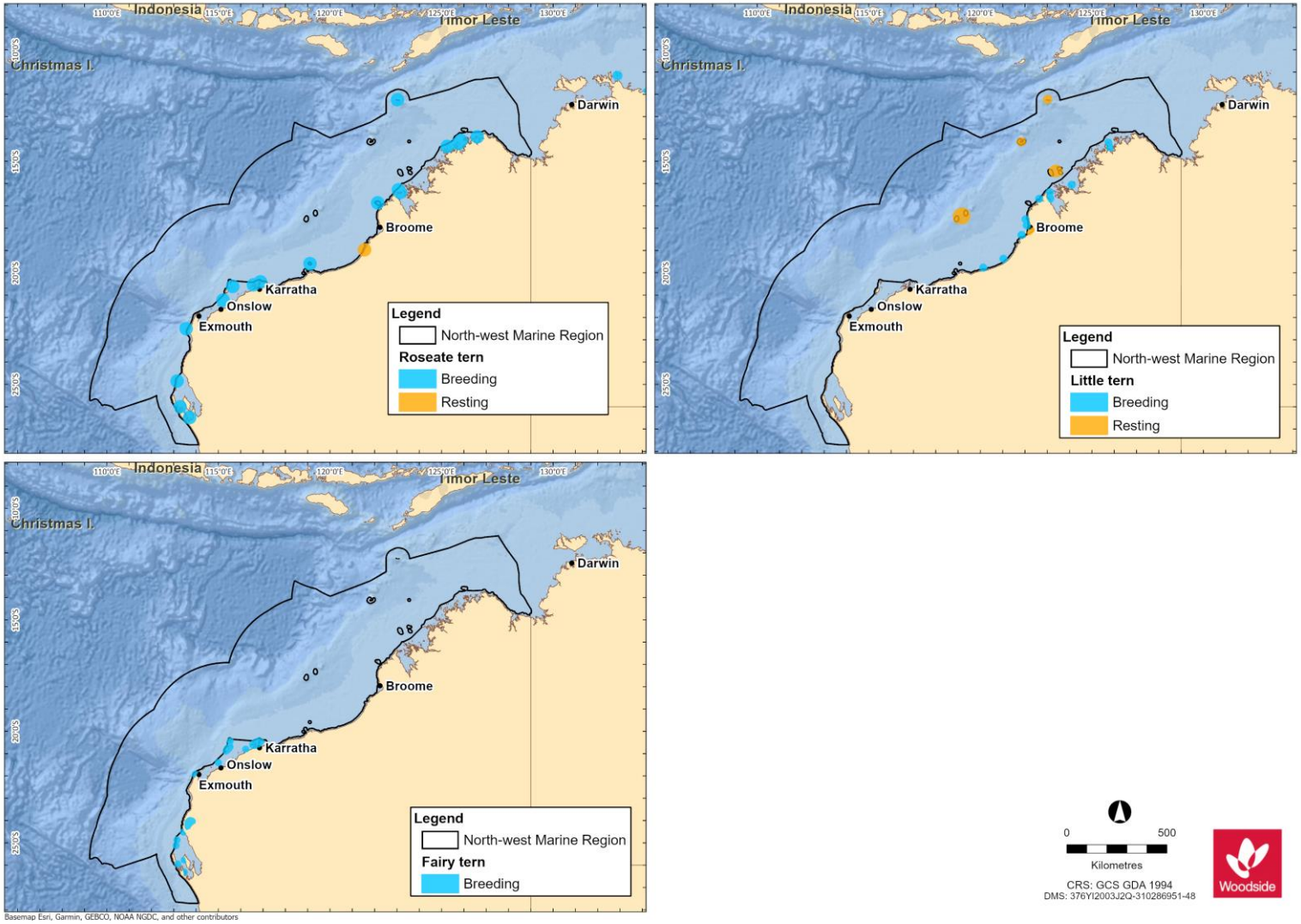

Figure 8-2 Tern species BIAs for the NWMR

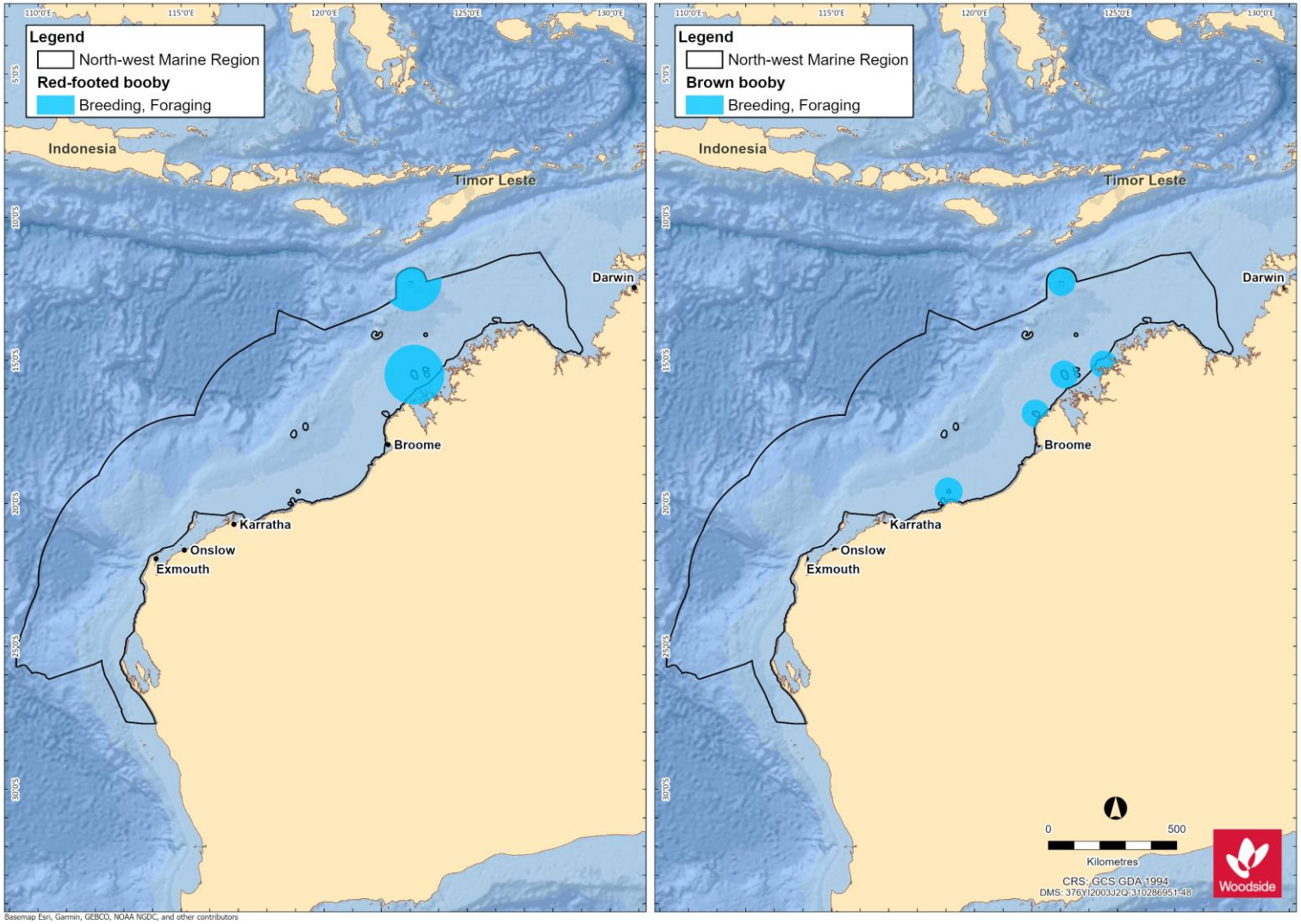

Figure 8-3 Red-footed and brown booby BIAs for the NWMR

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.

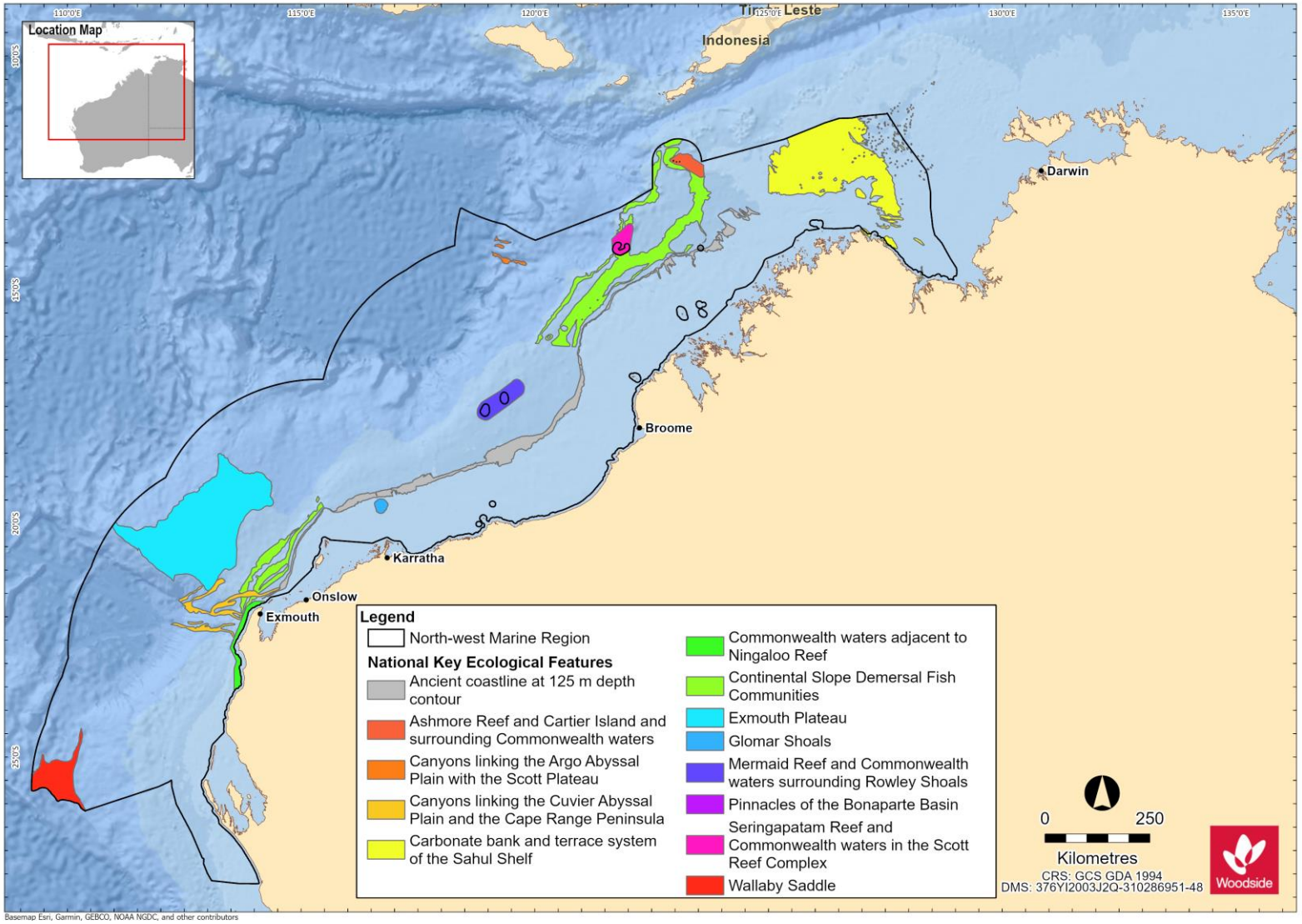

Figure 9-1 Key Ecological Features (KEFs) within the NWMR.

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

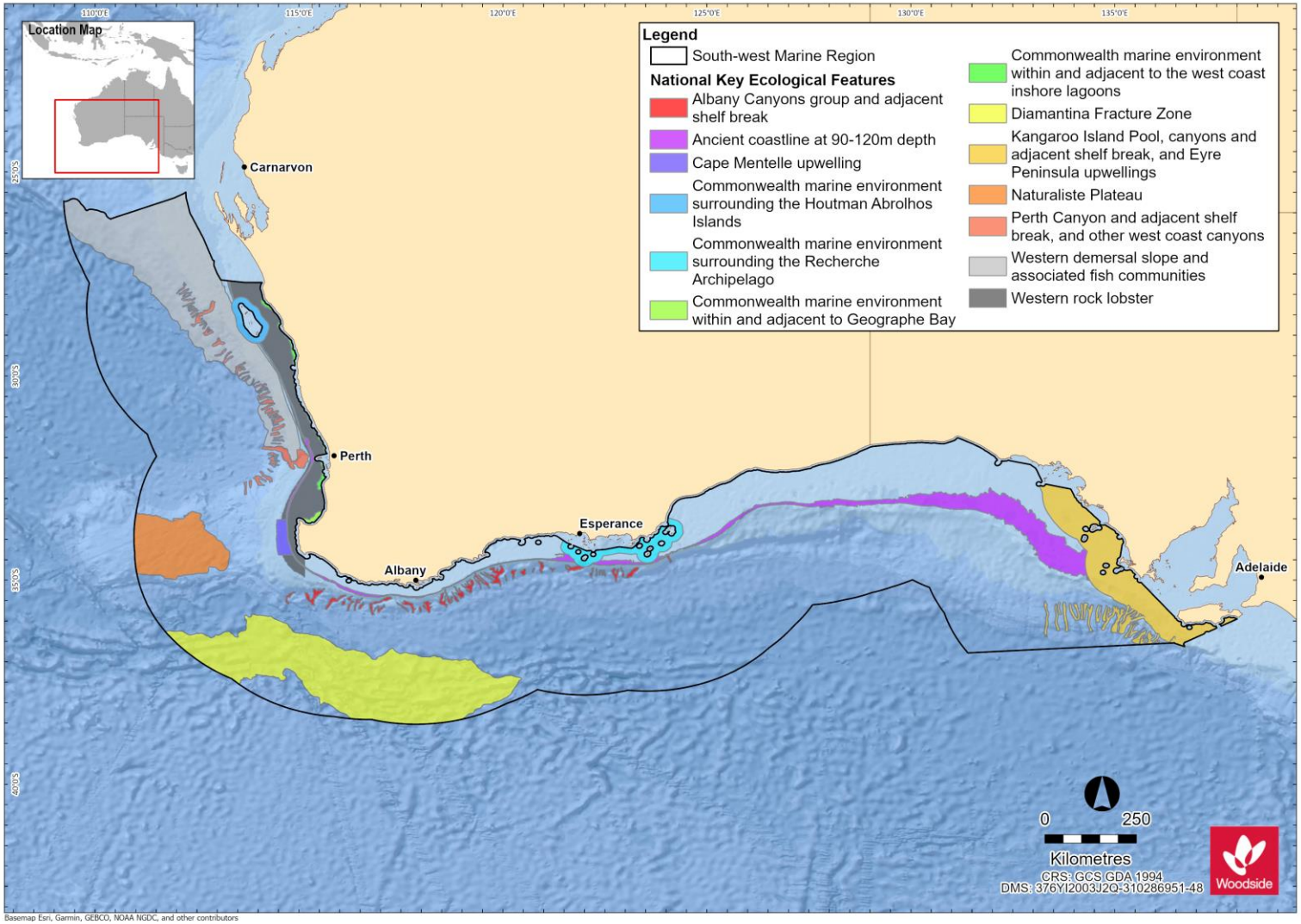

Figure 9-2. Key Ecological Features (KEFs) within the SWMR

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.*

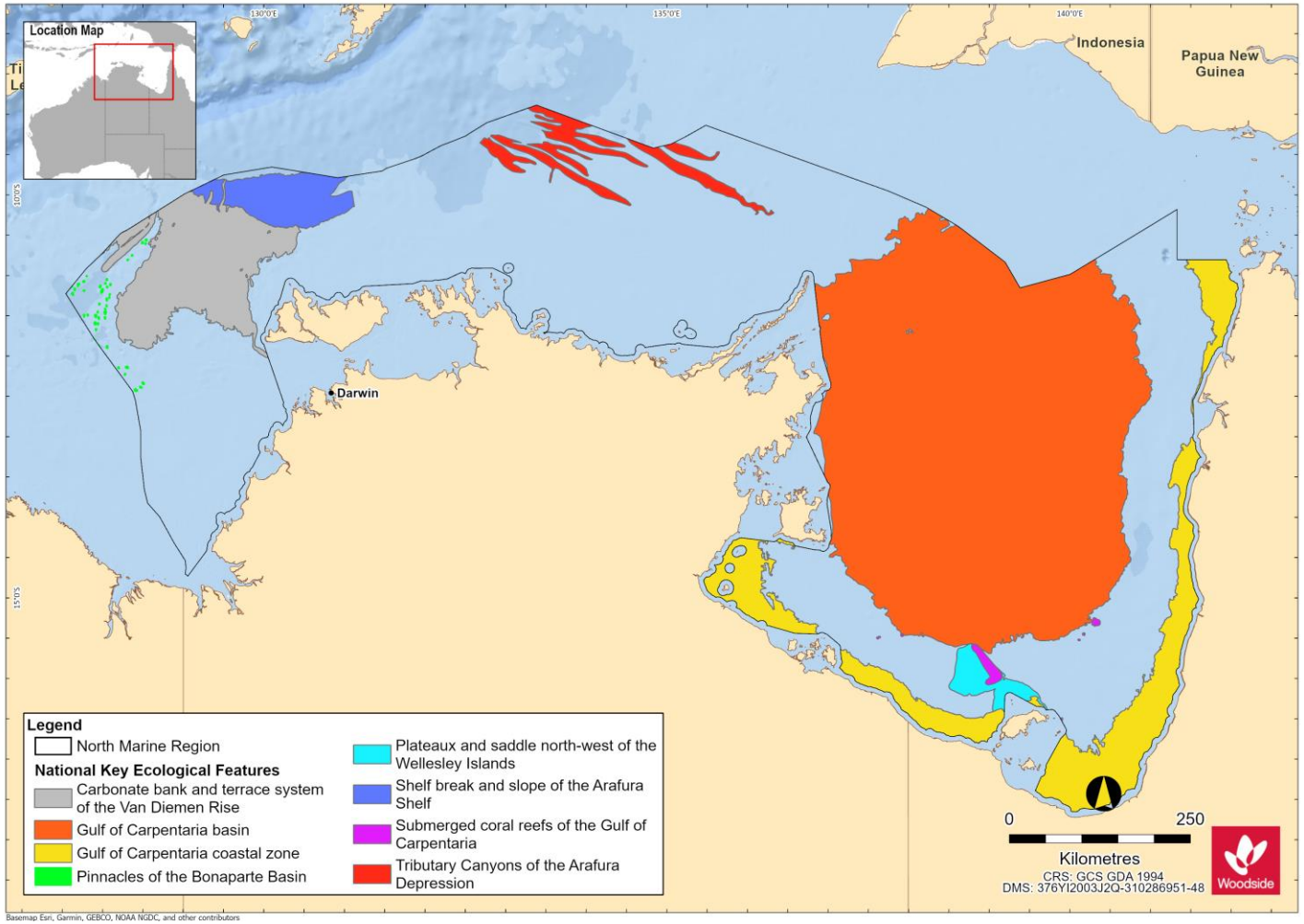

Figure 9-3. Key Ecological Features (KEFs) within the NMR

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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)

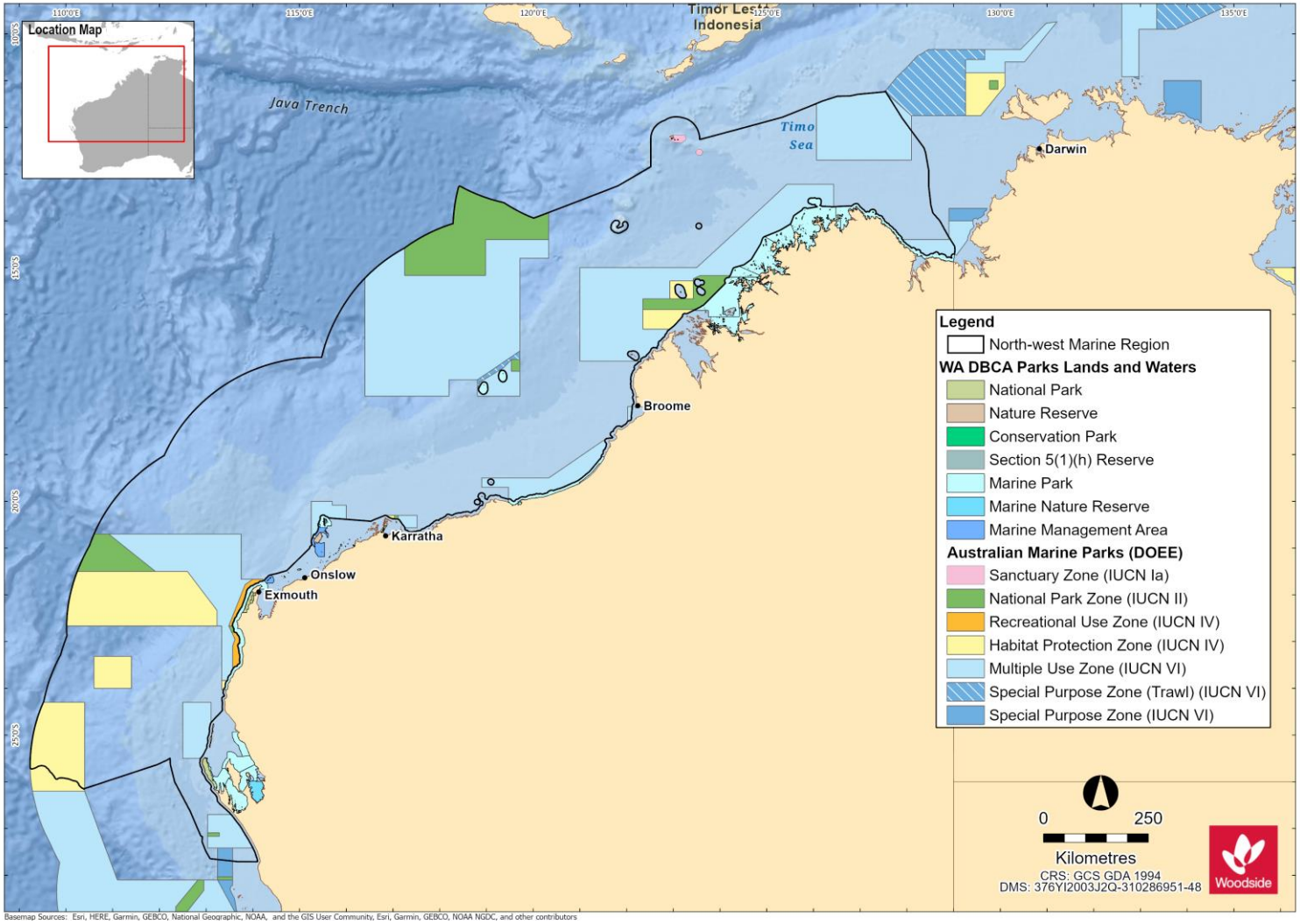

Figure 10-1 Commonwealth and State Marine Protected Areas for the NWMR

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)

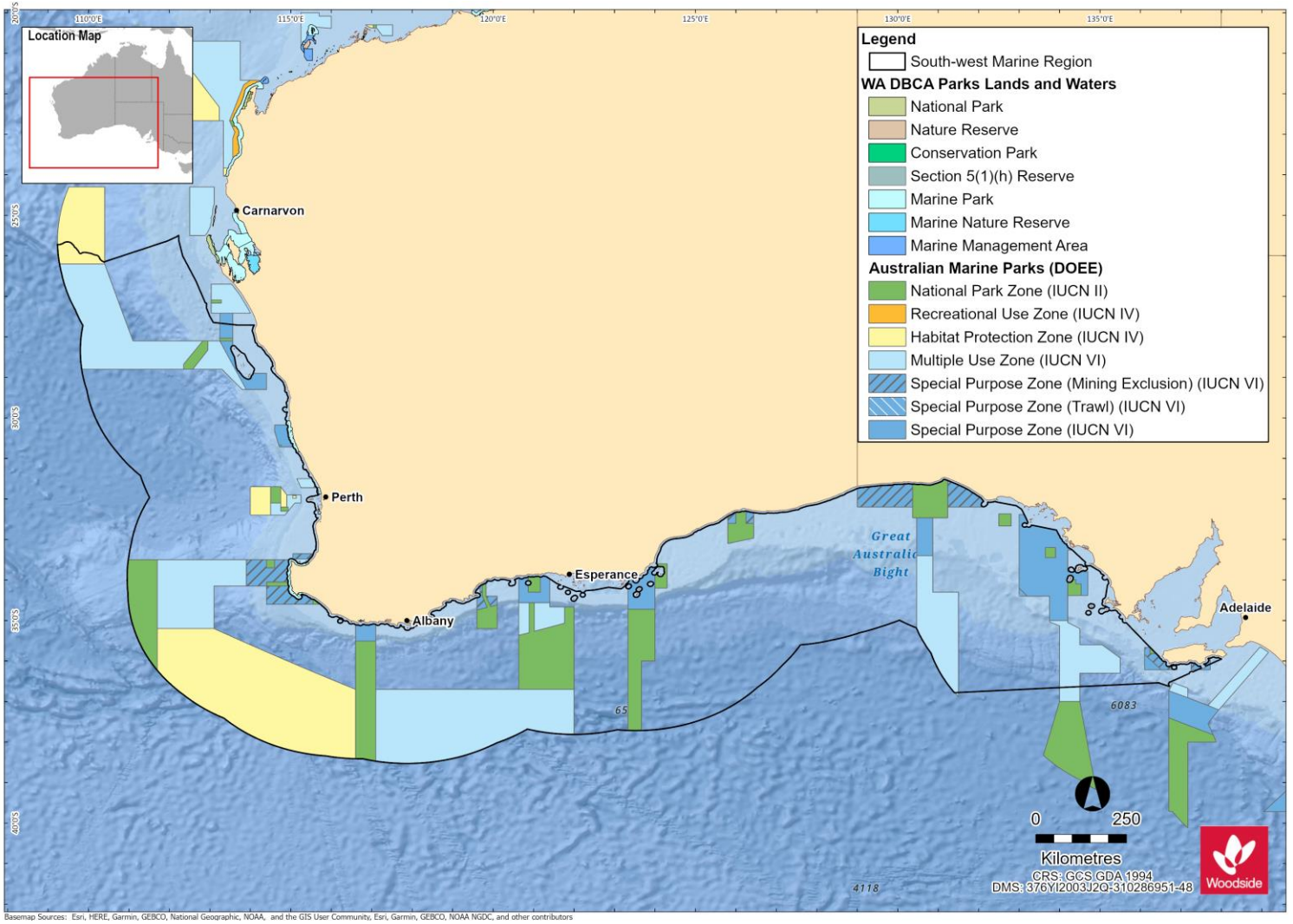

Figure 10-2. Commonwealth and State Marine Protected Areas for the SWMR

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)

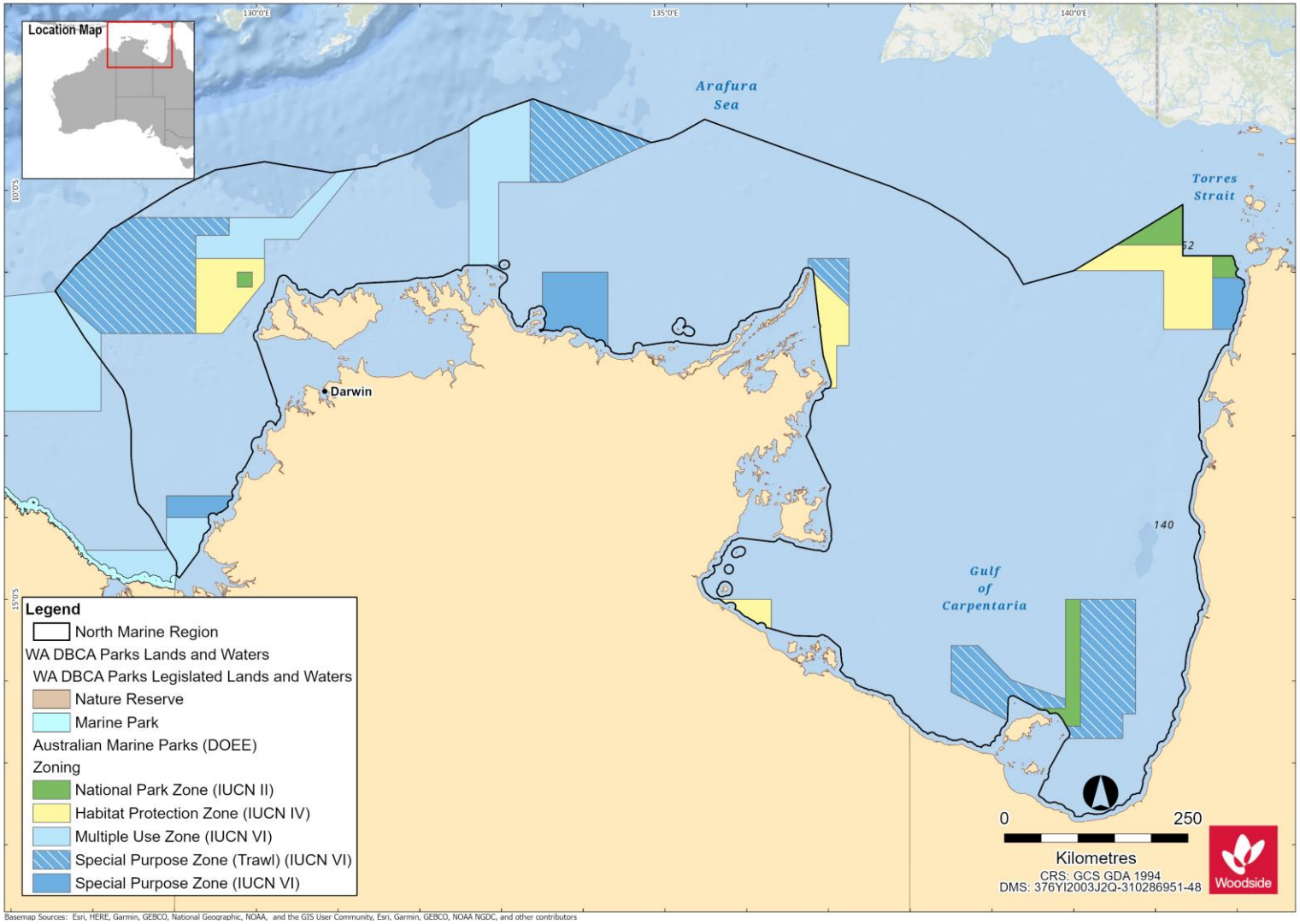

Figure 10-3. Commonwealth and State Marine Protected Areas within the NMR

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.

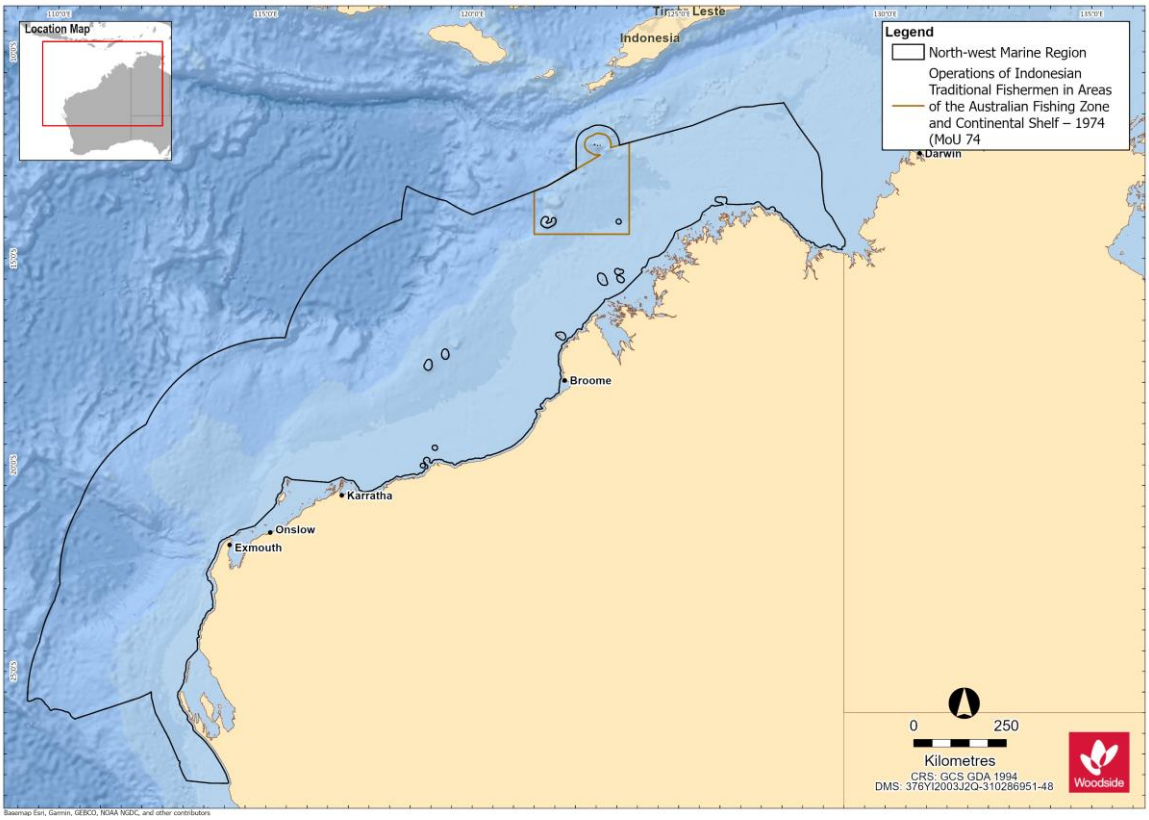

Figure 11-1 MOU 74 Box. Operations of Indonesian Traditional Fishermen in Areas of the Australian Fishing Zone and Continental Shelf – 1974

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.

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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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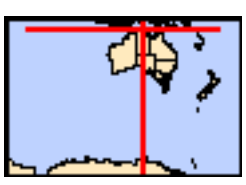

Summary

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.

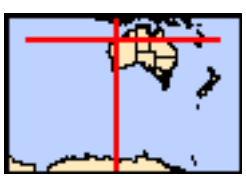
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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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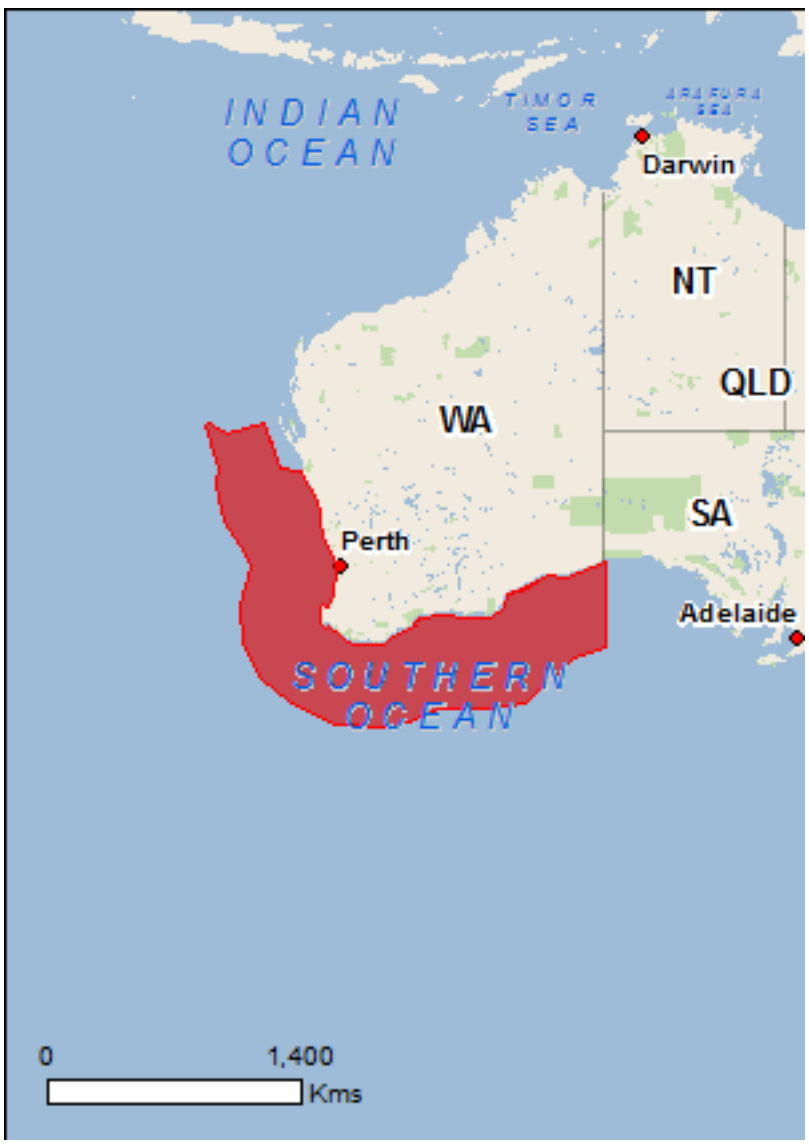
EPBC Act Protected Matters Report

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.

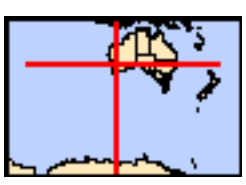
Report created: 10/05/21 12:51:00



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

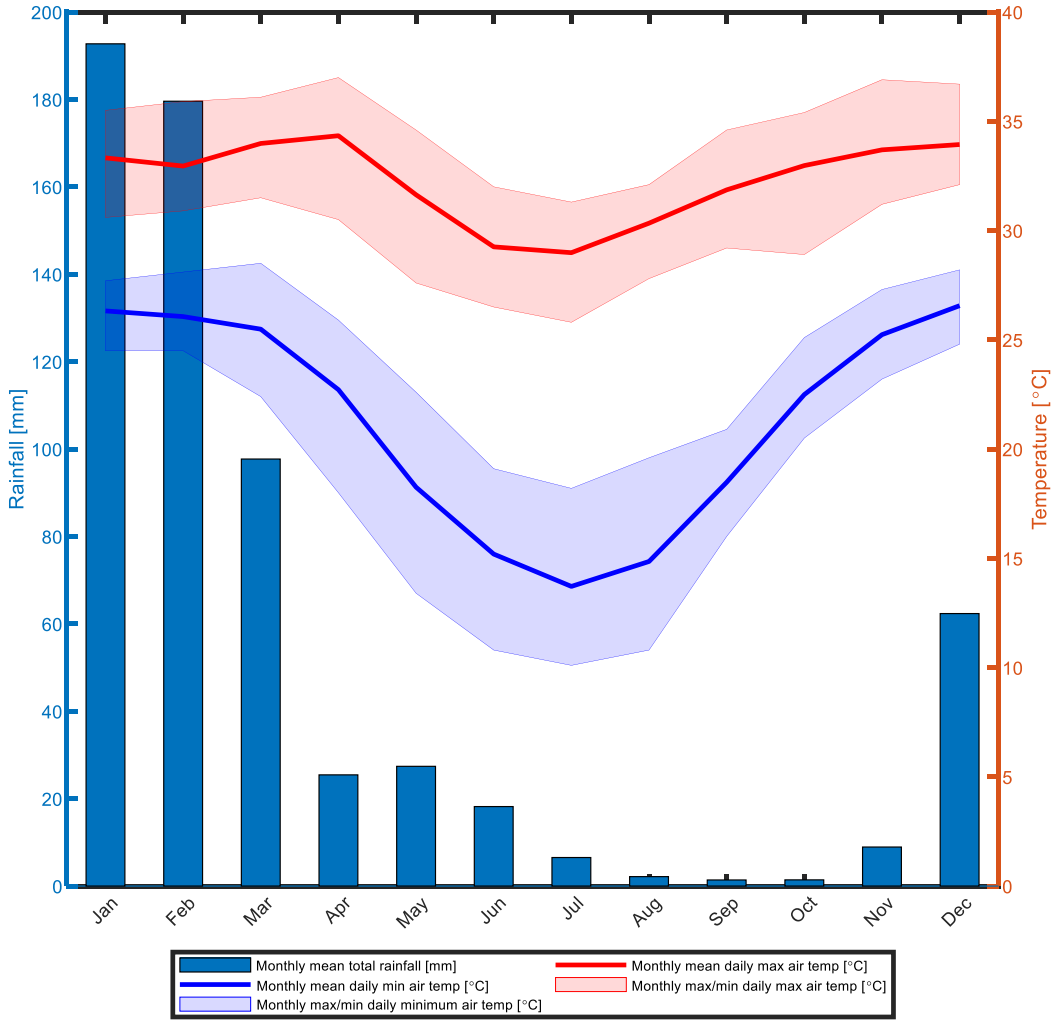


Figure 1. Monthly average total rainfall [mm] and air temperature [°C], calculated based on observations at the Broome Airport weather station from 1939-2020 (Bureau of Meteorology 2020). Bars show the monthly average total rainfall values, and thick blue and red lines denote monthly average daily minimum and maximum air temperatures, respectively. Shaded blue and red areas denote monthly recorded extremes of daily minimum and maximum air temperature, respectively.

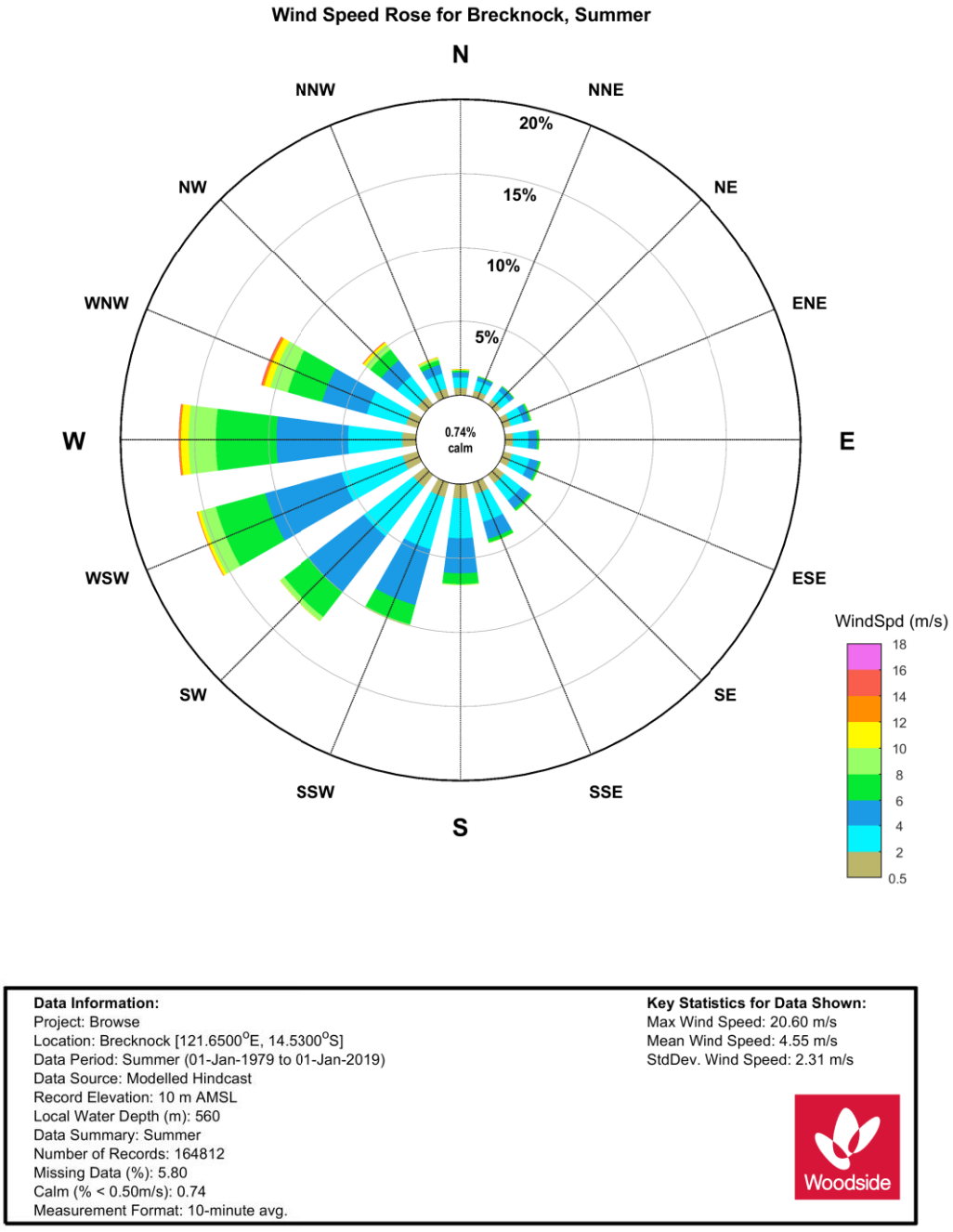
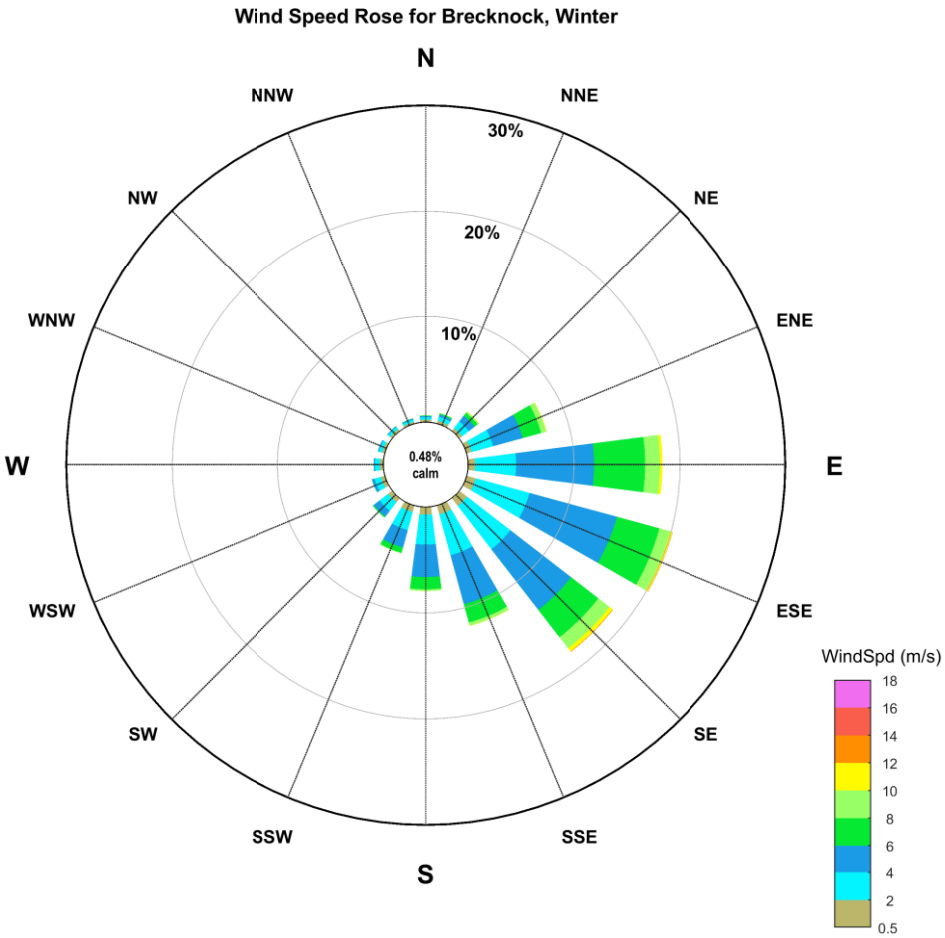


Figure 2. Summer distributions of 10-minute average wind speeds by 22.5° directional sectors at the Brecknock site (Metocean Solutions Ltd, 2019). Note tropical cyclone events were not included in this distribution. Winds at Brecknock in summer are predominantly from the WNW to SW due to the North West 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).

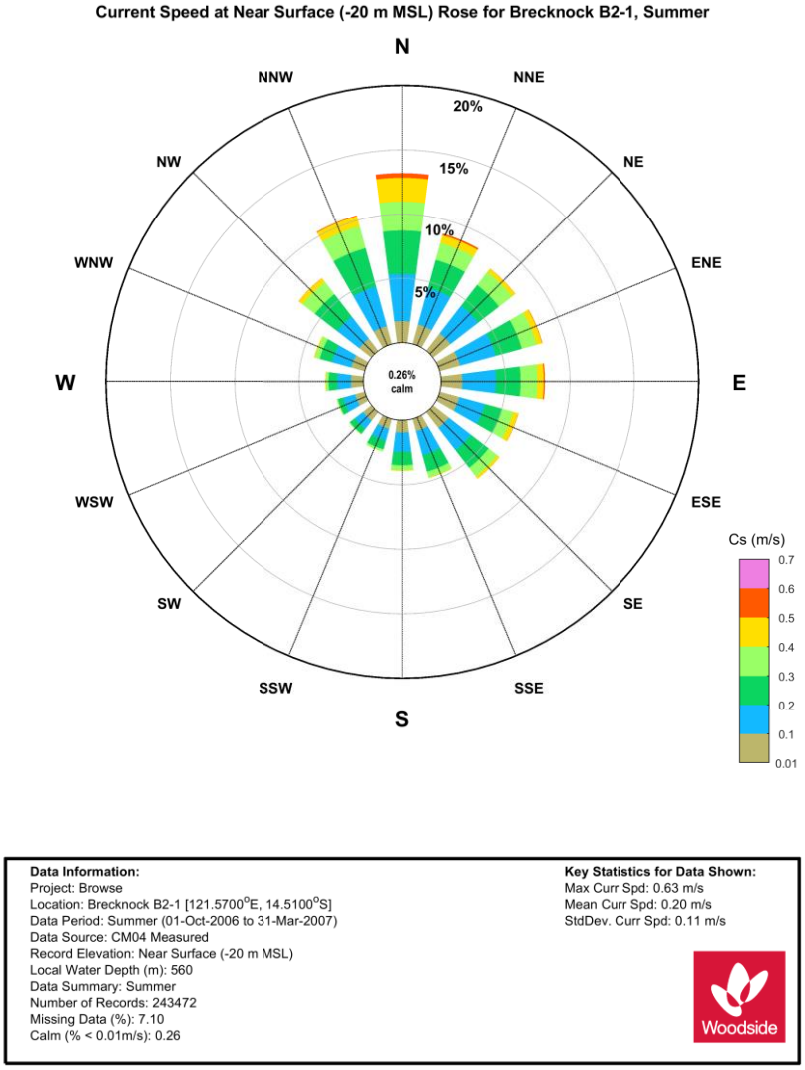
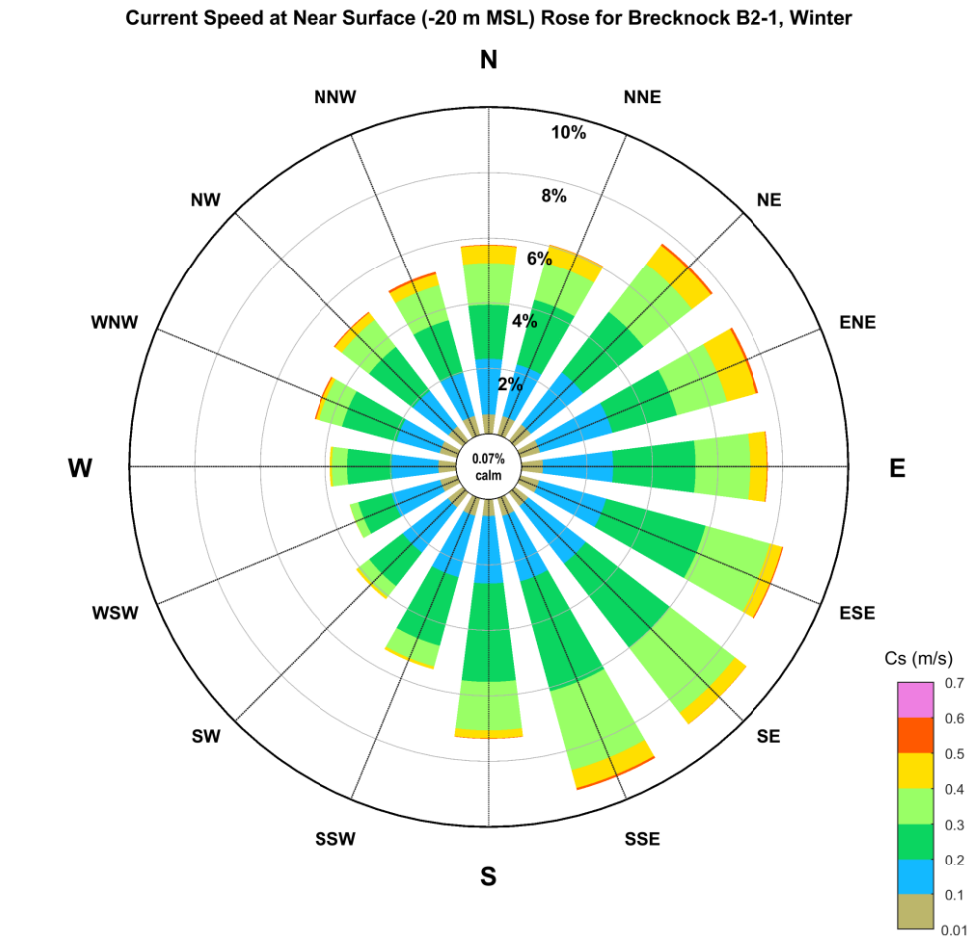


Figure 4. Summer (Nov-Apr) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at Brecknock B2-1 location (cyclones removed) (RPS Metocean Ltd. 2008).



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

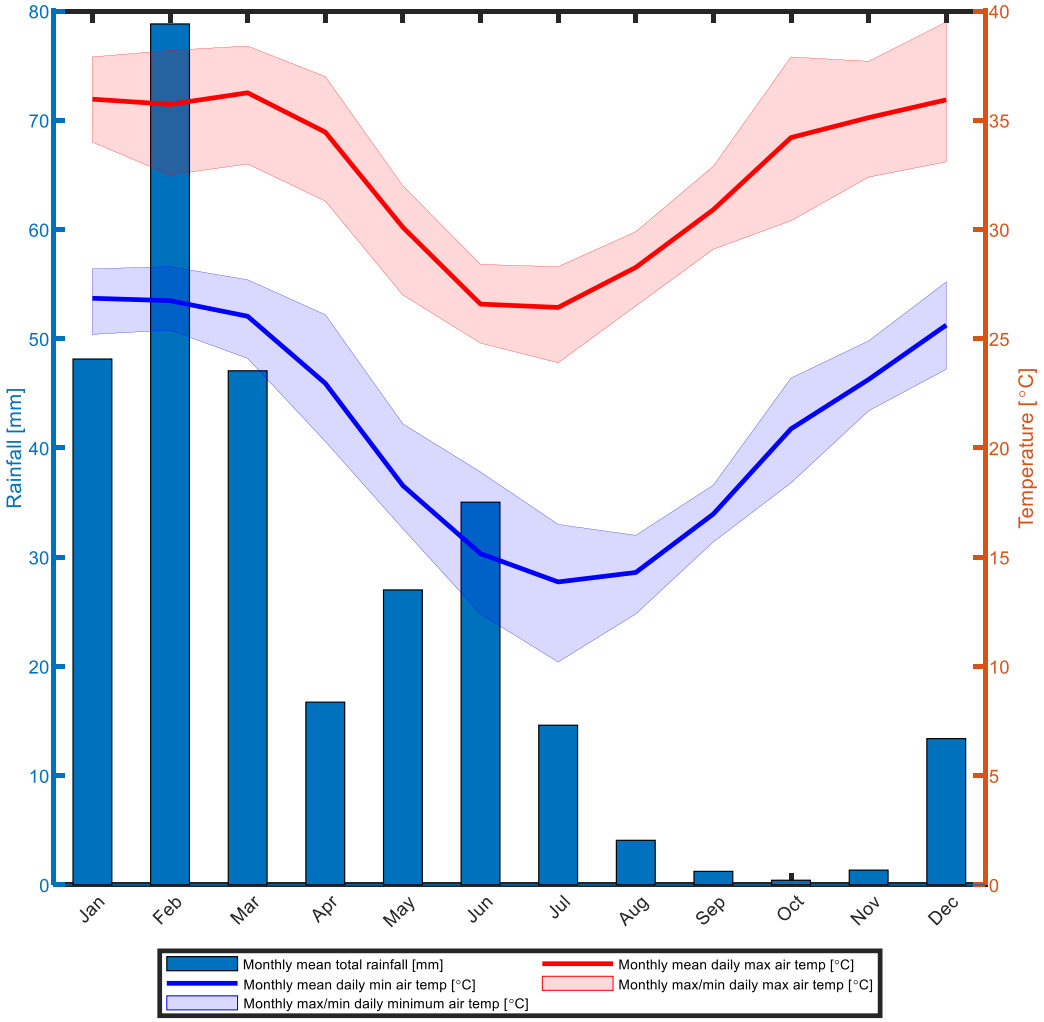
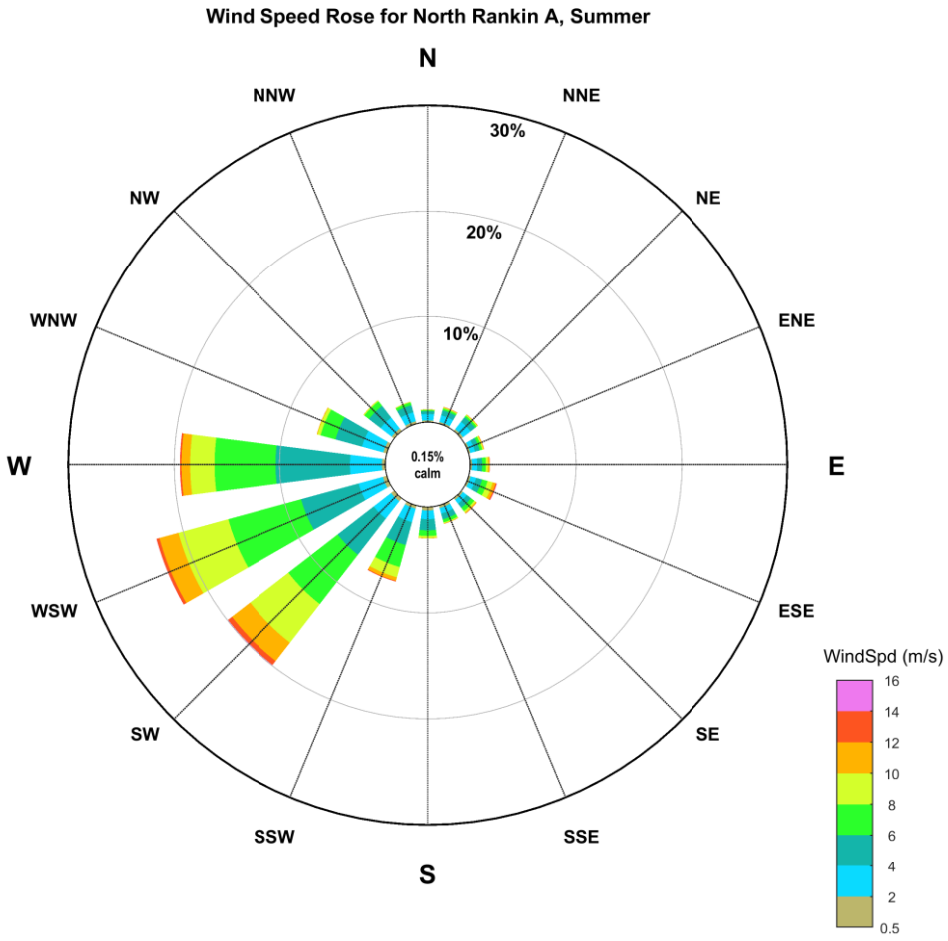


Figure 1. Monthly average total rainfall [mm] and air temperature [°C], calculated based on observations at the Karratha Aero weather station from 1972-2020 and 1993-2020 respectively (Bureau of Meteorology 2020). Bars show the monthly average total rainfall values, and thick blue and red lines denote 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.

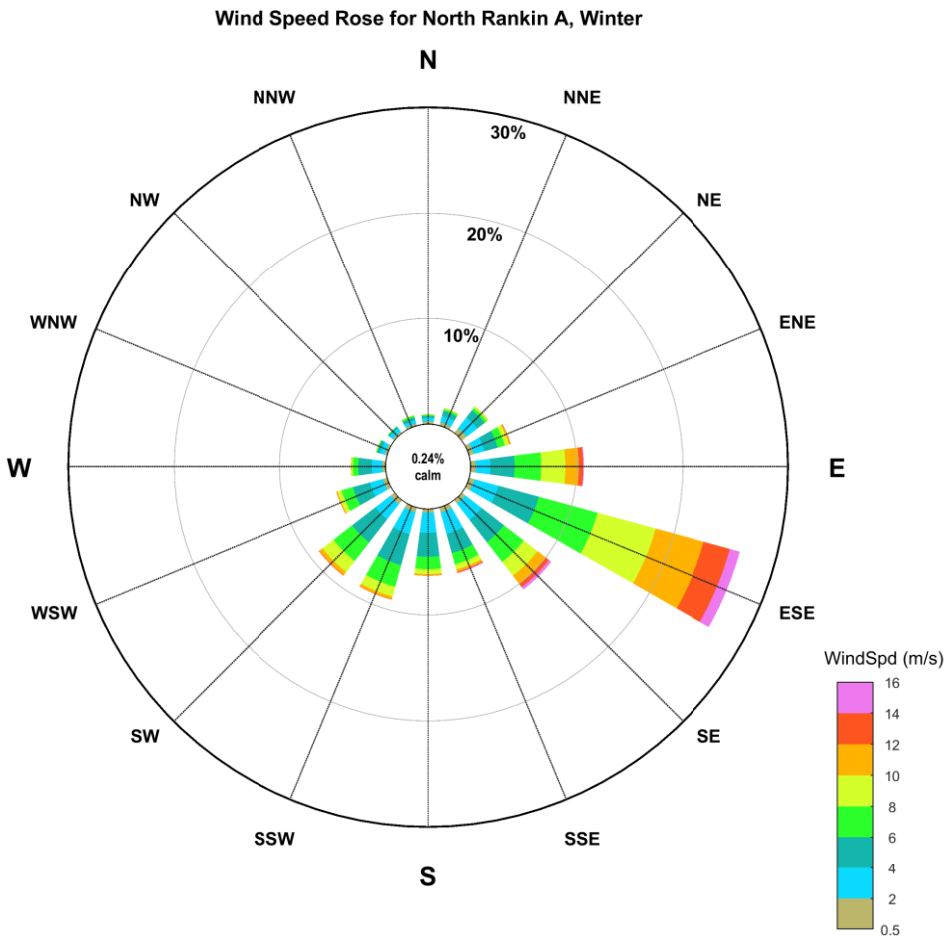


Data Information:
Project: North West Shelf
Location: North Rankin A [116.1200°E, 19.6100°S]
Data Period: Summer (01-Oct-1995 to 30-Nov-2015)
Data Source: Measured Winds
Record Elevation: 10 m AMSL
Local Water Depth (m): 125
Data Summary: Summer
Number of Records: 674659
Missing Data (%): 7.24
Calm (% < 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

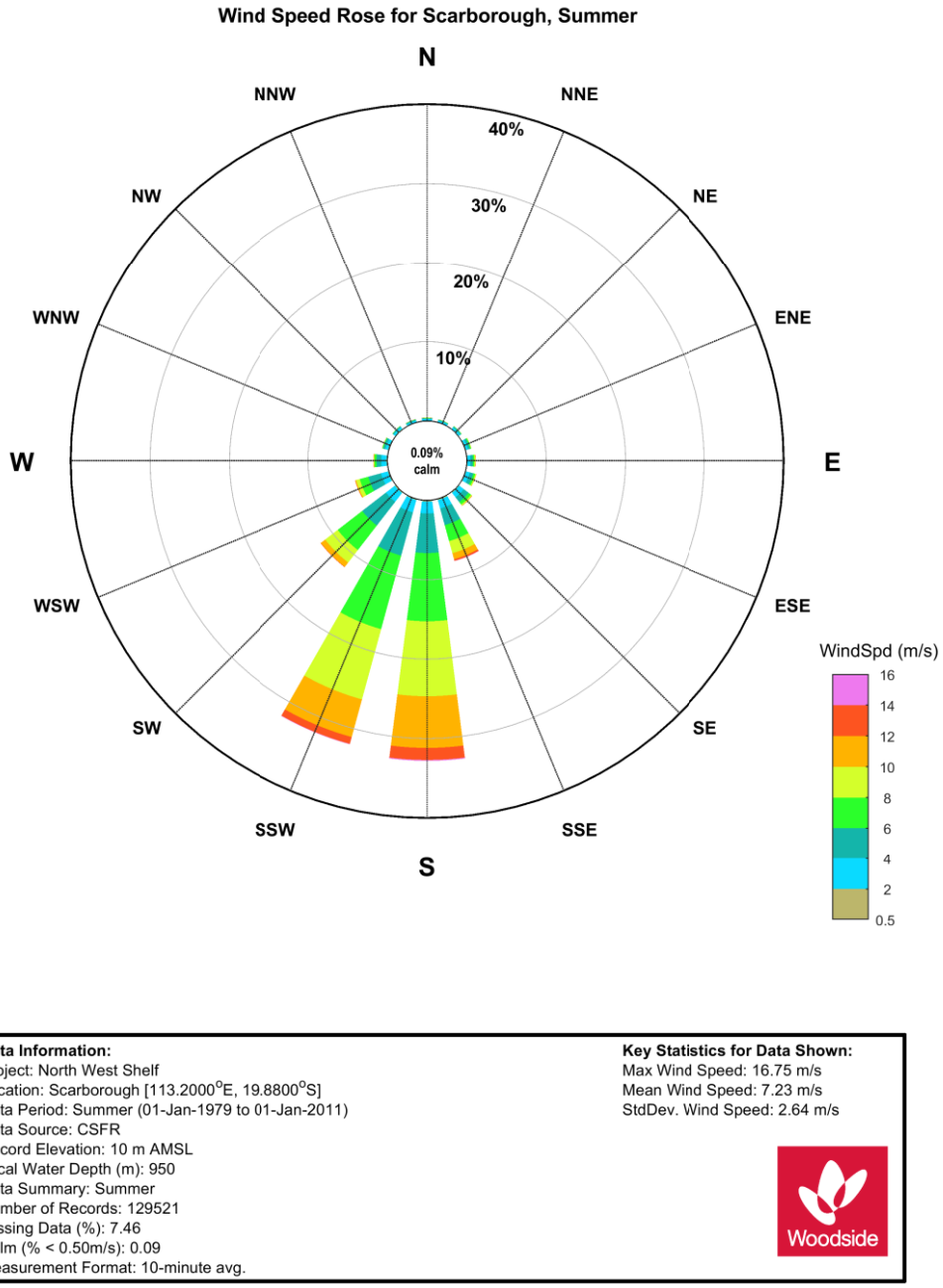
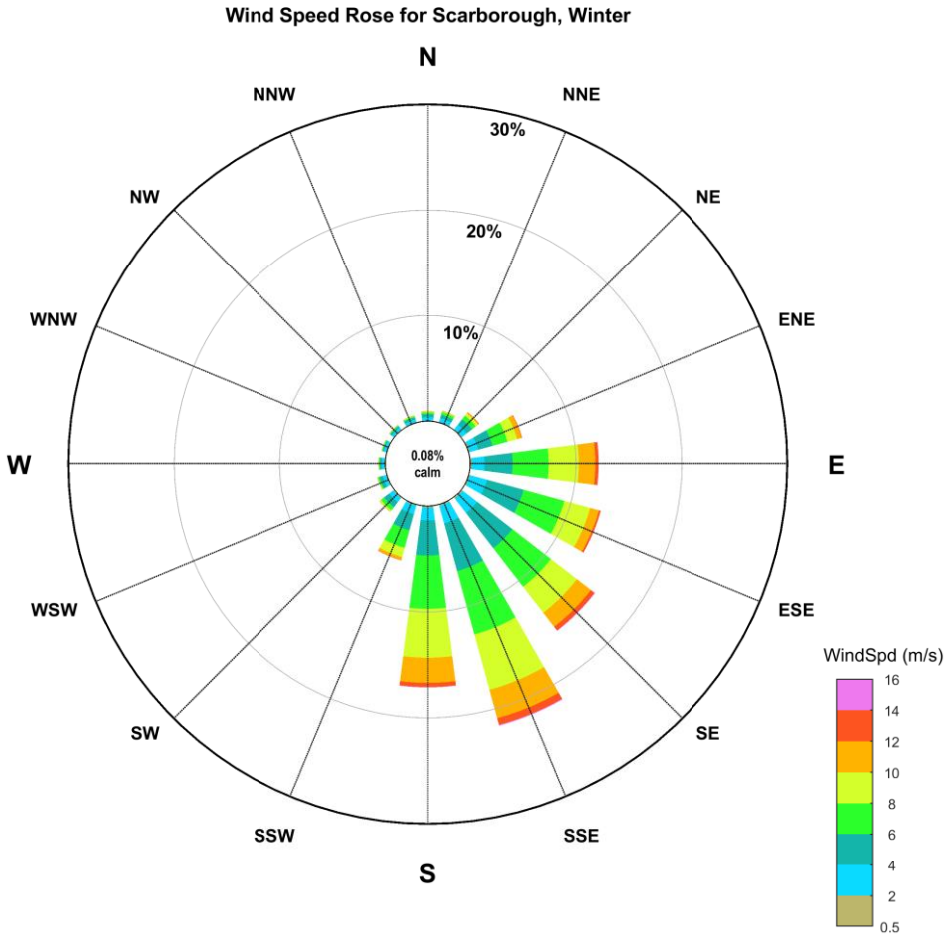


Figure 4. Summer distributions of wind speeds (10-minute at 10m ASL) by 22.5° directional sectors at the Scarborough site (WEL, 2018). Note tropical cyclone events were not included in this distribution. Winds at Scarborough in summer are predominantly from the S to SSW due to a Pilbara Heat Low forming over the northwest coast of Western Australia [R8] SW winds are also experienced at this site due to the monsoon trough.



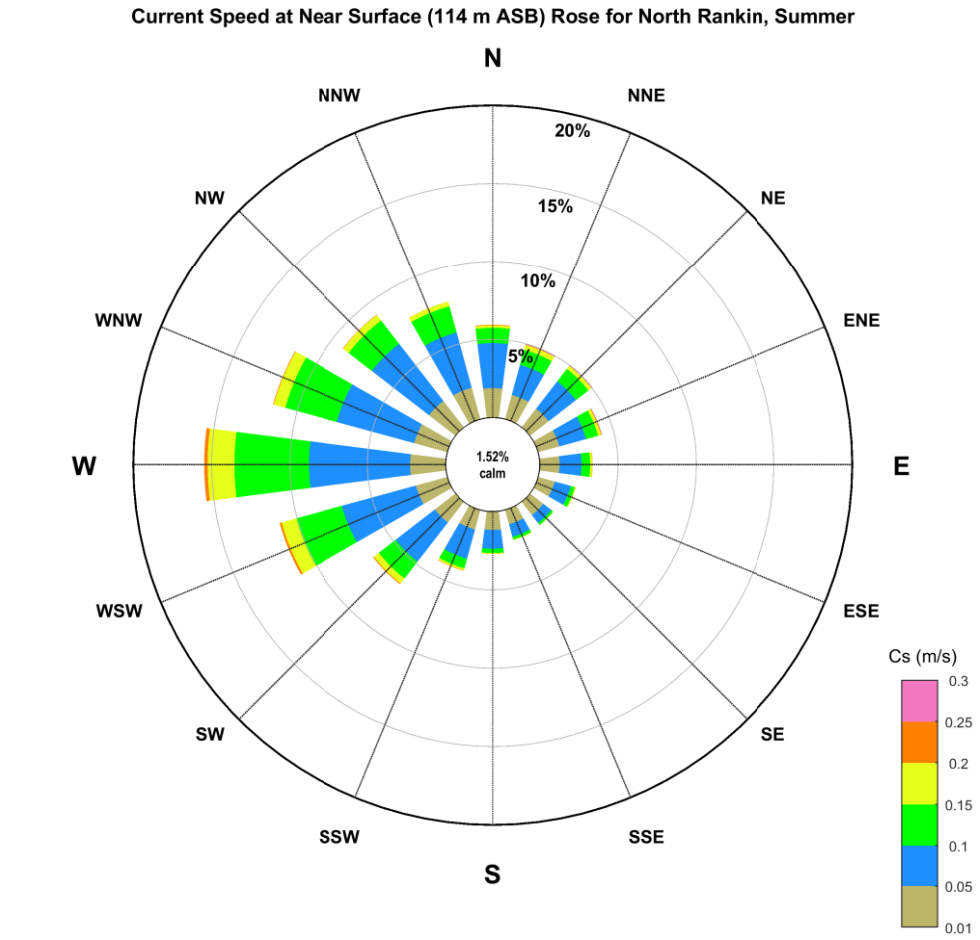
Data Information:
Project: North West Shelf
Location: Scarborough [113.2000°E, 19.8800°S]
Data Period: Winter (01-Apr-1979 to 30-Sep-2010)
Data Source: CSFR
Record Elevation: 10 m AMSL
Local Water Depth (m): 950
Data Summary: Winter
Number of Records: 138863
Missing Data (%): 1.20
Calm (% < 0.50m/s): 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

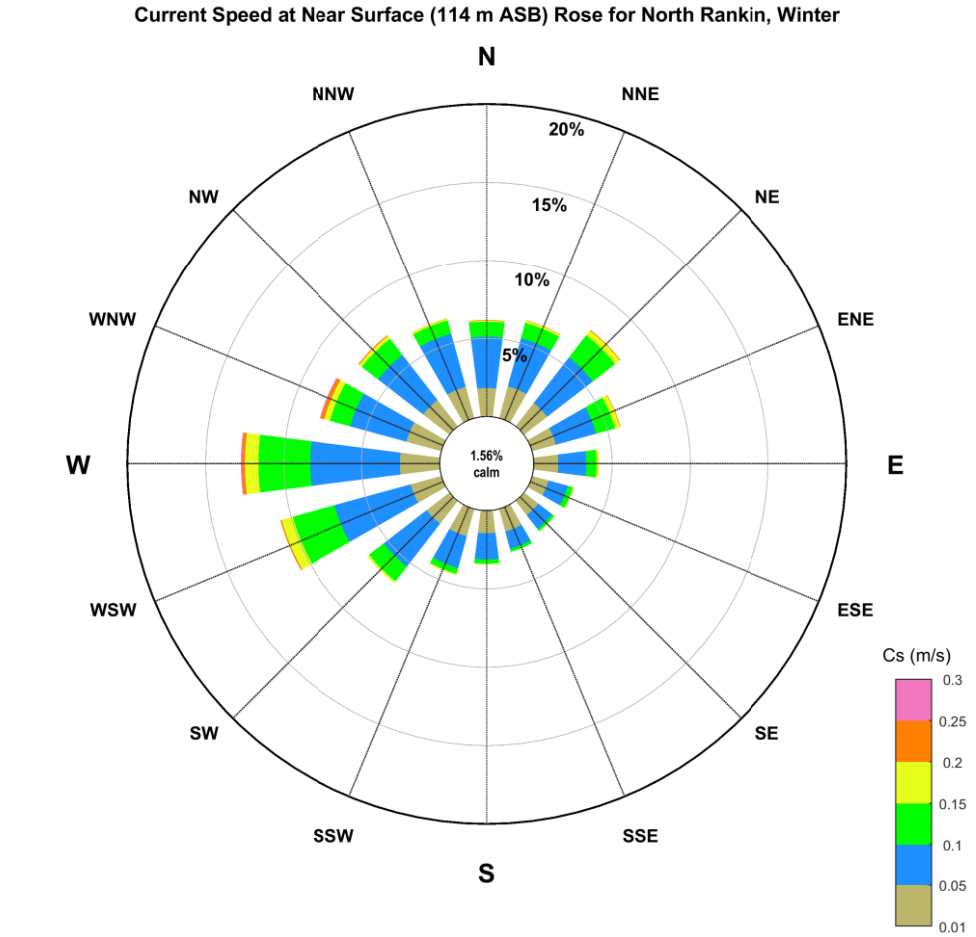


Data Information:
Project: North West Shelf
Location: North Rankin [116.1400°E, 19.5800°S]
Data Period: Summer (01-Oct-2004 to 31-Mar-2009)
Data Source: Measured Data
Record Elevation: Near Surface (114 m ASB)
Local Water Depth (m): 124.5
Data Summary: Summer
Number of Records: 496705
Missing Data (%): 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

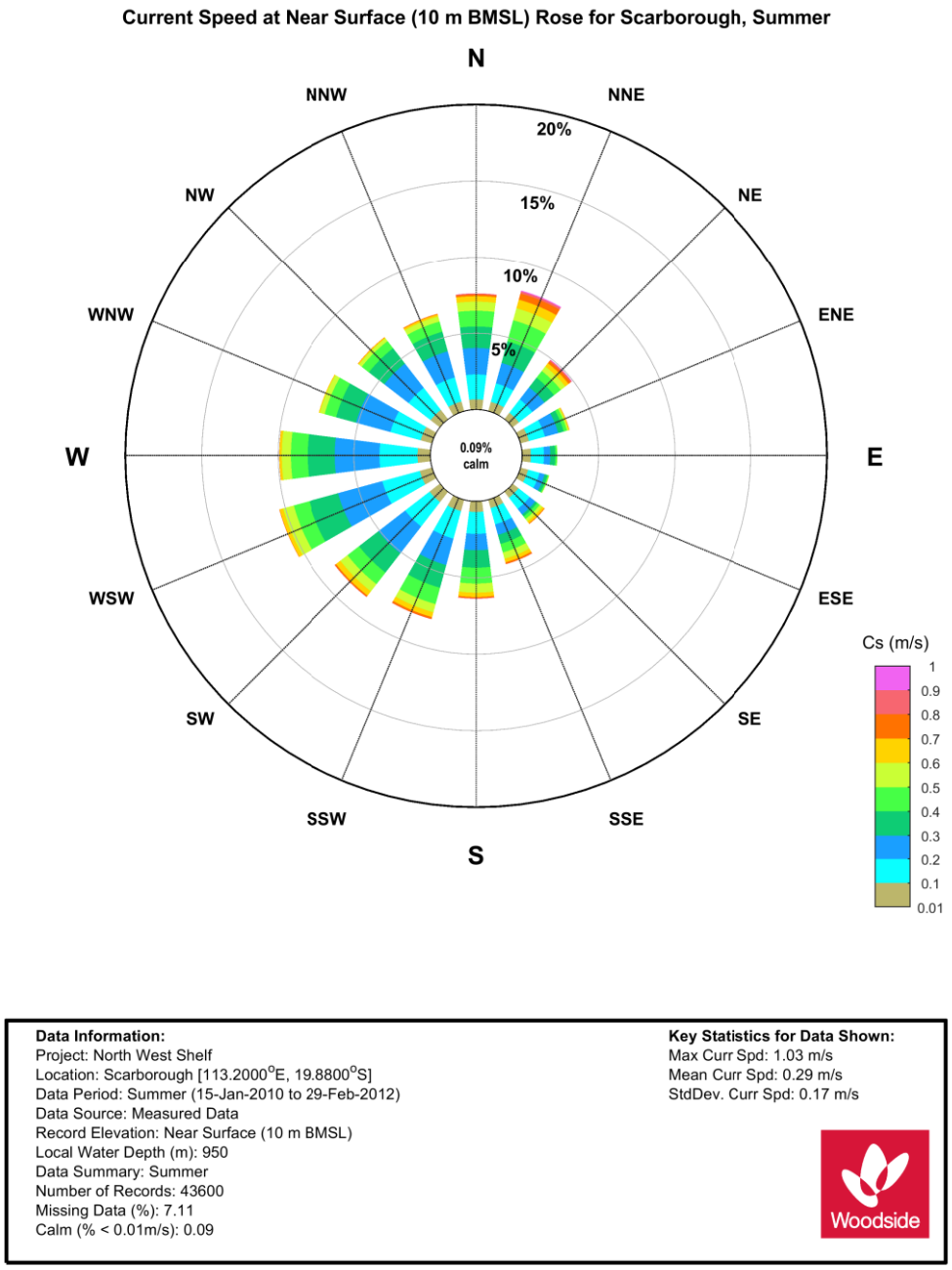


Figure 8. Summer (Nov - April) near surface combined frequency of 1-minute mean current speed and direction (towards) measured at the Scarborough location (cyclones removed) (WEL, 2018).

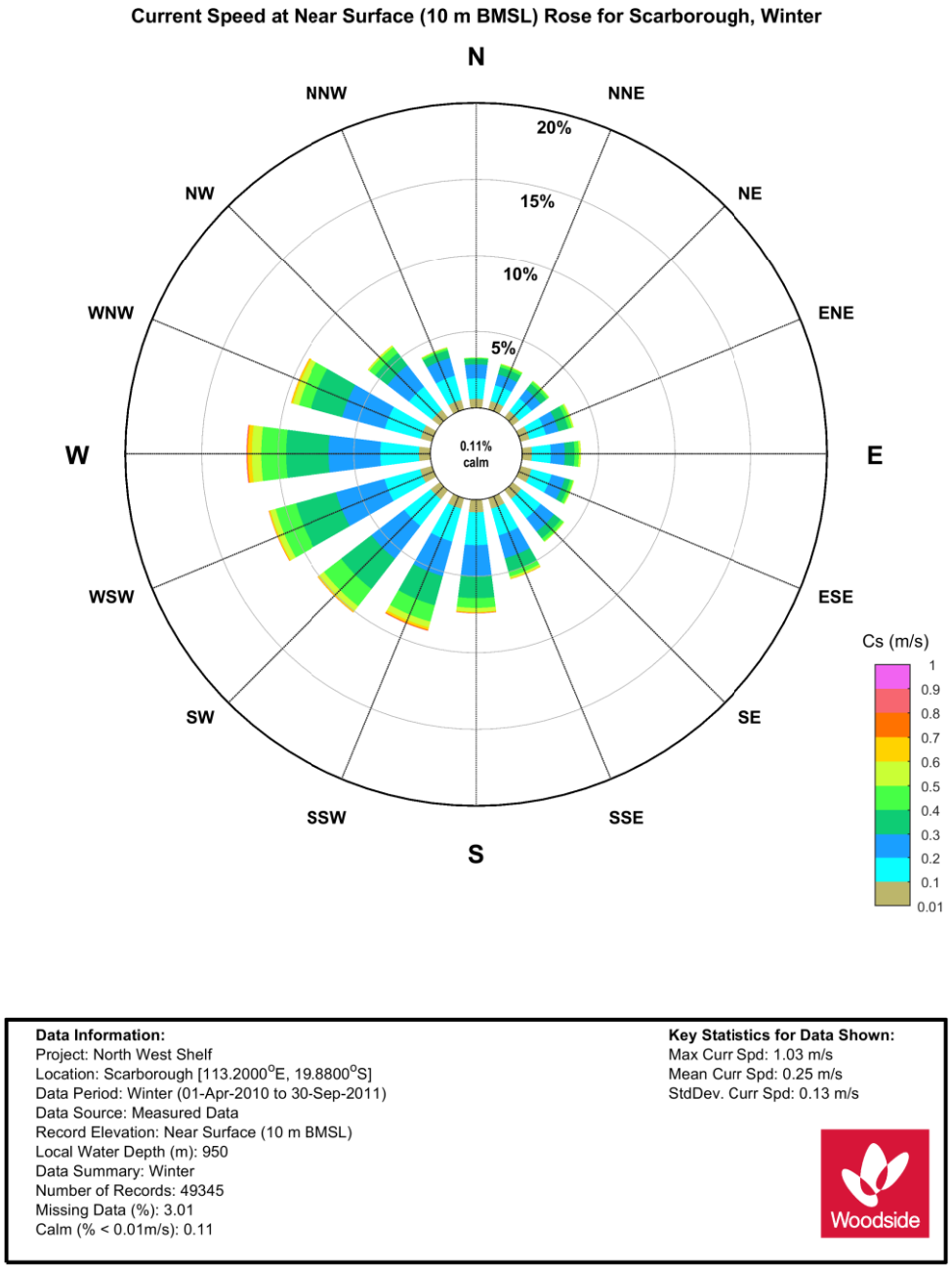


Figure 9. Winter (May-Sep) near surface combined frequency of 1-min mean current speed and direction (towards) measured at the Scarborough location (cyclones removed) (WEL, 2018).

North-west Cape

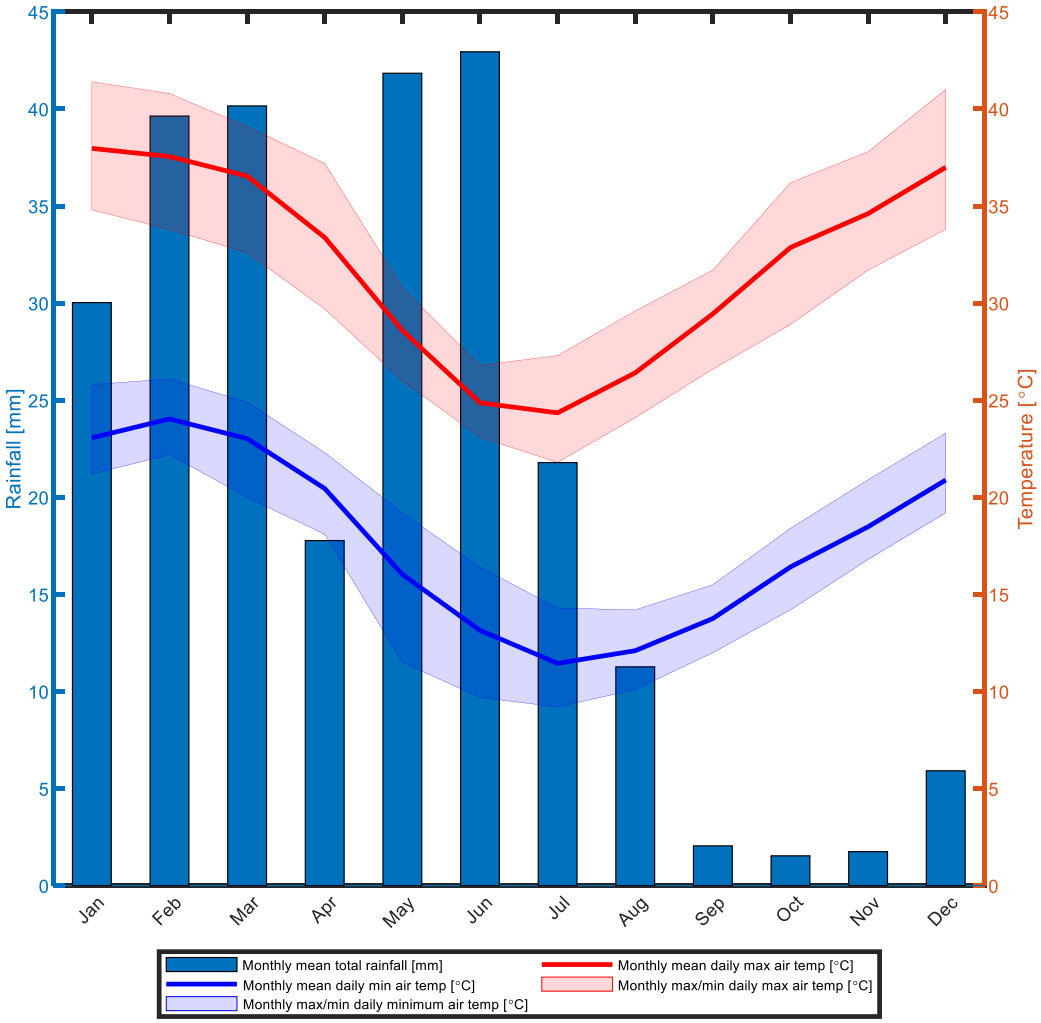


Figure 1. Monthly average total rainfall [mm] and air temperature [°C], calculated based on observations at the Learmonth Airport weather station from 1945-2020 and 1975-2020 respectively (Bureau of Meteorology 2020). Bars show the monthly average total rainfall values, and thick blue and red lines denote 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.

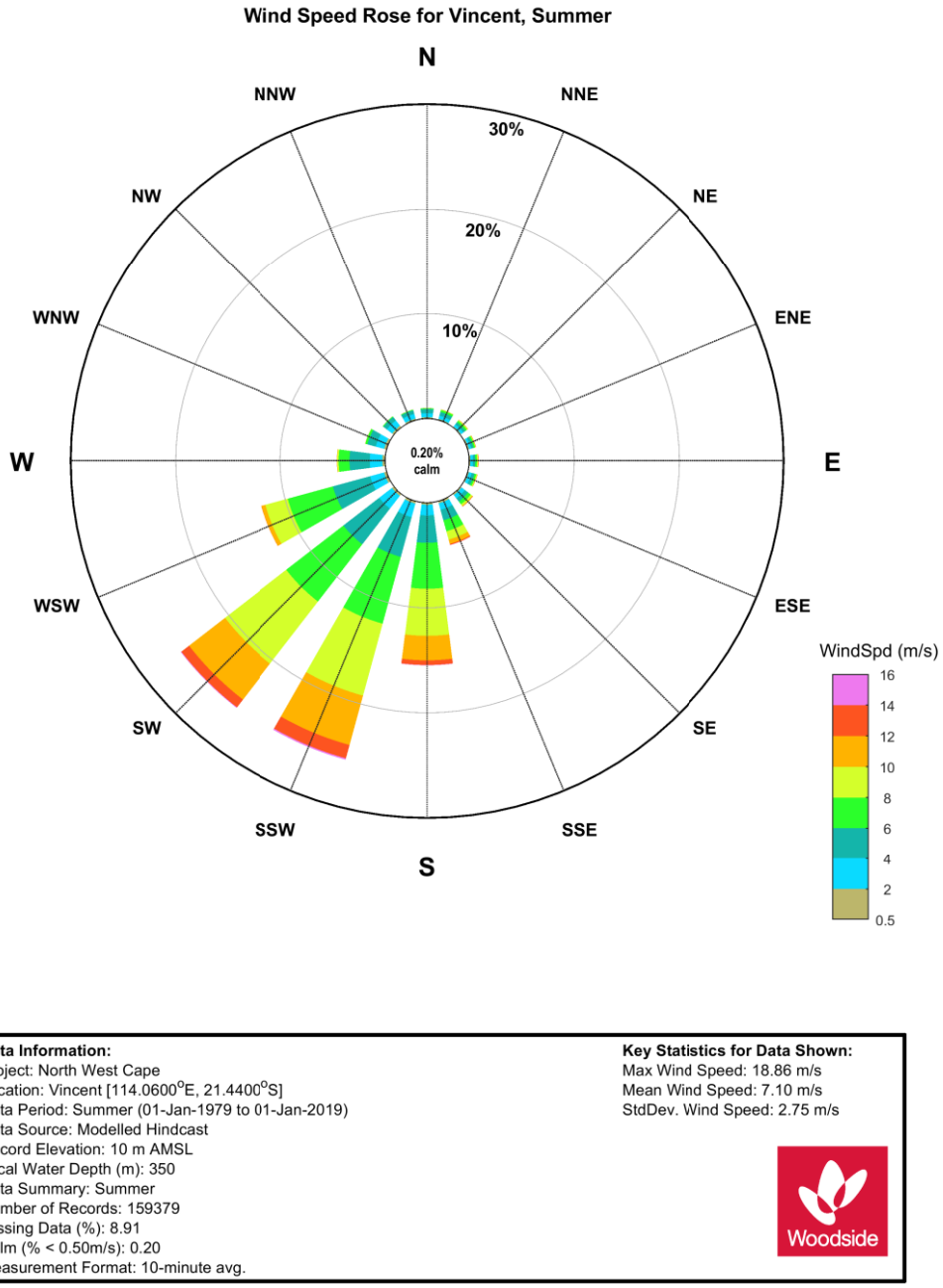
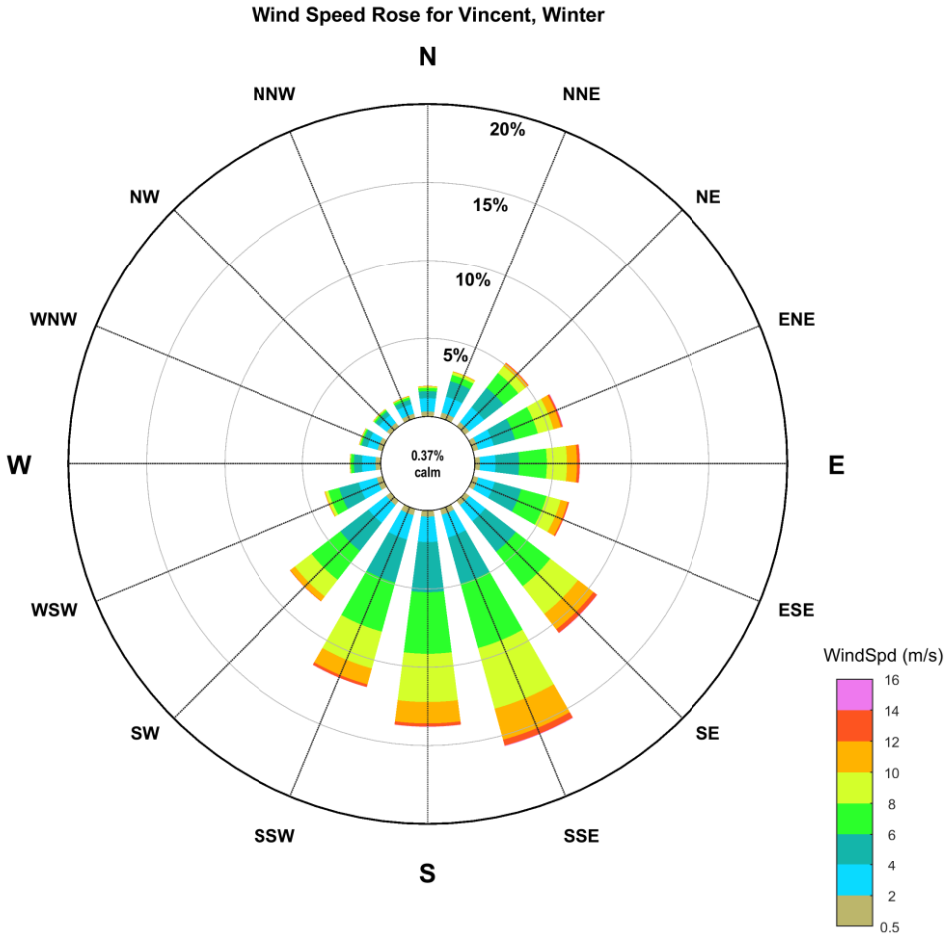


Figure 2. Summer distributions of wind speeds (10-minute at 10 m ASL) by 22.5° directional sectors at the Vincent site (Vincent Metocean). Note tropical cyclone events were not included in this distribution. Winds at Vincent in summer are predominantly from the SW to SSW in summer due to the presence of the Pilbara Heat Low (MetOcean Engineers, 2005).

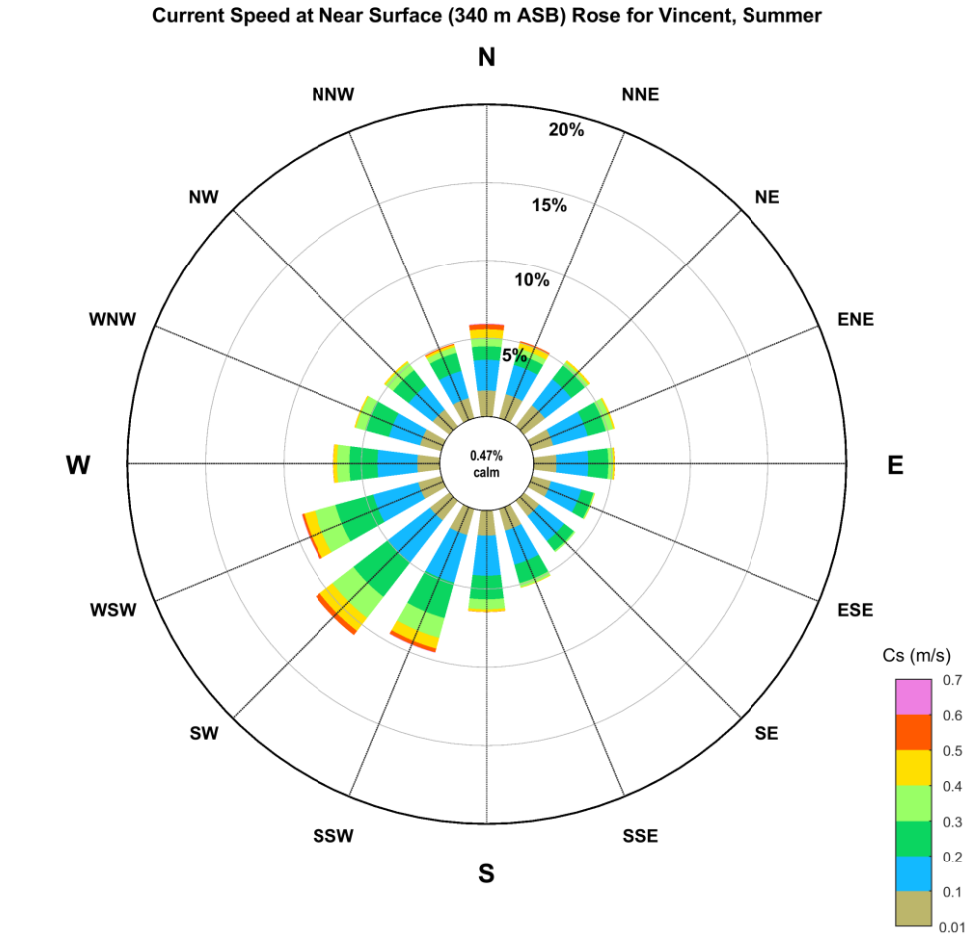


Data Information:
Project: North West Cape
Location: Vincent [114.0600°E, 21.4400°S]
Data Period: Winter (01-Apr-1979 to 30-Sep-2018)
Data Source: Modelled Hindcast
Record Elevation: 10 m AMSL
Local Water Depth (m): 350
Data Summary: Winter
Number of Records: 173626
Missing Data (%): 1.17
Calm (% < 0.50m/s): 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).

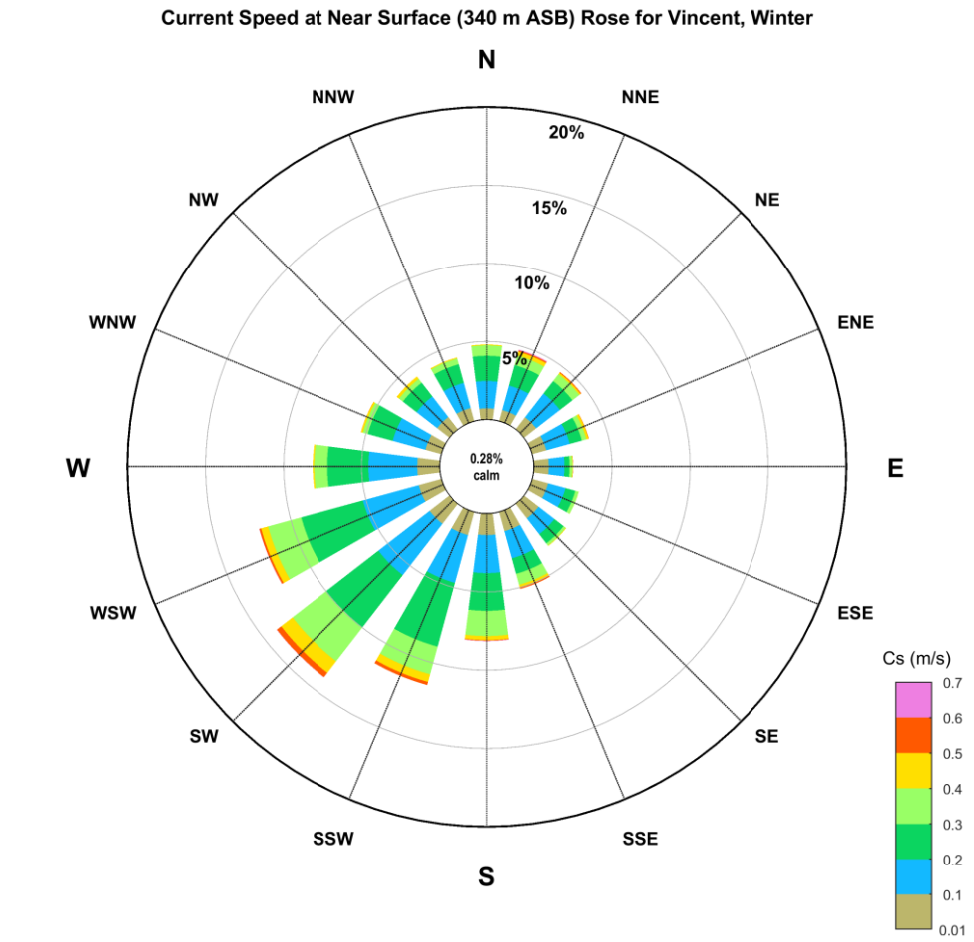


Data Information:
Project: North West Cape
Location: Vincent [114.0600°E, 21.4400°S]
Data Period: Summer (21-Nov-2000 to 13-Dec-2001)
Data Source: Measured Data
Record Elevation: Near Surface (340 m ASB)
Local Water Depth (m): 350
Data Summary: Summer
Number of Records: 144668
Missing Data (%): 1.59
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).

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APPENDIX G: NOPSEMA REPORTING FORMS

NOPSEMA Recordable Environmental Incident Monthly Reporting Form:
https://www.nopsema.gov.au/assets/Forms/A198750.doc

Report of an accident, dangerous occurrence or environmental incident:
https://www.nopsema.gov.au/assets/Forms